

ISLAMIAH COLLEGE

(AUTONOMOUS)

VANIYAMBADI – 635 752

(AIDED & SELF FINANCE)



SYLLABI BOOK - XII

13TH ACADEMIC COUNCIL MEETING

(For the UG & PG Candidates Admitted from 2020-2021)

7TH OCTOBER 2020

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253	PACSPR22	Python for Data Science - Lab	424
254	PAHR2001	Human Rights	51
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256	PACSEP22	Data Mining	426
	M. Phil. COMPUTER SCIENCE		
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SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFAR101	LANGUAGE	ARABIC I	6	5

Course Objectives:

Students are aimed to develop the correct pronunciation of Arabic Alphabet and write them joint to gather as per the give rules and to acquire adequate ability to form meaningful words and small sentences in Arabic.

Course Outcomes:

Students will be able

CO1: To get to know the ability to distinguish different alphabet.

CO2: To develop the skill of reading

CO3: To enhance the skill of writing

CO4: To clear understand the basic grammar

CO5: To write and use the language correctly and to develop the correct grammar sense.

Unit - I	Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Lesson 1, 2 & 3
Unit - 2	Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Lesson 4, 5 & 6
Unit - 3	Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Lesson 7, 8, 9 & 10
Unit -4	Basic Arabic Grammar	Lesson 1 to 10
Unit - 5	Basic Arabic Grammar	Lesson 11 to 20

Prescribed Text Book:

Title of the Book	Author Name	Publishing House
Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Dr. V. Abdur Raheem	I. F. T. Chennai
Basic Arabic Grammar	Dr. Syed Rahmathullah	Deen Store, Chennai

Reference / Recommended Book for Study:

Title of the Book	Author Name	Publishing House
Al Arabiyyah lil Hayat	Nasif Musthafa,	King Saud University Riyadh.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFAR201	LANGUAGE	ARABIC II	6	5

Course Objectives:

Students are expected to develop the sentences construction based on the lessons taught and to gain the translation skill.

Course Outcomes:

Students will be able

CO1: To under the types of sentences

CO2: To develop the skill of reading simple sentences

CO3: To develop the skill of writing simple sentences

CO4: To translate small sentences from Arabic to English

CO5: To gain the skill of translation

Unit - I	Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Lesson 11, 12, 13 & 14
Unit - 2	Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Lesson 15, 16, 17 & 18
Unit - 3	Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Lesson 19, 20, 21, 22 & 23
Unit -4	Ahadeeth Sahla	Lesson 1 to 10
Unit - 5	Ahadeeth Sahla	Lesson 11 to 20

Prescribed Text Book:

Title of the Book	Author Name	Publishing House
Durus-al-Lughat-al-arabiyyah li ghair al natiqina biha Vol-1.	Dr. V. Abdur Raheem	I. F. T. Chennai
Ahadeeth Sahla	Dr. V. Abdur Raheem	I. F. T. Chennai

Reference / Recommended Book for Study:

Title of the Book	Author Name	Publishing House
Al Arabiyyah lil Hayat	Nasif Musthafa,	King Saud University Riyadh.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFUR101	LANGUAGE	URDU I	6	5

PROSE, GRAMMER & LETTER WRITING

COURSE OUTCOME

1. Prose makes students understand National Integration and they inculcate moral and human values within themselves.
2. Develop their creative thinking and writing in prose.
3. Students will be able to write and use the language correctly and they develop the correct grammar sense.
4. Students to develop skill in writing and communicating to other personalities through letter.
5. They will be able to communicate effectively.

UNIT - I

1. SAIR PAHLAY DARWESH KI - Meer Amman Dehlavi
2. Ism aur Uski Qismein
3. Letter to the Principal Seeking leave

UNIT II

1. GHALIB KE AKHLAQ -O- AADAT - Moulana Althaf Hussain Hali
2. Fe'l aur Uski Qismein
3. Letter to the father/guardian asking money for payment of college fees

UNIT III

1. Ummed ki Khushi - Sir Syed Ahmed Khan
2. Sifat aur Uski Qismein
3. Letter to a friend inviting him to your sister's marriage

UNIT IV

1. Zubaida Khatoon – Moulana Abdul Haleem Sharar
2. Zameer aur Uski Qismein
3. Letter to the manager of a firm seeking employment

UNIT V

1. SAWERAY JO KAL MERI AANKH KHULI – Putars Bukhari
2. Alamat-e-Faa'il "Ne" aur Alamat-e-Mafool "Ku" bananey ke Qaidey
3. Letter to a publisher of a book seller placing order for books.

Books for reference:

1. URDU TEXT BOOK CUM WORK BOOK & Urdu Nasar
Published by the Applied Books, New Delhi

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFUR201	LANGUAGE	URDU II	6	5

GHAZALIAT, MANZOOMAT , RUBAIYAT & TRANSLATION

UNIT - I

1. MEER TAQI MEER – Ulti hogayeen Sab tadbeerein kuch na dawa nay kam kiya
2. KHUSH AAMAD – NAZEER AKBAR ABADI
3. MEER ANEES – Gulshan me phirun k sair sehra dekhun

UNIT II

1. GHALIB – Dil hi to hai na Sang-o-Qisht Dard se bhar na aaye kyun
2. SHIKWA – ALLAMA IQBAL
3. AMJAD – Is naam ki zindagi me kuch jan to ho

UNIT III

1. NIYAZ VANIYAMBADI – Hum O hain jo k waqt ki chalon me aagaye
2. JAWAB-E-SHIWA—ALLAMA IQBAL
3. AKBAR – Gaflat ki hansa se aah bharna achcha

UNIT IV

1. SHAKIR Nayeti – Shahid-e-Maqsood ek din ru baru hojayega
2. TAJ MAHAL—SAHIR LUDHIANAWI
3. JOSH – Pa mal-e-Gham insane huwa jata hai

UNIT V

1. JIGAR MURADABADI – Duniya ke sitam yaad na apni hi wafa yaad
2. SUBH-E-AZADI—FAIZ AHMED FAIZ
3. ASGAR VELLORI – Dhoondha to kitabon me sadaqat na mili
4. TRANSLATION from English to Urdu

Books for reference:

1. URDU SHAYERI Published by the Applied Books, New Delhi
2. MAZHAR-E-ADAB Published by the Applied Books, New Delhi

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SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFHD101	LANGUAGE	HINDI I	6	5

CO1	Understand National Integration (Dinakar) and inculcate moral & human values within themselves through prose.
CO2	Develop their creative thinking and writing in prose.
CO3	Identify, write and use the language correctly and develop the correct Grammar sense.
CO4	Improve letter writing skills.
CO5	Effectively face interviews for the post of Hindi translators by understanding translation of technical terms and phrases.
CO6	Understand and develop writing Gender and Number correctly
CO7	Understand and use Causative Verbs effectively.

Objectives: 1. To acquaint the students with different forms of thoughts and styles used in Hindi Prose writing 2. To develop a correct grammar sense is very important for written communication. 3. Functional Hindi will help the students to improve their writing skills.

SYLLABUS :

UNIT – I PROSE: ‘GADYA NIKASH’

LESSONS PRESCRIBED:

1. MAHAVEER PRASAD DWIVEDI - LOBH
2. PREMCHAND - SABHYATA KA RAHASYA
3. DINAKAR - BHARAT EK HAI
4. HARISHANKAR PARSA YEE - KRANTIKARI KI KATHA
5. SUBHADRA KUMARI CHOUHAN – RAAHI

UNIT – II APPLIED GRAMMAR-

PRESCRIBED POINTS: a) LING b) VACHAN c) PRERANARTHA KRIYA d) VISHESHAN
e) SHUDDH ROOP

UNIT – III LETTER WRITING:

PRESCRIBED LETTERS : (PERSONAL & COMMERCIAL):

1. ORDERING FOR BOOKS
2. EMPLOYMENT LETTER
3. LETTER OF COMPLAINT
4. LETTER TO BANK
5. LETTER TO THE EDITOR & 6. LETTER TO A FRIEND

UNIT – IV FUNCTIONAL HINDI: ADMINISTRATIVE & BUSINESS

TERMINOLOGY: TERMS/WORDS FROM ENGLISH TO HINDI & VICE VERSA

UNIT –V PHRASES FROM HINDI TO ENGLISH only

[PRESCRIBED TERMINOLOGY ENCLOSED]

BOOK FOR STUDY: GADYA NIKASH, Ed. SHAIK ABDUL WAHAB, RAKA PRAKASHAN, ALLAHABAD.

BOOKS FOR REFERENCE:

1. SHAIKSHIK VYAKARAN AUR VYAVAHARIK HINDI, Dr. KRISHNA KUMAR GOSWAMI, AALEKH PRAKASHAN, DELHI – 32.
2. PRAMANIK ALEKHAN AUR TIPPAN, PROF. VIRAJ, RAJPAL & SONS, KASHMERE GATE, DELHI, 2001
3. SAMPOORNA HINDI VYAKARAN, SREESHARAN & SRI ALOK KUMAR RASTOGI, MADHUR BOOKS, DELHI - 51.
4. GLOSSARY OF ADMINISTRATIVE TERMINOLOGY, MINISTRY OF HRD, NEW DELHI, 2004

PRESCRIBED TERMINOLOGY : UNIT - IV

ADMINISTRATIVE AND BUSINESS TERMINOLOGY

A) ENGLISH TO HINDI and VICE VERSA

ACCOUNTANT = लेखपाल; ACTING = कार्यकारी; ADMINISTRATOR = प्रशासक; ALLOTMENT = आबंटन; AUCTION = नीलाम; AUDITOR = लेखापरीक्षक; ALLOWANCE = भत्ता; BALANCE SHEET = तुलनपत्र; BROKER = दलाल; MANAGER = प्रबंधक; BEARER = धारक; CABINET = मंत्रिमंडल; CIRCULAR = परिपत्र; CLERK = लिपिक; CONTROLLER = नियंत्रक; CONSUMER = उपभोक्ता; COMMISSIONER = आयुक्त; CASHIER = रोकडिया; CUSTOMER = ग्राहक; DEBENTURE = ऋणपत्र; DIRECTOR = निदेशक; DOCUMENT = प्रलेख / दस्तावेज़; EDITOR = संपादक; ELECTION = चुनाव; EMPLOYMENT = रोज़गार; EXCHANGE = विनिमय; FUND = निधि; GOVERNOR = राज्यपाल; GRANT = अनुदान; GAZETTE = राजपत्र; INCOME TAX = आयकर; INSPECTOR = निरीक्षक; INSURANCE = बीमा; INVOICE = बीजक; MAYOR = महापौर; MINISTRY = मंत्रालय; PRIME MINISTER = प्रधानमंत्री; MINISTRY OF DEFENCE = रक्षामंत्रालय; MINISTRY OF FINANCE = वित्तमंत्रालय; MINISTRY OF HOME = गृहमंत्रालय; MINISTRY OF HEALTH = स्वास्थ्यमंत्रालय; MINISTRY OF RAILWAYS = रेलमंत्रालय; MINISTRY OF EXTERNAL AFFAIRS = विदेशमंत्रालय; MINISTRY OF COMMERCE = वाणिज्यमंत्रालय; PARLIAMENT = संसद; PASSPORT = पारपत्र; QUALIFICATION = अर्हता / योग्यता; SECRETARY = सचिव; DEPUTY SECRETARY = उपसचिव; JOINT SECRETARY = संयुक्तसचिव; GENERAL SECRETARY = महासचिव; SUPER TAX = अधिकर; TENDER = निविदा; TYPIST = टंकक; UNDERTAKING = उपक्रम; VICE CHANCELLOR = कुलपति; WHIP = सचेतक.

B) HINDI TO ENGLISH PHRASES:

तदनुसार = ACCORDINGLY; यथाप्रस्तावअनुमोदित = APPROVED AS PROPOSED; यथासंभव = AS FAR AS POSSIBLE; केप्राधिकारसे = BY AUTHORITY OF; पदकेनाते = by VIRTUE OF OFFICE;

अनुमोदनार्थप्रारूप = DRAFT FOR APPROVAL; कार्रवाईशीघ्रकरें = EXPEDITE ACTION; मुझेनिदेशहुआहै = I AM DIRECTED TO; सेपरामर्शकरके = IN CONSULTATION OF; अमुमतिदीजाये = MAY BE PERMITTED; पक्ष-विपक्ष = PROS AND CONS; देखलिया , धन्यवाद् = SEEN, THANKS; प्रमाणितकियाजाताहै = THIS IS TO CERTIFY; कीसीमातक = TO THE EXTENT OF; केबारेमें = with REGARD TO; अवलोकनार्थ = FOR PERUSAL; सूचनार्थ = FOR INFORMATION; मार्गदर्शनकेलिए = FOR GUIDANCE; हस्ताक्षरकेलिए = FOR SIGNATURE; केआदेशसे = BY ORDER; लागुहोना = COME INTO FORCE; टिप्पणीकेलिए = FOR COMMENTS; आजहीजारीकरें = ISSUE TODAY; पालनकरना = ABIDE BY; इसमामले / विषयमें = IN THIS CASE / IN THIS INSTANCE.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFHD201	LANGUAGE	HINDI II	6	5

CO1	Understand and promote communal harmony, humanity and patriotism through One Act Plays.
CO2	Understand and inculcate loyalty, human values through short stories
CO3	Develop skill to translate from one language to another through translation practice
CO4	Improve effective Communication skill through Dialogue Writing
CO5	Develop the correct grammar sense
CO6	Improve word power by understanding synonyms & Antonyms.
CO7	Understand and use Abstract Nouns effectively.

Objectives: 1. Fiction and One – Act plays to the students for appreciation and critical analysis 2.To help students develop their creative thinking and writing. 3. Dialogue Writing enables students to develop the effective communicative skills 4.To help students develop Practical translation skills.

SYLLABUS AND BOOKS PRESCRIBED:

UNIT – I ONE ACT PLAY: GADYA NIKASH

LESSONS PRESCRIBED :

1. RAMKUMAR VARMA - CHARUMITRA
2. UDAYSHANKAR BHATT - DAS HAZAR.
3. HARIKRISHNA PREMI - RAKSHA BANDHAN

UNIT – II SHORT- STORY: TEXT – GADYA NIKASH

LESSONS PRESCRIBED

1. PREMCHAND - MUKTIDHAN
2. JAYSHANKAR PRASAD - DEVRATH
3. RAJENDRA YADAV – BIRADARI BAAHAR

UNIT –III TRANSLATION PRACTICE:

HINDI TO ENGLISH & VICEVERSA

LESSONS PRESCRIBED: ENGLISH TO HINDI 16, 17, 18 & 19

HINDI TO ENGLISH – 8, 9, 10, 11 & 12 only

UNIT –IV DIALOGUE WRITING:

PRESCRIBED COMMUNICATIONS:

1. ADHYAPAK AUR VIDYARTHI
2. DUKANDAR AUR GRAHAK
3. DUKANDAR AUR VIDYARTHI
4. DOCTOR AUR ROGI
5. DO YAATRI
6. DO MITRA

UNIT –V APPLIED GRAMMAR:

1. SAMANARTHI SHABD
2. VILOM SHABD
3. ANEKARTHA SHABD
4. YUGM SHABD
5. ABSTRACT NOUN

BOOKS FOR STUDY: 1. GADYA NIKASH, Ed. SHAIK ABDUL WAHAB, RAKA PRAKASHAN, ALLAHABAD, 2018

2. ANUVAD ABHYAS – I, D.B.HINDI PRACHAR SABHA, CHENNAI

BOOKS FOR REFERENCE :

1. NAYEE HINDI RACHNA- PART – II D.B.HINDI PRACHAR SABHA, CHENNAI, 2001
2. SHAIKSHIK VYAKARAN AUR VYAVAHARIK HINDI, Dr. KRISHNA KUMAR GOSWAMI, AALEKH PRAKASHAN, DELHI – 32.
3. BOLCHAL KI HINDI, Dr. SUSHEELA GUPTA, LOKBHARATI PRAKASHAN, ALLAHABAD, 2006

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SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFTA101	LANGUAGE	TAMIL I	6	5

Objectives:மாணவர்களிடையேசங்கிலக்கியம், நீதிஇலக்கியத்தைஅறிமுகப்படுத்துதல். ஊடகநுட்பங்களைஅறிவித்தல் மொழித்திறன்பயிற்சிஅளித்தல்.

- அலகு 1 சங்க இலக்கியம்**
குறுந்தொகை 5 பாடல்கள்
புறநானூறு 5 பாடல்கள்
- அலகு 2 நீதி இலக்கியம்**
இனியவை நாற்பது 10 பாடல்கள்
ஆசாரக்கோவை 10 பாடல்கள்
நான்மணிக்கடிகை 10 பாடல்கள்
- அலகு 3 ஊடகவெளியீட்டுநுட்பங்கள்**
1.அறிவித்தல்
2.வாசித்தல்
3.நேர்முகவருணனைகள்
- அலகு 4 தன்னம்பிக்கைக் கட்டுரை**
1. எண்ணங்கள் - எம்.எஸ். உதயமூர்த்தி
2. கல்வியியல் கருத்து - எம்.ஆர்.எம். அப்துர் ரஹீம்
- அலகு 5 மொழித்திறன்**
அகரவரிசைப்படுத்தல்
எழுத்துப்பிழை நீக்கம்
வல்லினம் மிகுமிடம்
கலைச்சொல்லாக்கம்
நிறுத்தக் குறிகள்

பார்வைநூல்கள்

1.குறுந்தொகைமூலமும்உரையும்
நியூசெஞ்சுரிபுக்ஹவுஸ்(பி)லிட்
41-பி, சிட்கோஇண்டஸ்ட்ரியல்எஸ்டேட்
அம்பத்தூர், சென்னை-98.

2.புறநானூறுமூலமும்உரையும்
நியூசெஞ்சுரிபுக்ஹவுஸ்(பி)லிட்
41-பி, சிட்கோஇண்டஸ்ட்ரியல்எஸ்டேட்
அம்பத்தூர்,சென்னை-98.

3.பதினெண்கீழ்க்கணக்குநூல்கள்

சாரதாபதிப்பகம்,
சென்னை-98.

4.எண்ணங்கள்- எம்.எஸ்.உதயமூர்த்தி
கங்கைபுத்தகநிலையம்
23,தீனதயாளன்தெரு
சென்னை-17.

5.கல்வியியல்கருத்து
எம்.ஆர்.எம். அப்துற்றஹீம்
யுனிவர்ஸல்பப்ளிஷர்ஸ், தியாகராயர்நகர்,சென்னை-17.

6.ஊடகவியல்
முனைவர்துரை.மணிகண்டன்
கமலினிபதிப்பகம்,
தஞ்சாவூர்-2

7.மொழித்திறன்
பேராசிரியர்ஜெ.ஜெயச்சந்திரன்
வர்த்தமானன்பதிப்பகம்
தியாகராயர்நகர்,சென்னை-17.

Course Outcome (பாடப்பயன்)

1. சங்கஇலக்கியத்தின்வாயிலாகசங்ககாலமக்களினப்பண்பாட்டைஅறிந்துகொள்வதற்கும்நீதி இலக்கியங்கள்வாயிலாகஅறக்கருத்துக்களைத்தெரிந்துகொள்ளுதல் .
2. ஊடகநுட்பங்கள்வாயிலாகபத்திரிகையாளர்மற்றும்செய்தியாளராகஊடகத்துறையின்பணியில்சேரஉறுதுணையாகஇருக்கும் .
3. உரைடைப்பகுதியில்இடம்பெற்றிருக்கும்கட்டுரைவாயிலாகதன்னம்பிக்கையோடுசெயல்படஉதவும் .
4. மொழித்திறன்வாயிலாகதமிழ்மொழியின்அமைப்பைஅறியலாம் .
5. பிழையின்றிஎழுதுவதற்கும்பேசுவதற்கும்மாணவர்களுக்குபயன்படும்என்பதுகுறிப்பிடத்தக்கது .

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFTA201	LANGUAGE	TAMIL II	6	5

Objectives: மாணவர்களுக்குபக்தி இலக்கியத்தையும் , காப்பிய இலக்கியத்தையும் அறிமுகப்படுத்துதல். இணையம், பேச்சுக்கலைகுறித்துஅறிவித்தல். கடிதம்எழுதும்முறையைஉணர்த்திபயிற்சிஅளித்தல்.

அலகு 1 பக்தி இலக்கியம்

- சைவம் - திருநாவுக்கரசர்தேவாரம்- திருத்தாண்டகம் (10 பாடல்கள்)
- வைணவம் - ஆண்டாள் (10 பாடல்கள்)
- இசுலாம் - சீறாப்புராணம்- ஒட்டகைபேசியபடலம்
- கிறித்துவம் - தேம்பாவணி- வளன்சனித்தபடலம்

அலகு 2 காப்பிய இலக்கியம்

- சிலப்பதிகாரம் - காட்சிக்காதை
- கம்பராமாயணம் - நகர்நீங்குபடலம்

அலகு 3 இணையமும் தமிழும்

- இணையம் - அறிமுகம்
- இணையம்வழிதமிழ்க்கற்றலும், கற்பித்தலும்

அலகு 4 பேச்சுக்கலை

- பேச்சாளர்தகுதிகள், வகைகள், பேச்சுக்கலையின்பண்புகள்,
- கற்றல் - கற்பித்தல்கலை

அலகு 5 கடிதங்கள்

1. அலுவல் முறைக் கடிதங்கள்
2. உறவு முறைக் கடிதங்கள்

பார்வைநூல்கள்

1. திருநாவுக்கரசர்தேவாரம்-கழகவெளியீடு
திருநெல்வேலிதென்னிந்தியசைவசித்தாந்தநூற்பதிப்புக்கழகம், லிமிடெட், 154, டி.டி.கே.சாலை,சென்னை-18
2. திருவெம்பாவை
சாரதாபதிப்பகம்,சென்னை-14.
3. சீறாப்புராணம்
செய்குதம்பிபாவலர்உரை
யுனிவர்ஸல்பப்ளிஷர்ஸ், தியாகராயர்நகர்,சென்னை-17.
4. சிலப்பதிகாரம்- கழகவெளியீடு

- திருநெல்வேலிதென்னிந்தியசைவசித்தாந்தநூற்பதிப்புக்கழகம், லிமிடெட், 154, டி.டி.கே.சாலை,சென்னை-18.
5. கம்பராமாயணம்-கழகவெளியீடு
திருநெல்வேலிதென்னிந்தியசைவசித்தாந்தநூற்பதிப்புக்கழகம், லிமிடெட், 154, டி.டி.கே.சாலை,சென்னை-18.
 6. தேம்பாவணி--கழகவெளியீடு
திருநெல்வேலிதென்னிந்தியசைவசித்தாந்தநூற்பதிப்புக்கழகம், லிமிடெட், 154, டி.டி.கே.சாலை,சென்னை-18.
 7. தமிழ்க்கணினிஇணையப்பயன்பாடுகள்
முனைவர்துரை.மணிகண்டன்
கமலினிபதிப்பகம்,
தஞ்சாவூர்-2
 8. பேச்சுக்கலை
முனைவர்ம. திருமலை
மீனாட்சிபுத்தகநிலையம்
சென்னை-17.

Course Outcome(பாடப்பயன்)

1. பக்தி
இலக்கியங்கள்வாயிலாகஅனைத்துசமயநல்லிணக்ககருத்துக்களைஅறிந்துகொள்ள
லாம்.
2. காப்பிய
இலக்கியம்வாயிலாகவாழ்வியல்நெறிமுறைகளைஅறிந்துகொள்ளஉதவும்.
3. இணையம்அறிமுகம்வாயிலாகஇணையம்வழிதமிழ்கற்றல், கற்பித்தல்.
4. பேச்சுக்கலைவாயிலாகமாணவர்களைமேடைப்பேச்சாளராகஆவதற்குவழிவகுக்கு
ம்.
5. கடிதம்எழுதும்பயிற்சிபெறுவதன்மூலம்அலுவல்முறைக்
கடிதங்கள்எழுதிஅதன்மூலம்பணிபெறுவதற்கும்உரியவகையில்இப்பாடத்திட்டம்உ
தவும்.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFEN101	ENGLISH	ENGLISH I	6	5

Instructional Objectives:

1. To promote the linguistics competence into the minds of the young learners through teaching the basics of English.
2. To acquaint them with situational dialogues
3. To expose the learners to the production skills.
4. To expose the learners to receptive skills
5. To acquaint the learners with different speaking contexts

COURSE OUTCOMES:

1. Promotes linguistics competence of the learner
2. Acquainting with situational dialogues
3. Practicing production and receptive skills.
4. Enhancing the language to suit the context in Restaurant, airport, telephone banking and getting driving license.
5. To set language which adapts to the global economy and the current markets

Unit-I	GRAMMAR	8 Hours
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Parts of Speech

1. Noun,Pronoun,Adjective,Verb,Adverb,Preposition,Conjunction,Interjection
2. Articles

Unit-II	GRAMMAR	8 Hours
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1. Infinitives
2. Participles
3. Gerunds
4. Auxiliaries and Modals
5. Subject Verb Agreement
6. Tenses

Language Lab – *1 hour per week.*

Unit-III	BUSINESS ENGLISH: Essential Phrases For Meetings And Phone Calls	7 Hours
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1. Beginning a Conference Call
2. Clarifying Things on a Phone Call
3. Taking a Break from the Conversation
4. Starting a Great Presentation
5. Introducing the Topic of Your Presentation
6. Ending Your Presentation
7. Being an Active Participant in Meetings
8. Negotiating Successfully
9. Planning for Future Meetings

Unit-IV	BUSINESS ENGLISH:English Phrases for Advanced Fluency	7 Hours
1. On Topic/On Track and Off Topic/Off Track 2. Through The Roof 3. Train of Thought 4. To Bank On 5. Brush Up On 6. Bring To The Table 7. To Table/To Shelve 8. Off The Top of My Head 9. Left Field/Out of Left Field 10. Think Outside the Box 11. Bring Up To Speed 12. To Touch Base 13. To Reach Out 14. In the Loop 15. At the End of the Day		
Unit-V	WRITING	6 Hours
1. Short messages 2. Paragraph Writing 3. Note – making 4. Jumbled sentences 5. Comprehension		
Books for Study/Online Materials: <ol style="list-style-type: none"> 1. Foundation English for Semester I – published by Islamiah College (Autonomous), Vaniyambadi, 2013. 2. https://www.learngrammar.net/english-grammar/modal-auxiliaries 3. https://webapps.towson.edu/ows/sub-verb.htm 4. https://www.onsip.com/voip-resources/smb-tips/conference-call-script-sample-5-examples-for-your-next-meeting 5. https://www.oxbridgeacademy.edu.za/blog/the-8-secrets-of-effective-negotiation/ 		
Books for Reference/Online Materials: <ol style="list-style-type: none"> 1. https://www.toppr.com/guides/english/verbs/auxiliary-and-modal-verbs/ 2. https://www.grammarbook.com/grammar/subjectVerbAgree.asp 3. https://www.businessballs.com/communication-skills/meetings-how-to-plan-and-run-meetings/ 4. https://www.toppr.com/guides/reasoning-ability/verbal-reasoning/spotting-errors/ 5. https://www.esleschool.com/a2-short-messages-exercise-1/ 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAVED101	ENGLISH	VALUE EDUCATION	2	1

Instructional Objectives

1. To promote the linguistics competence into the minds of the young learners through teaching the basics of English.
2. To acquaint them with family values
3. To educate learners status of women in family
4. To establish awareness on anger management
5. To acquaint the learners with ethics and leadership qualities

COURSE OUTCOME:

1. Establish contexts for the learners to make a right moral judgment
2. Cultivate their minds to adopt the values
3. Enable the learners to reflect on issues and develop the right attitude to address them
4. Cultivate compassion and responsibility with themselves and people around them
5. Recognize and uphold human, social and global values

Unit-I	VALUES	3 Hours
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1. Definition and relevance in present day
2. Good values to be followed by individuals
3. Values related to self, society, culture, organization, country development, goodness and self-esteem

Unit-II	FAMILY	3 Hours
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1. Family and family values – responsibility of the family
2. Neutralization of anger, adjustability and threats of family life
3. Status of women in family – society, caring for needy and elders, time allotment and sharing

Unit-III	ETHICS	2 Hours
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1. Definition –Types – Ethical Values
2. Professional Ethics – Mass Media Ethics – Advertisement Ethics
3. Leadership qualities – personality development

Unit-IV	SOCIAL VALUES	2 Hours
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1. Definition –faith - service - secularism – social senses and commitment
2. Students and Politics – Social Awareness – Consumer Awareness
3. Rights and Responsibility – Rights to Food and Shelter, good education, medical care and attention, to earn in right and good manner

Unit-V	GLOBAL ISSUES	2 Hours
<ol style="list-style-type: none"> 1. Definition – Effect of International Affairs on values of life – Issues of Globalization 2. Environmental Issues 3. Mutual respect for different culture, religion and their values 		
Books for Study/Online Materials: <ol style="list-style-type: none"> 1. Value Education: M. Uma Maheswari & K.R. Lakshmi Narayanan, Nanilam Pathipagam, Chennai 3. https://parenting.firstcry.com/articles/10-moral-values-you-must-teach-your-kids/ 4. https://pandagossips.com/posts/4708 5. https://www.carnegiecouncil.org/education/001/ethics/eiaprimer 6. https://journals.sagepub.com/doi/abs/10.1177/0263395716629687 		
Books for Reference/Online Materials: <ol style="list-style-type: none"> 1. https://business.tutsplus.com/tutorials/what-are-personal-values--cms-31561 2. https://www.beliefnet.com/love-family/family-values.aspx 3. https://www.youtube.com/watch?v=zY_tURNi480 4. https://www.renewableresourcescoalition.org/top-environmental-problems/ 5. https://www.mindtools.com/pages/article/mutual-respect.htm 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UASKB101	SKILL BASED	COMMUNICATIVE ENGLISH	4	3

Unit I (20 hours)

1. Listening and Speaking
 - a. Introducing self and others
 - b. Listening for specific information
- c. Pronunciation (without phonetic symbols)
 - i. Essentials of pronunciation
 - ii. American and British pronunciation
2. Reading and Writing
 - a. Reading short articles – newspaper reports / fact based articles
 - i. Skimming and scanning
 - ii. Diction and tone
 - iii. Identifying topic sentences
 - b. Reading aloud: Reading an article/report
 - c. Journal (Diary) Writing
3. Study Skills –1
 - a. Using dictionaries, encyclopaedias, thesaurus
4. Grammar in Context:

Naming and Describing

- Nouns & Pronouns
- Adjectives

Unit II (20 hours)

1. Listening and Speaking

- a. Listening with a Purpose
- b. Effective Listening
- c. Tonal Variation
- d. Listening for Information
- e. Asking for Information
- f. Giving Information

2. Reading and Writing

- a. Strategies of Reading: Skimming and Scanning
- b. Types of Reading :

Extensive and Intensive Reading

- c. Reading a prose passage
- d. Reading a poem
- e. Reading a short story

2. Paragraphs: Structure and Types

- a. What is a Paragraph?
- b. Paragraph structure
- c. Topic Sentence
- d. Unity
- e. Coherence
- f. Connections between Ideas: Using Transitional words and expressions
- g. Types of Paragraphs

4. Study Skills II:

Using the Internet as a Resource

- a. Online search
- b. Know the keyword
- c. Refine your search
- d. Guidelines for using the Resources
- e. e-learning resources of Government of India
- f. Terms to know

4. Grammar in Context

Involving Action-I

- a. Verbs
- b. Concord

Unit III (16 hours)

1. Listening and Speaking

- a. Giving and following instructions
- b. Asking for and giving directions
- c. Continuing discussions with connecting ideas

2. Reading and writing

- a. Reading feature articles (from newspapers and magazines)
 - b. Reading to identify point of view and perspective (opinion pieces, editorials etc.)
 - c. Descriptive writing – writing a short descriptive essay of two to three paragraphs.

3. Grammar in Context:

Involving Action – II

- Verbals - Gerund, Participle, Infinitive
- Modals

Unit IV (16 hours)

1. Listening and Speaking
 - a. Giving and responding to opinions
2. Reading and writing
 - a. Note taking
 - b. Narrative writing – writing narrative essays of two to three paragraphs
3. Grammar in Context:

Tense

- Present
- Past
- Future

Unit V (18 hours)

1. Listening and Speaking
 - a. Participating in a Group Discussion
2. Reading and writing
 - a. Reading diagrammatic information – interpretations maps, graphs and pie charts
 - b. Writing short essays using the language of comparison and contrast
3. Grammar in Context: Voice (showing the relationship between Tense and Voice)

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAEN1001	CORE 1	INDIAN LITERATURE IN ENGLISH	7	6

Instructional Objectives		
<ol style="list-style-type: none"> 1. To get the glimpse of later part of the 18th century which had witnessed the need for English education in India 2. To understand the works of social reformists who had stirred the mindset of populations on topics like women's emancipation and their voting rights. 3. To create awareness of diverse literary cultures of India 4. To understand the true devotion and dedication in human life 5. To analyze the socio and economic problems of the past 		
COURSE OUTCOME: <ol style="list-style-type: none"> 1. Getting the glimpse of later part of the 18th century 2. Enhancing the Indian writers' Literary sense 3. Understanding the works of social reformist 4. Creating an awareness about women's emancipation 5. Build the understanding and awareness, education and literary expression in Communication 		
Unit-I	POETRY	12 Hours
<ol style="list-style-type: none"> 1. Rabindranath Tagore: On The Nature of Love Paper Boats 2. A.K.Ramanujan : Astronomer 3. Nissim Ezekiel: The Professor 		
Unit-II	SHORT STORY	12 Hours
<ol style="list-style-type: none"> 1. Mulk Raj Anand: The Lost Child 2. R.K. Narayan: A Snake in the Grass 		
Unit-III	PROSE	12 Hours
<ol style="list-style-type: none"> 1. Jawaharlal Nehru: Selections from the Discovery of India – Macmillan 2. Nirad C. Chaudhuri: The Eternal Silence of Infinite Crowds 		
Unit-IV	DRAMA	12 Hours
<ol style="list-style-type: none"> 1. Vijay Tendulkar: Silence! The Court is in Session 		
Unit-V	FICTION	12 Hours
<ol style="list-style-type: none"> 1. R.K. Narayan : English Teacher 		
Books for Study/Online Materials: <ol style="list-style-type: none"> 1. https://mywordinyourear.com/2020/06/28/the-nature-of-love-rabindranath-tagore-comments/ 2. https://soundarya.wordpress.com/2012/11/05/astronomer -a-poem-by-a-k-ramanujan/ 1. https://www.successcds.net/learn-english/class-9/the-lost-child-class-9-english.html 2. https://www.learnrcram.com/english-summary/a-snake-in-the-grass-summary/ 3. https://www.supersummary.com/coolie/summary/ 		

Books for Reference/Online Materials:

1. K.R.Srinivasa Iyenger : Indian Writing in English, Sterling Publishers, New Delhi.
2. M.K.Naik – A History of Indian English Literature, Satitya Akademi, New Delhi.
3. H.M.Williams – Indo-Anglian Literature 1800-1970: A Survey, Orient Longman, Chennai.
4. <https://brainly.in/question/18414632>
5. <https://www.youtube.com/watch?v=8KW28UVbJM>

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAENAL11	ALLIED 1	ALLIED - LITERARY FORMS	7	6

Instructional Objectives

1. To retain the core values of human society
2. To feel worthy of leading a humanistic life in the society
3. To highlight the immemorial traditions
4. To create the basic structure of human life
5. To understand the use of language structure and analyzing the context critically

COURSE OUTCOME:

1. To understand the definitions of literary forms
2. Applying literature terminology in genres
3. Applying the language structure and analyzing the context critically
4. To understand and appreciate the works
5. To explore literary elements in a text

Unit-I	POETRY	12 Hours
Lyric, Ode, Sonnet, Elegy, Epic, Ballad, Mock-Epic, Satire and Idyll		
Unit-II	NOVEL	12 Hours
Dedective Novels, Dramatic Novels, Picaresque Novel, Psychological Novel and Historical Novel		
Unit-III	DRAMA	12 Hours
English Tragic Plays, Comic Plays, Tragic-Comedies, Farce and Masque		
Unit-IV	ESSAY	12 Hours
Expository Essays, Descriptive Essays, Narrative Essays and Argumentative Essays		
Unit-V	SHORT STORY, BIOGRAPHY, AUTOBIOGRAPHY	12 Hours

Short Story: Anecdote, Drabble, Fable, Feghoot, Flash Fiction, Frame Story, Mini-Saga, Story Sequence and Sketch Story and Vignette

Biography: Historical Fiction, Academic, Fictional Academic, And The Prophetic Biography.

Autobiography: Thematic, Religious, Intellectual, and Fictionalized.

Books for Study/Online Materials:

1. <https://study.com/academy/lesson/english-sonnet-definition-rhyme-scheme-structure-examples.html>
2. <https://study.com/academy/lesson/what-is-a-ballad-definition-examples-quiz.html>
3. <https://www.britannica.com/art/psychological-novel>
4. <https://literaryterms.net/farce/>
5. <https://www.masterclass.com/articles/what-is-historical-fiction-definition-of-the-historical-fiction-genre-and-tips-for-writing-your-historical-novel>

Books for Reference/Online Materials:

1. William Henry Hudson: An Introduction to the Study of Literature, Kalayani Publishers, Ludhiana
2. Birjadish Prasad: A Background to the Study of English Literature (Revised Edition); Macmillan Company, Chennai.
3. R.J.Rees: English Literature – An Introduction for foreign Readers, Macmillan, London.
4. K.R.Srinivasa Iyengar and Prema Nandakumar: Introduction to the Study of English Literature; Asia Publishing House, Bombay.
5. <https://www.lovereadings.co.uk/genre/ghf/Historical-Fiction.html>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFEN201	ENGLISH	ENGLISH II	6	5

Instructional Objectives		
<ol style="list-style-type: none"> 1. To promote the linguistics competence into the minds of the young learners through teaching the basics of English. 2. To acquaint them with entrepreneurial skills 3. To inculcate business acumen. 4. To expose the learners to various prose 5. To acquaint the learners with different genres of writing 		
COURSE OUTCOME:		
<ol style="list-style-type: none"> 1. Promoting linguistics competence 2. Practicing production and receptive skills 3. Make learner read the selected passages aloud 4. To Build the core values of human society and leading the humanistic life 5. To set language which adapts to the global economy and the current markets 		
Unit-I	PROSE	12 Hours
<ol style="list-style-type: none"> 1. Anita Desai : A Devoted Son 2. O Henry : The Gift of the Magi 		
Unit-II	POETRY	12 Hours
<ol style="list-style-type: none"> 1. Nissim Ezeikel : Night of the Scorpion 2. Robert Frost : The Road Not Taken 3. William Wordsworth: Daffodils 		
Unit-III	BUSINESS ENGLISH	12 Hours
<p>A.Business :Idioms and Expressions A long shot, Back to the drawing board, To corner the market, Hands are tied, Up in the air, To learn the ropes, learning curve, To go down swinging, By the book, To cut corners, Between a rock and a hard place, From the ground up, The bottom line, To get down to business, It's not rocket science</p> <p>B.Business Etiquette: DOs and DON'Ts Do Pay Attention to The Subject Line, Do Use a Proper Salutation, Do Use an Introduction Do Know The Culture, Don't Include Humor and Sarcasm, Do Double-Check Your Attachments, Don't Hit "Reply All",Do Protect Privacy, Do Proof reading, Don't Forget the Conversation Closer</p>		

Unit-IV	SOFT SKILLS	12 Hours
A. Time management <ol style="list-style-type: none"> 1. Importance of time 2. Characteristics of management tasks 3. Determining time elements 4. Time management techniques B. Entrepreneurship <ol style="list-style-type: none"> 1. Entrepreneur and its role 2. Essentials steps to become an entrepreneur 3. EDP training 		
Unit-V	WRITING	12 Hours
<ol style="list-style-type: none"> 1. Report writing 2. Cover letter 3. Curriculum vitae 		
Books for Study/Online Materials: <ol style="list-style-type: none"> 1. Foundation English for Semester II – published by Islamiah College (Autonomous), Vaniyambadi, 2013. 2. https://www.enotes.com/topics/devoted-son 3. https://americanenglish.state.gov/files/ae/resource_files/1-the_gift_of_the_magi_0.pdf 4. https://www.gradesaver.com/the-poems-of-nissim-ezekiel/study-guide/summary-night-of-the-scorpion 5. https://englishsummary.com/night-scorpion-nissim-ezekiel/ 6. How to become a successful student.(time management) 		
Books for Reference/Online Materials: <ol style="list-style-type: none"> 1. https://www.supersummary.com/a-devoted-son/summary/ 2. https://www.shmoop.com/study-guides/literature/gift-of-the-magi/summary 3. https://www.successcds.net/learn-english/class-9/the-road-not-taken-class-9-cbse-english.html 4. https://englicist.com/notes/daffodils-i-wandered-lonely-as-a-cloud-wordsworth-summary 5. https://www.pinterest.com/pin/549017010822452591/ 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UASKB201	SKILL BASED	PROFESSIONAL ENGLISH FOR ARTS & SOCIAL SCIENCES	4	3

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar
(Outcomes based on guidelines in UGC LOCF – Generic Elective)

NB: All four skills are taught based on texts/passages.

UNIT 1 : COMMUNICATION

- Listening** : Listening to audio text and answering questions
- Listening to Instructions
- Speaking** : Pair work and small group work
- Reading** : Comprehension passages –Differentiate between facts and opinion
- Writing** : Developing a story with pictures.
- Vocabulary** : Register specific - Incorporated into the LSRW tasks

UNIT 2 : DESCRIPTION

- Listening** : Listening to process description - Drawing a flow chart.
- Speaking** : Role play (formal context)
- Reading** : Skimming/Scanning-
Reading passages on products, equipment and gadgets.
- Writing:** Process Description –Compare and Contrast
Paragraph-Sentence Definition and Extended definition-
Free Writing.
- Vocabulary** : Register specific -Incorporated into the LSRW tasks.

UNIT 3: NEGOTIATION STRATEGIES

Listening : Listening to interviews of specialists / Inventors in fields
(Subject specific)

Speaking : Brainstorming (Mind mapping)

Small group discussions (Subject- Specific)

Reading : Longer Reading text.

Writing : Essay writing (250 words)

Vocabulary : Register specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS

Listening : Listening to lectures.

Speaking : Short talks

Reading : Reading Comprehension passages

Writing : Writing Recommendations

Interpreting Visuals inputs

Vocabulary : Register specific -Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS

Listening : Listening comprehension- Listening for information

Speaking : Making presentations (with PPT- practice).

Reading : Comprehension passages – Note making.

Comprehension: Motivational article on Professional Competence,
Professional Ethics and Life Skills)

Writing : Problem and Solution essay– Creative writing –Summary writing

Vocabulary : Register specific - Incorporated into the LSRW tasks

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAEN2001	CORE 2	FICTION	4	4

Instructional Objectives

1. To get a quick glance of the 19th century
2. To creation interest in literary works ranging from novel, short story and magazine.
3. To evoke an emotional response among the students,
4. To analyzev the social problems of the day caused by industrialization and the urbanization of the working classes.
5. To interpret the critical ideas and values

COURSE OUTCOME:

1. Reading notable 19th century creation of literary work
2. To develop literary emotional responses
3. To apply social problems of industrialization of 19th to the present day
4. To compare the urbanization of the working classes of the past and present century
5. To organize an ideal social set up inferred from the ideas of the writers.

Unit-I		5 Hours
Jane Austen	– Pride and Prejudice	
Unit-II		5 Hours
Joesph Conrad	-The Secret Sharer	
Unit-III		5 Hours
George Orwell	- Animal Farm	
Unit-IV		5 Hours
Thomas Hardy	- Far from the Madding Crowd	
Unit-V		4 Hours
Graham Greene	- The Power and the Glory	

Books for Study/Online Materials:

1. <https://www.planetebook.com/free-ebooks/pride-and-prejudice.pdf>
2. <https://www.gutenberg.org/files/220/220-h/220-h.htm>
3. <https://www.marxists.org/subject/art/literature/children/texts/orwell/animal-farm/ch01.htm>
4. <https://www.gutenberg.org/files/107/107-h/107-h.htm>
5. <https://www.sparknotes.com/lit/powerglory/summary/>

Books for Reference/Online Materials:

1. <https://www.britannica.com/topic/Pride-and-Prejudice>
2. <https://www.cliffsnotes.com/literature/s/the-secret-sharer/story-summary>
3. <https://www.sparknotes.com/lit/animalfarm/summary/>
4. <https://www.sparknotes.com/lit/maddingcrowd/summary/>
5. <https://www.iasj.net/iasj?func=fulltext&aId=22923>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAEN2002	CORE 3	ENGLISH PROSE	4	4

Instructional Objectives

1. To acquaint the students with the thoughts of free flowing speeches of different writers
2. To enable the students to connect with the different forms of media; newspaper, novel, magazine and letters
3. To read with correct pronunciation, stress, intonation and articulation of voice
4. To enrich active and passive vocabulary
5. To understand the passage and comprehending its meaning

COURSE OUTCOME:

1. To compare and contrast the works of different writers
2. To classify the ideas of different authors
3. To build human relationships for prospective development
4. To infer from life experience that desire and happiness are just a little proportion
5. To interpret the nationalism through prose
- 6.

Unit-I		3 Hours
Francis Bacon	: Of Truth	
Francis Bacon	: Of Parents and Children	
Francis Bacon	: Of Great Place	
Unit-II		3 Hours
Sir Philip Sidney	: The defence of poesie, Political discourses; Correspondence	
Unit-III		2 Hours
Charles Lamb	: Tales from Shakespeare	
Unit-IV		2 Hours
E. M. Foster	: The Machine Stops	
Unit-V		2 Hours
Robert Lynd	: Back to the Desk	

Books for Study/Online Materials:

1. [https://www.thoughtco.com/of-truth-by-francis-bacon-1690073#:~:text=%22Of%20Truth%22%20is%20the%20opening,and%20Moral%22%20\(1625\).&text=In%20%22Of%20Truth%2C%22%20Bacon,%2C%20of%20the%20lie%20itself.%22](https://www.thoughtco.com/of-truth-by-francis-bacon-1690073#:~:text=%22Of%20Truth%22%20is%20the%20opening,and%20Moral%22%20(1625).&text=In%20%22Of%20Truth%2C%22%20Bacon,%2C%20of%20the%20lie%20itself.%22)
2. <http://www.arvindguptatoys.com/arvindgupta/confessions-tolstoy.pdf>
3. <https://www.gutenberg.org/files/2667/2667-h/2667-h.htm>
4. https://icsefriends.weebly.com/uploads/1/0/1/0/101025636/my_lost_dollar.pdf
5. <https://robertlynd.wordpress.com/2013/08/01/back-to-the-desk/>

Books for Reference/Online Materials:

1. <http://learningliteratureoverhere.blogspot.com/2017/02/of-truth-francis-bacon-summary.html>
2. <https://reasonandmeaning.com/2015/01/05/leo-tolstoy-meaning-and-a-leap-of-faith/>
3. <https://study.com/academy/lesson/the-vicar-of-wakefield-summary-characters-themes-analysis.html#:~:text=The%20Vicar%20of%20Wakefield%20is,misfortunes%20of%20the%20Primrose%20family.>
4. <https://brainly.in/question/211081>
5. <http://sittingbee.com/back-to-the-desk-robert-lynd/>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAENAL21	ALLIED 2	ALLIED - HISTORY OF ENGLISH LITERATURE I (1350-1850)	4	3

Instructional Objectives

1. To acquaint the students with the linguistic development of the language.
2. To understand the past history of all sections of the society from gentry to humble craftsmen
3. To make the students to read out the selected passages aloud
4. To interpret different style of writings
5. To distinguish the different emotions and thoughts of prominent writers

COURSE OUTCOME:

1. Gain knowledge of different historical events
2. Understand the history of English literature
3. Classify the ideas of different authors
4. Comprehend literary terminologies
5. Creating awareness about critical approaches

Unit-I	THE AGE OF CHAUCER(1350-1450)	5 Hours
	<ol style="list-style-type: none"> 1. Literary Features of the Age 2. His Life and His Poems 3. Features of his Poetry 4. Other Prominent Writers 	
Unit-II	CHAUCER TO SPENCER(1450-1550)	5 Hours
	<ol style="list-style-type: none"> 1. Literary Features of the Age 2. The Development of Literary Forms and Literary Style 3. Other Prominent Writers 	
Unit-III	THE AGE OF ELIZABETH(1550-1630)	5 Hours
	<ol style="list-style-type: none"> 1. Literary Features of the Age 	

	2. The Development of Literary Forms and Literary Style 3. Pre-Shakespearian Drama, The University Wits 4. William Shakespeare(1564-1616), Ben Jonson(1573-1637) to Cyril Tourneur(1557-1626) 5. Francis Bacon (1561-1626) 6. Other Prose Writers	
Unit-IV	AGE OF MILTON(1630-1660), RESTORATION(1660-1700)	5 Hours
	1. The Metaphysical Poets 2. The Cavalier poets 3. Neo-Classicism 4. John Dryden 5. Restoration Comedy, Tragedy	
Unit-V	AGE OF POPE(1700-1750) & AGE OF TRANSITION(1740-1800)	4 Hours
	1. Prose, Poetry and Drama 2. The New Romanticism-The Reactionary School-The Transitional Poets	
Books for Study/Online Materials:		
1. http://www.unife.it/lettere/filosofia/lm.lingue/insegnamenti/letteratura-inglese-ii/materiale-didattico-2019-2020/Edward%20Albert-%20History%20of%20English%20Literature-%20OUP-%202000.pdf 2. https://www.academia.edu/36004761/David Daiches A Critical History of English Literature vol I 3. http://www.englandandenglishhistory.com/english-social-history/anglo-saxon-england-449-ad-to-1066-ad 4. https://khandyeducation.weebly.com/1550-1630.html 5. http://englishlanguagelearningforum.blogspot.com/2009/03/age-of-pope-1700-1750.html		
Books for Reference/Online Materials:		
1. An Outline History of English Literature – Hudson 2. https://www.slideshare.net/vijichola/the-age-of-milton-1625-1660-cholan 3. https://www.josbd.com/historical-background-and-literary-features-of-the-elizabethan-age-1550-1630/ 4. https://www.youtube.com/watch?v=juSBiWNEens 5. https://ardhendude.blogspot.com/2011/04/sojourn-at-age-of-pope-1700-50.html		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAENAL22	ALLIED 3	ALLIED - SOCIAL HISTORY OF ENGLAND	4	3

Instructional Objectives

1. To explore the transforming influence of pre-history to the early modern England
2. To help students to think critically the impact upon the English society and its literature.
3. To identify the key themes which encapsulate the period
4. To explore the full breadth of English life and Society
5. To analyze the major trends that have shaped English society

COURSE OUTCOME:

1. Explore the transforming influence of pre-history to the present modern history of England
2. Think critically the impact upon the English Society and its literature
3. Recommend how the present work culture can be best utilized
4. Discuss varieties of technological functions of the past to present
5. Transmit the accumulated knowledge from present to future

Unit-I	THE EARLY HISTORY OF ENGLAND	5 Hours
Celts, Romans, Anglo-Saxons and Normans Heptarchy- Caedmon- Cynewulf- Augustine-William the Conqueror Feudalism-Thomas Becket-Black Death		
Unit-II	THE RENAISSANCE	5 Hours
Medieval Thinkers-Petrarch, Boccaccio, Michelangelo, Raphael and Leonardo De Vinci Reformation and Counter Reformation		
Unit-III	THE INDUSTRIAL AND AGRARIAN REVOLUTION	5 Hours
Reign of George III, Sir Richard Arkwright and James Watt Most workers Exploitation The Enclosure Acts Improved Methods of Growing Crops		
Unit-IV	EFFECTS OF FRENCH REVOLUTION ON BRITISH LIFE	5 Hours
Despotism and Exploitation The Court of Louis XVI Rights of Man Corn Law		

Unit-V	ENGLAND IN TWENTY-FIRST CENTURY	4 Hours
Scottish National Party European Unification Golden Age of Television Internet of Things and Artificial Intelligence		
Books and e-Books for Study/Online Materials: <ol style="list-style-type: none"> 1. The Social History of England by Padmaja Ashok, Orient Blackswan Private Limited 2011- First Publication 2011-Reprinted 2012(Four Times), 2016(Two times)Second Edition 2019 2. https://www.ebooks.com/en-us/series/great-medieval-thinkers/ 3. https://www.britannica.com/event/Industrial-Revolution#:~:text=Industrial%20Revolution%2C%20in%20modern%20history,other%20parts%20of%20the%20world. 4. https://www.bl.uk/romantics-and-victorians/articles/the-impact-of-the-french-revolution-in-britain 5. https://www.ippr.org/files/2017-10/1508402633_cej-wealth-in-the-21st-century-oct-2017.pdf 		
e-Books for Reference/Online Materials: <ol style="list-style-type: none"> 1. https://www.historyextra.com/period/anglo-saxon/difference-between-britain-england-brief-history/ 2. https://www.history.com/topics/renaissance/renaissance#:~:text=The%20Renaissance%20was%20a%20fervent,classical%20philosophy%2C%20literature%20and%20art. 3. https://www.history.com/topics/industrial-revolution/industrial-revolution 4. http://www.nationalarchives.gov.uk/pathways/citizenship/struggle_democracy/revolution.htm 5. https://www.nytimes.com/2020/04/30/movies/capital-in-twenty-first-century-review.html 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN1001	CORE 1	BRITISH LITERATURE-I	6	5

INSTRUCTIONAL OBJECTIVES

1. To inspire the visual arts and literature
2. To emphasize the theatre and music of the golden period of English
3. To present and body and soul of the society.
4. To portray the picture of Chaucer's society.
5. To compare and contrast the problems and issues of the past with the present

COURSE OUTCOMES:

1. Learners will get the knowledge of the literary ages
2. Understand the dramatic and theoretical development
3. Understand the societal development of past and present
4. Gains technique, culture and language
5. Psychological development of the people and society

Unit-I	POETRY	12 Hours
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Geoffery Chaucer :Prologue to the Canterbury Tales (The Knight,
The Wife of Bath & The Monk)
Edmund Spenser :Epithalamion
John Milton (1608-1674) : Paradise Lost Book IX

Unit-II	SONNETS AND ODES	12 Hours
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William Shakespeare : Those hours, that with gentle work did frame
John Donne : The Sun Rising
John Keats :Ode to the Nightingale
Percy Bysshe Shelley :Ode to the Westwind

Unit-III	PROSE	12 Hours
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Francis Bacon :Of Wisdom for a Man's Self
:Of Plantations
Dr.Johnson :Life of Milton

Unit-IV	DRAMA	12 Hours
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John Webster :The Duchess of Malfi
William Congreve :The Way of the World

Unit-V	NOVEL	12 Hours
John Bunyan	: The Pilgrim's Progress	
Jonathan Swift (1667-1745)	: The Battle of the Books	
Books for Study/ Online Materials:		
<ol style="list-style-type: none"> 1. http://www.cliffsnotes.com/literature/c/the-canterbury-theses/summary-and-analysis/the-prologue 2. http://www.gradesaver.com/spensers-amoretti/study-guide/summary 3. http://www.shmoop.com/the-duchess-of-malfi/suffering-theme.html 4. http://www.enotes.com/topics/every-man-his-humour 5. https://www.annacastle.com/bacons-essays-of-plantations 		
Books for Reference/ Online Materials:		
<ol style="list-style-type: none"> 1. https://www.enotes.com/topics/epithalamion 2. https://www.sparknotes.com/poetry/donne/section4/ 3. https://www.gradesaver.com/shakespeares-sonnets/study-guide/summary-sonnet-5-those-hours-that-with-gentle-work-did-frame 4. https://en.wikisource.org/wiki/The_Essays_of_Francis_Bacon/XXIII_Of_Wisdom_for_a_Man%27s_Self 5. https://www.gradesaver.com/the-duchess-of-malfi/study-guide/summary 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN1002	CORE 2	INDIAN LITERATURE IN ENGLISH	6	5

INSTRUCTIONAL OBJECTIVES

1. To enhance the learners with early contribution of Indian English Writers.
2. To introduce the learners the varied range of Indian English writers from R.K.Narayan, Mulk Raj Anand, Raja Rao to Salman Rushdie.
3. To understand the devotion and dedication in human life
4. To compare and contrast the past and present
5. To interpret and critical ideas and values

COURSE OUTCOMES:

1. Read the prominent works of Indian writing in English
2. Enhance the India writers' Literary sense
3. Understand the ethos of Indian writing
4. Comprehend the uniqueness of Indian Literature in English
5. Analyse the innovative style of Indian writers

Unit-I	POETRY	12 Hours
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Nissim Ezekiel	: The Patriot
Arun Kolatkar	: A Game Of Tigers And Sheep

Unit-II	POETRY	12 Hours
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Rabindranath Tagore	:Gitanjali
Dom Moraes	:Sindbad

Unit-III	PROSE	12 Hours
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B.R. Ambedhkar	:Annihilation of Caste
Sri Aurobindo	:The Renaissance in India

Unit-IV	DRAMA	12 Hours
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Girish Karnad	: Nagamandala
Manjula Padmanabhan	: Kleptomania

Unit-V	NOVEL	12 Hours
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Sashi Deshpande	: Roots and Shadows 1983
Kamala Markandaya	: A Handful Of Rice

Books for Study/ Online Materials:

1. <http://litaide.blogspot.com/2018/12/the-patriot-by-nissim-ezekiel-summary.html>
2. <https://brainly.in/question/12273721#:~:text=A%20large%20flock%20was%20created,of%20killing%20each%20other%20began.>

3. <https://www.enotes.com/topics/gitanjali-song-offerings#:~:text=The%20collection%20begins%20with%20the,fulfillment%20of%20his%20life's%20purpose.>
4. https://ccnmtl.columbia.edu/projects/mmt/ambedkar/web/readings/aoc_print_2004.pdf
5. <file:///C:/Users/SKN/Downloads/20TheRenaissanceInIndia.pdf>

Books for Reference/ Online Materials:

1. <http://education.seattlepi.com/main-theme-poem-goodbye-party-miss-pushpa-ts-6614.html>
2. <http://www.sacred-texts.com/hin/tagore/gitnjali.htm>
3. <http://oscareducation.blogspot.in/2013/10/nagamandala-summary.html>
4. <http://ijellh.com/dark-holds-terrors-woman-searching-for-her-identity/>
5. <http://www.iosrjournals.org/iosr-jhss/papers/Vol.%2021%20Issue2/Version-6/C021261217.pdf>

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN1003	CORE 3	AMERICAN LITERATURE	6	4

INSTRUCTIONAL OBJECTIVES

1. To introduce students to the major works of American authors and their intellectual philosophies
2. To portrait different periods and movements through American Literature
3. To increase the knowledge of the roots of American Literature
4. To cultivate the systematic approach for analysis
5. To discuss literary and dramatic aspects

COURSE OUTCOMES:

1. Create an awareness of American historical, cultural and formal issues
2. Gain knowledge about American literary world
3. Develop the critical approaches when dealing with text
4. Understand the features of individual works
5. Get a working knowledge of the cultural and historical contexts of the works

Unit-I	POETRY	12 Hours
Walt Whitman	: A Clear Midnight	
Emily Dickinson	: Success is Counted Sweetest	
	: The last night that she lived	
Robert Frost	: Nothing Gold Can Stay	
Unit-II	POETRY	12 Hours
E.E.Cummings	: Any one lived in a pretty how town.	
Langston Hughes	: I too Sing America	
Sylvia Plath	: Daddy	

Unit-III	PROSE	12 Hours
Ralph Waldo Emerson	:Stonehenge	
Martin King Jr.	:I have a Dream	
Unit-IV	DRAMA	12 Hours
Nathaniel Hawthorne	:The Scarlet Letter	
Arthur Miller	:After the Fall 1964	
Unit-V	NOVEL	12 Hours
Toni Morrison	:Paradise 1997	
Tennessee Williams	:The Glass Menagerie	
Books for Study/ Online Materials:		
<ol style="list-style-type: none"> 1. https://poets.org/poem/clear-midnight 2. https://www.litcharts.com/poetry/emily-dickinson/success-is-counted-sweetest 3. https://www.litcharts.com/poetry/langston-hughes/i-too 4. https://www.enotes.com/topics/after-fall 5. https://www.sparknotes.com/lit/menagerie/summary/ 		
Books for Reference/ Online Materials:		
<ol style="list-style-type: none"> 1. http://www.gradesaver.com/walt-whitman-poems/study-guide/summary-a-child-said-what-is-the-grass 2. http://www.enotes.com/topics/american-scholar 3. http://www.biography.com/people/ralph-waldo-emerson-9287153 4. http://www.sparknotes.com/lit/menagerie/ 5. https://en.wikipedia.org/wiki/Paradise (novel) 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN1004	CORE 4	WOMEN'S WRITING IN ENGLISH	6	4

INSTRUCTIONAL OBJECTIVES

1. To demonstrate an understanding of the social construction of gender.
2. To acquaint knowledge about gender issues as they affect diverse populations.
3. To get familiarize with women's studies, men's studies and queer studies
4. To acquire the connotation of cultural or attitudinal characteristics.
5. To understand the characteristics or traits that are associated with biological aspect.

COURSE OUTCOMES:

Unit-I	POETRY	12 Hours
	<ol style="list-style-type: none"> 1. Emily Dickinson : A Bird came down the walk 2. Sylvia Plath : Daddy 3. Kamala Das : An Introduction 	
Unit-II	PROSE	12 Hours
	<ol style="list-style-type: none"> 1. Virginia Woolf: A room of one's own 	
Unit-III	FICTION	12 Hours
	<ol style="list-style-type: none"> 1. Edith Wharton: The House of Mirth 	
Unit-IV	DRAMA	12 Hours
	<ol style="list-style-type: none"> 1. Henrick Ibsen : A Doll's House 2. Vijay Tendulkar : Silence! The court is in session 	
UNIT V	THEORY	12 Hours
	<ol style="list-style-type: none"> 1. Dr. Vandana Siva: Women and the Environment 2. Helen Cixous: The Laugh of the Medusa 3. Luce Irigaray: This sex which is not one 	
Books for Study/Online Materials:		
<ol style="list-style-type: none"> 1. https://www.westernreservepublicmedia.org/poetry/images/because-i-could-not-stop-for-death.pdf 2. https://www.poetrynook.com/poem/my-grandmothers-house 3. https://ebooks.adelaide.edu.au/w/woolf/virginia/w91r/contents.html 4. https://www.cliffsnotes.com/literature/t/tess-of-the-durbervilles/book-summary 5. https://www.sparknotes.com/lit/dollhouse/summary/ 		

Books for Reference/Online Materials:

1. Sandra M Gilbert and Susan Gubar, 1985, The Norton Anthology of literature by Women, New York
2. An Anthology of American Women Writing, Rajani P, V. Rajagopalan and NirmalSelvamani, Dept. of English, Madras Christian College
3. Sandra M.Gilbertand Susan Gubar,ed.,1985,The Norton Anthology of
4. LiteraturebyWomen, New York.
5. <https://www.shmoop.com/because-i-could-not-stop-for-death/summary.html>
6. <https://englishsummary.com/lesson/mygrandmother-house-kamala-das/>
7. <https://www.sparknotes.com/lit/roomofonesown/summary/>
8. <https://www.sparknotes.com/lit/tess/summary/>

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAENEP11	ELECTIVE 1	CREATIVE WRITING	6	4

INSTRUCTIONAL OBJECTIVES

1. To teach how to draft, revise and edit the passage.
2. To compile the journals and magazines
3. To compose the professional letter.
4. To join two different pieces as one
5. To build the confidence

COURSE OUTCOMES:

1. Acquaint learners with linguistic development of the language
2. Learning skills in more meaningful way
3. Revise, edit and drafts the passages
4. Compile journals and magazines
5. Compose the professional letters

Unit-I	CREATIVE WRITING	12 Hours
Unique style of saying, developing characters and point-of-view		
Unit-II	THE ART OF WRITING	12 Hours
Think deep in mind ,an array of analogies , editing skills, pack with details		

Unit-III	WRITING FICTION AND SHORT STORIES	12 Hours
Fiction and Non fiction – Literary and popular fiction – Character, Plot, Point of View and Setting in Short Story		
Unit-IV	WRITING DRAMA	12 Hours
Concepts and Characteristics of Drama – Plot, Structure and Characterization		
Unit-V	TECHNICAL WRITING	12 Hours
End user documentation, traditional writing and technological marketing communication		
Books for Study/ Online Materials: <ol style="list-style-type: none"> 1. Elements of Literature. (Eds.) Scholes et al. (Oxford) 2. Creative writing. Anjana Neira Dev, Anuradha Marwah, Swathi Pal. Pearson Longman Publication. 3. https://pdfs.semanticscholar.org/c27f/2524e17d2e1f3b690facec1e7a22a77bf85a.pdf 4. https://www.misd.net/languageart/GrammarInAction/ProofreadingRevisingEditing.pdf 5. https://formidableforms.com/4-steps-to-creating-great-end-user-documentation/ 		
Books for Reference/ Online Materials: <ol style="list-style-type: none"> 1. https://twp.duke.edu/sites/twp.duke.edu/files/file-attachments/creative-writing-1.original.pdf 2. https://www.researchgate.net/publication/230669856 Using Blogs to Practice 3. Grammar_Editing_Skills 4. https://self-publishingschool.com/how-to-write-a-short-story/#:~:text=%232%20%E2%80%93%20Make%20sure%20the%20reader,to%20write%20a%20short%20story! 5. https://www.bkconnection.com/bkblog/charles-arnot/modern-writing-or-traditional-writing-which-is-most-effective-way-of-writing 6. https://quizlet.com/48410500/6-methods-of-characterization-flash-cards/ 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAENEP12	ELECTIVE 1	BUSINESS WRITING	6	4

INSTRUCTIONAL OBJECTIVES

1. To provide exposure to business writing skills
2. To introduce them to etiquettes of business communication
3. To clarify the details
4. To build relationship and networking
5. To keep business with communication letters

COURSE OUTCOME:

1. Comprehending the language between the lines
2. Expressing the views precisely
3. Skill of making grammatically correct sentences.
4. Drafting the business emails
5. Publishing the academic papers of their specialization

UNIT-I	BUSINESS PLAN	12 Hours
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1. Company Description
2. Funding Request
3. Telling People Why it will be Successful

UNIT-II	STEPS IN WRITING	12 Hours
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1. Explain why you Care your Company
2. Overview of the Company and Team

UNIT-III	WRITING A PLAN	12 Hours
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1. 2.Reffering and Giving News
2. 3.Saying What You Can/Can't do and Giving Reasons

Unit-IV	STEPS TO PREPARATION OF REPLIES	12 Hours
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1. Steps to Prepare An Appropriate Reply
2. Understanding the Source
3. Preparing Hints
4. Drafting

Unit-V	WRITING PROCESS	12 Hours
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1. 1.Mechanics of Writing
2. 2.Framing a reply
3. 3.Final Steps
4. 4.Cheking Reply
5. 5.Polishing and Improving

Books for Study/ Online Materials:

1. Dr. K.M. Prabu-“Advanced Business Writing”
2. <https://articles.bplans.com/how-to-write-a-business-plan/>
3. <https://www.entrepreneur.com/article/281416>
4. <https://www.thebalancesmb.com/executive-summary-of-the-business-plan-2948012>
5. <https://smallbusiness.chron.com/write-executive-summary-marketing-plan-43199.html>

Books for Reference/ Online Materials:

1. <https://smallbusiness.chron.com/6-types-business-plans-2591.html>
2. <https://www.entrepreneur.com/article/247574>
3. <https://www.thebalancesmb.com/business-plan-executive-summary-example-2948007>
4. <https://bizfluent.com/how-6534008-write-executive-summary-marketing-plan.html>
5. https://www.fels.upenn.edu/sites/default/files/5_executive_summary_examples.pdf

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN2001	CORE 5	BRITISH LITERATUREII	5	5

INSTRUCTIONAL OBJECTIVES

1. To portrait the ideals of the 19th century
2. To focus the beauty and imagination of the writers
3. To turn the classical writers as a source of inspiration
4. To analyze the emotional, personal, natural and artistic themes
5. To appreciate the language and literary works form scintillating poets.

COURSE OUTCOMES:

1. To make use of notable 19th century creation of literary work
2. Appreciate the poetic devices and techniques
3. Analyze the poems and prose critically
4. To compare the urbanization of the working classes of the past and present century
5. To organize an ideal social set up inferring from the ideas from the writers.

Unit-I POETRY 10 Hours

William Wordsworth :Ode: Intimations of Immortality from Recollections of Early Childhood
 Samuel Taylor Coleridge :Kubla Khan

Unit-II POETRY 08 Hours

P.B. Shelley :A Dialogue
 Robert Browning :My Last Duchess
 William Blake :The Lamb/Tiger/London
 Mathew Arnold :The Scholar Gipsy

Unit-III PROSE 10 Hours

William Hazlitt :On going a Journey
 Mathew Arnold :The Study of Poetry

Unit-IV DRAMA 10 Hours

Oscar Wilde :The Importance of Being Ernest
 Henrik Ibsen :An Enemy of People

Unit-V	NOVEL	10 Hours
Charles Dickens	:Great Expectations	
Thomas Hardy	:Far from the Madding Crowd	
Books for Study/ Online Materials:		
<ol style="list-style-type: none"> 1. http://www.poetryfoundation.org/poem/173744. 2. http://www.shmoop.com/my-last-duchess/themes.html 3. http://www.poetryfoundation.org/learning/essay/237816 4. http://www.shmoop.com/great-expectations/summary.html 5. http://www.sparknotes.com/lit/maddingcrowd/summary.html 		
Books for Reference/ Online Materials:		
<ol style="list-style-type: none"> 1. https://www.sparknotes.com/poetry/wordsworth/section3/ 2. https://www.sparknotes.com/poetry/coleridge/section5/ 3. https://www.sparknotes.com/lit/enemyofthepeople/ 4. https://www.sparknotes.com/lit/greatex/summary/ 5. https://www.sparknotes.com/lit/maddingcrowd/summary/ 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN2002	CORE 6	ENGLISH LANGUAGE AND LINGUISTICS	6	5

INSTRUCTIONAL OBJECTIVES

1. To set an aim to reflect the history of English Language through different periods, an individual's personality through the language development
2. To enable learners to have deeper understanding in studying the language.
3. To teach the 44 sounds of 26 English letters.
4. To reflect the current status of English in India.
5. To analyze wide variety of languages and dialects

COURSE OUTCOMES:

1. Reflects the history of English language through different periods
2. Deeper understanding in language development
3. Gains knowledge in studying the language scientifically
4. Compares the different language structures
5. Gains the current status of English in India

UNIT-I ENGLISH LANGUAGE

12 Hours

1. The History of English Language
2. Standard English
3. English in India

Unit-II SCIENTIFIC STUDY

12 Hours

1. What is studying a language?
2. What Linguistics is
3. Scientific Study of a Language
4. Linguistics in a historical context
5. Phonetics and Phonology
6. Organs of Speech
7. Morphological Structure of Words
8. Syntax – Constituent, Argument and Thematic Structures
9. Semantics and Pragmatics

Unit-III	CONSONANTS, VOWELS AND SYLLABLES	12 Hours
1. Description and classification of consonants and vowels – allophonic variants 2. Syllable and its structure 3. Intonation, Rhythm and Stress		
Unit-IV	SOCIO-LINGUISTICS	12 Hours
1. What is sociolinguistics? 2. Functions of a language 3. Language and Mind 4. Applied Linguistics		
Unit-V	APPROACHES TO GRAMMAR	12 Hours
1. Structural grammar 2. Transformative Generative Grammar 3. Communicative Grammar		
Books for Study/ Online Materials: <ol style="list-style-type: none"> 1. F.T.Wood -“<i>An Outline History of English Language</i>” 2. Frank Palmer -“<i>Grammar</i>” 3. A C Gimson -“<i>An Introduction to the Pronunciation of English</i>” 4. Daniel Jones -“<i>English Pronouncing Dictionary</i>”. 5. George Yule -“<i>The Study of Language</i>” 		
Books for Reference/ Online Materials: <ol style="list-style-type: none"> 2. Crystal David -“<i>Linguistics</i>” 3. A C Bough -“<i>A History of English Language</i>” 4. Andrew Radford, Martin Atkinson and David Britain – “<i>Linguistics: An Introduction</i>”, Cambridge University Press 5. Niladri Sekhar Dash – “<i>Applied Linguistics</i>”, Heritage Publication 6. RA Hudson -“<i>Sociolinguistics</i>”, Cambridge University Press 7. Monica Marquez – “<i>Methods in Cognitive Linguistics</i>”, John Benjamins Publishing Company, 2006 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN2003	CORE 7	NEW LITERATURE IN ENGLISH	5	4

INSTRUCTIONAL OBJECTIVES

1. To enable the learner to communicate effectively
2. To introduce students to modern literature
3. To provide exposure to millennial thinking
4. To develop appreciation and interest in literature
5. To integrate the four skills

COURSE OUTCOMES:

1. Gaining knowledge in modern literature
2. Exposure to millennial thinking
3. Develop the creative process by comparing two or more works of different poets
4. Maximize the thought that every individual or thing is a significant contributor of the society
5. Discover how the past literary knowledge makes sense with present time

Unit-I		12 Hours
Vikram Seth	:Equals	
Wole Soyinka	:A Shuttle in the Crypt (1971)	
A.D. Hope	: Standardisation	
Judith Wright	:Fire at the Murdering Hut	
Unit-II		12 Hours
Derek Walcott	:Ruins of a Great House	
Margaret Atwood	:Journey to the Interior	
Faiz Ahmed Faiz	: Nowhere, no Trace Can I Discover	
Unit-III		12 Hours
Chinua Achehe	:Marriage is a Private Affair	
Ananda Coomarasamy	: The Dance of Siva	
Unit-IV		12 Hours
Wole Soyinka	: The Lion and the Jewel	
Dario Fo	: Can't Pay? Won't Pay! 1974	
Unit-V		12 Hours
Margaret Laurence	: <i>The Stone Angel</i> (1964)	
James Ngugi	: A Grain of Wheat	

Books for Study/ Online Materials:

1. <https://www.ajol.info/index.php/tvl/article/view/93215>
2. <https://www.enotes.com/topics/d-hope-63117>
3. <https://huong1952.tumblr.com/post/25753890534/from-fire-at-murdering-hut-by-judith-wright/amp>
4. <https://www.poemhunter.com/poem/ruins-of-a-great-house/>
5. <https://www.litcharts.com/lit/marriage-is-a-private-affair/summary>

Books for Reference/ Online Materials:

1. https://shodhganga.inflibnet.ac.in/bitstream/10603/28677/9/09_chapter%204.pdf
2. <https://www.youtube.com/watch?v=j2pkhED-X08>
3. <https://owlcation.com/humanities/Analysis-of-Poem-Ruins-Of-A-Great-House-by-Derek-Walcott>
4. <https://www.litcharts.com/lit/the-stone-angel/summary>
5. <https://www.litcharts.com/lit/a-grain-of-wheat/summary>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN2004	CORE 8	POSTCOLONIAL LITERATURE	5	4

Instructional Objectives

1. To highlight the cultural, political and social identity
2. To build interest in nationhood and nationalism
3. To analyze the history , culture and races
4. To examine the contextual reflections carefully
5. To understand the emotions of postcolonial writers

COURSE OUTCOMES:

1. Knowing key ideas and texts and intellectual shifts in reading the culture, language and literature.
2. Ideals with ideas and concepts of 20th century criticism
3. Ideas associated with movements like structuralism, post structuralism and feminism.
4. Deals with changing notions of the relationship between humans and nature
5. Recurrence in later social, historical, cultural and literary contexts.

Unit-I POETRY

12 Hours

A.D. Hope: Australia
Kofi Awoonor: The Weaver Bird
Terek Walcott: A Far Cry From Africa

Unit-II PROSE

12 Hours

Ngugi Wa Thiong'o : Decolonizing The Mind(Chapter-1- The language of African Literature)
Frantz Fanon: Black Skin White Mask(Chapter-1-The Negro and Language)

Unit-III DRAMA

12 Hours

George Ryga: The Ecstasy of Rita Joe
Wolesoyinka: Kongi Harvest

Unit-IV NOVEL

12 Hours

Chinua Achebe: No Longer at Ease
Michael Ondaatje: The English Patient

Unit-V	FEMINISM AND CRITICAL THEORY	12 Hours
	Chakravorty Spivak: Three Women's Text and a Critique of Imperialism Gayatri Helen Tiffin Griffiths, Ashcroft: The Empire Writes Back(Introduction, Cutting the Ground)	
Books for Study/ Online Materials: <ol style="list-style-type: none"> 1. B. Ashcroft: The Empire Writes Back. 2. Edward Said: Orientalism. 3. Homi Bhabha: Nation and Narration 4. Gayatri Spivak: In Other Worlds. 5. Aijaz Ahmad: In Theory 		
Books for Reference/ Online Materials: <p>Mannoni: Prospero and Caliban, (Tr.By P. Powesland)</p> <p>Harish Trivedi: Colonial Transactions</p> <p>George Lamming: The Pleasure of Exile.</p> <p>Ganesh Devi: After Amnesia</p> <p>Makarand Paranjape(ed.): In-diaspora.</p>		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAEN2001	COMMON COURSE	HUMAN RIGHTS	2	-

Objective: To make the students know the different dimensions in connection with the Human Rights.

UNIT– I (5 Hours)

Definition of Human Rights – Nature, Content, Legitimacy and Priority – Theories on Human Rights – Historical Development of Human Rights.

UNIT– II (5 Hours)

International Human Rights – Prescription and Enforcement till World War II – Human Rights and the U.N.O. – Universal Declaration of Human Rights – International Covenant on Civil and Political Rights – International Covenant on Economic, Social and Cultural Rights and Optional Protocol.

UNIT– III (5 Hours)

Human Rights Declarations – U.N. Human Rights Declarations – U.N. Human Commissioner.

UNIT– IV (5 Hours)

Amnesty International – Human Rights and Helsinki Process – Regional Developments – European Human Rights System – African Human Rights System
– International Human Rights in Domestic courts.

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UNIT– V (5 Hours)

Contemporary Issues on Human Rights: Children's Rights – Women's Rights – Dalit's Rights – Bonded Labour and Wages – Refugees – Capital Punishment.
Fundamental Rights in the Indian Constitution – Directive Principles of State Policy
– Fundamental Duties – National Human Rights Commission.

Books for study:

- 1. K. Mohanasundaram**, Human Rights: Theories and Practice, Concept Publishing Company (P) Ltd., New Delhi.
- 2. Begum S**, Human Rights in the New Millennium, APH Publishing Corporation, New Delhi.

Books for Reference:

1. Ram Ahuja, Social Problems in India, Rawat Publications, Jaipur.
2. B. Goswami, ed., Human Rights and Reforming the Law Raj Publishing House, Jaipur. Rekha Roy, Women's Rights in India: A Feminist Perspective, Akasha Publishing House, New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAENEP21	ELECTIVE II	SOFT SKILLS	6	4

Instructional Objectives

1. To help them to communicate effectively
2. To give realistic perspective of work and work related expectations
3. To formulate problem solving skills in different working context
4. To build their confidence level in challenging work environment
5. To develop all-round personality

COURSE OUTCOMES:

1. To impart the value of soft skills
2. To stress the importance of etiquettes
3. To gain public speaking skills
4. To learn the procedure of group discussion
5. Handle the day affairs well with the knowledge of soft skills.

Unit-I	COMMUNICATION	12 Hours
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Listening-Non-Verbal Communication, Be Clear and Be Consise, Be Personable, Be Confident Always Have An Open Mind, convey Respect and Give and Receive Feedback

Unit-II	EMPATHY	12 Hours
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Honesty, cultural diversity, ability to take other's point of view, integrating Cognitive and affective skills

Unit-III	INTRAPERSONAL	12 Hours
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Self-management, self-esteem, self-awareness, self-regulation, self-critique

Unit-IV	INTERPERSONAL	12 Hours
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Interpersonal - Team work, persuasion, negotiation, conflict resolution, Reading social situations, learning to say no, active listening

Unit-V	LEADERSHIP	12 Hours
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Patience, Empathy, Active Listening, Reliability, Dependability, Creativity, Positivity, Effective Feedback, Team Building, flexibility and Risk-taking

Books for Study/ Online Materials:

1. Working with Emotional Intelligence. Daniel Coleman.
2. <https://skillsology.com/wc/top-10-essential-skills-for-effective-communication/>
3. <https://www.entrepreneur.com/article/23013>
4. <https://www.indeed.com/career-advice/resumes-cover-letters/leadership-skills>
5. <https://www.youthemployment.org.uk/young-professional-training/self-management-skills-young-professional/>
6. <https://operationmeditation.com/discover/8-benefits-of-having-an-open-mind-and-how-to-get-one/>

Books for Reference/ Online Materials:

1. How to Develop Self Confidence and Influence People by Public Speaking. Dale Carnegie.
2. [Unit I- Body Language: Alan Pease]
3. <https://afineparent.com/be-positive/non-verbal-communication-skills.html>
4. <https://www.mindmovies.com/blogroll/3-golden-rules-for-honest-communication>
5. <https://fluxes.com/blog/self-management-skills/>
6. <https://www.thebalancecareers.com/list-of-teamwork-skills-2063773>
7. <https://fs.blog/2017/09/open-closed-minded/>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAENEP22	ELECTIVE II	JOURNALISM AND MASS COMMUNICATION	6	4

INSTRUCTIONAL OBJECTIVES

1. To enrich the understanding of Journalism and Media
2. To help students to work with their practical knowledge and experience
3. To establish students to have social contacts and linkages
4. To persuade students build more interest in reaching larger audience
5. To learn the current affairs of all over the world.

COURSE OUTCOME:

1. Make effective use of media English
2. Apply basic and advanced human communication theories and models to academic and professional situations.
3. Helping learners to develop innovative ideas
4. To write a variety of mass media products.
5. Create and design emerging blogs, digital audio, social media etc.,

Unit-I	INTRODUCTION TO JOURNALISM AND MASS COMMUNICATION	12 Hours
Growth of Journalism and its impact on society - Radio Journalism - T.V journalism- Growth, Impact, Merits and Demerits		
Unit-II	PRINT JOURNALISM	12 Hours
- Role of Cinema as a Mass Medium - Investigative Journalism- News Websites		
Unit-III	NEWSPAPER ORGANIZATION	12 Hours
-Reporting: Ethics of Good Reporting, T.V. Reporting, Radio Reporting etc. - Feature Writing: Economic, Politics, Sports etc. -Editing, Organization and Presentation - Presenting Book Reviews		
Unit-IV	ASPECTS OF COMMUNICATIVE STUDIES	12 Hours
- Definition of Communicative Studies - Communicative Terms and Principles- Communicative Purpose and Setting		
Unit-V	COMMUNICATIVE SKILLS	12 Hours
Skimming – Scanning – Referencing – Coding – Decoding - Transcoding - Advertising		

Books for Study/ Online Materials:

1. Mass Communication and Journalism in India. D.S. Mehta
2. Theory and Practice of Journalism. B.M.Ahuja
3. https://shodhganga.inflibnet.ac.in/bitstream/10603/145147/12/12_chapter%205.pdf
4. <https://idreamcareer.com/blog/tv-journalism-as-career/>
5. <https://ethicaljournalismnetwork.org/who-we-are/5-principles-of-journalism>

Books for Reference/ Online Materials:

1. News Reporting and Editing-K.M. Shrivastava : Sterling Publishers. Bangalore 1987.
2. <https://www.tandfonline.com/doi/full/10.1080/1461670X.2017.1370977>
3. <https://cjc-online.ca/index.php/journal/article/view/617/523>
4. <https://mediaguide.fi/mediaguide/ethics-in-journalism/>
5. <https://www.scimagojr.com/journalsearch.php?q=5600153399&tip=sid>

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAHI1001	CORE 1	HISTORY OF INDIA UPTO 712 A. D.	7	6

Instructional Objectives:

- (i) To trace the history of the development of human civilization in ancient India
- (ii) To study the Indus valley and the Vedic period
- (iii) To analyse the teachings of Jainism and Buddhism
- (iv) To study the Culture of Mauryan period.
- (v) To explain the Golden period of Gupta Empire.

Course Outcomes:

- (i) Students understand the culture of Pre - history.
- (ii) Students come to know the Indus valley and Vedic Culture.
- (iii) Students can identify the differences between Jainism and Buddhism
- (iv) Students are aware of the development of Mauryan period.
- (v) Students understand the golden age of Gupta's

Unit - I: Introduction: Geographical features of India – Influence on Indian History – Sources of Indian History – Archaeological, Epigraphy, Numismatics, Literary, Foreign Accounts - Pre - history: Paleolithic – Mesolithic – Neolithic Cultures – distribution – tools – Patterns of Exchange

Unit - II: Indus-Valley Civilization & Vedic Period: Indus Valley Civilization – Origin – Extent – Major Sites – Town Planning – Seals - Religion – Society – Internal and External trade - Decline - Vedic Period – Rig Vedic and Later vedic Period Society and Culture -Vedic Literature – Polity - Economy - Religion.

Unit - III: Emergence of State and Rise of new religious movements – Janapadha – Sixteen Mahajanapadhas – Ajivikas - Charvakas - Lokayathas - Jainism – Tri Ratna – Five Great Vows - Four Buddhism – Four Noble Truths – Eight Fold path - Buddhist Councils – Nandas - Rise of Magadha – Nandas – Persian and Alexander's invasion and its effects.

Unit - IV: Mauryan Empire: Foundation of Mauryan dynasty - Asoka and his Dhamma-Asokan Edicts - Polity - Administration - Society – Economy – Religion – Literature - Art and Architecture – Causes for its decline – Post Mauryan kingdoms: Indo Greeks – Sungas, Sakas, Satavahanas, Kushanas and Kanishka - Parthians - Post Mauryan: Society – Economy – Religion – Literature - Art and Architecture .

Unit - V: Gupta Empire: – A brief political History - Administration – Polity – Society - Economic Conditions - Agriculture - Land grants – Feudalism - Caste system - Position of women - Education – Religion – Literature - Science and technology - Art and Architecture- Golden Age - Harshavardana and his Achievements .

Books for Study:

1. Basham A. L., *The Wonder that was India*, Rupa & Co, New Delhi, 2001.
2. Luniya B. N., *Evolution of Indian Culture*, Lakshmi Narain Publications, Agra, 2005.
3. Mahajan V. D., *Ancient India*, S. Chand & Co, New Delhi.
4. Majumdar R. C., Raychaudri H. C. & Dutta K., *An Advanced History of India*, Macmillan, Chennai, 2004.
5. Sharma L. P., *Ancient History of India*, Vikas publishers, New Delhi.

Books for Reference:

1. Kosambi, D.D., *The Culture and Civilization*, Standard Book Distribution House, New Delhi, 2001.
2. Metcalf D and Thomas, R. Metcalf, *A Concise History of India*, Cambridge University Press, 2002.
3. Romila Thapar, *A History of India, Vol-I*, Penguin books, New Delhi, 1990.
4. Sathianatha Iyer, *Political and Cultural History of India*, Vol. I, Viswanathan & Co., Chennai, 1980.
5. Upinder Singh, *A History of Ancient and Early Medieval India*, Pearson and Longman, 2008.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAHIAL11	ALLIED 1	INTRODUCTION TO TOURISM	7	6

Instructional Objectives:

- To impart the knowledge on basic concepts about Tourism
- To create awareness about the various types and forms of Tourism
- To create awareness about Tourism enabled Services and Industries
- To analyse the role of Various Organisations in the promotion of Tourism
- To assess the role of Government in Promoting Tourism

Learning Outcome:

- The Students understand the fundamentals of tourism.
- The students acquire knowledge about the various forms of tourism.
- The students acquire knowledge about the factors determining tourism.
- The students understood the role of various national and international organisations in the promotion of tourism.
- The students could analyse the various plans and programmes of Government to promote tourism.

Unit - I: Introduction: Definition, Nature, Scope and Importance of Tourism – Tourism and Economy – Basic Components of Tourism – Motivation for Tourism – Factors Affecting Tourism – Negative impact of Tourism.

Unit - II: Types of Tourism: Kinds of Tourism: Domestic, International and Space – Forms of Tourism: Historical Tourism – Social Tourism - Cultural Tourism – Educational Tourism – Religious and Spiritual Tourism – Medical and Health Tourism – Adventure Tourism – Dark Tourism – Rural or Village Tourism - Eco-Tourism

Unit - III: Tourism Amenities: Transport: Rail – Road – Water – Air – Accommodation: International Hotels – Resort Hotels – Commercial Hotels – Residential Hotels – Heritage Hotels – Flotels – Rotels – Aerotels – Space Hotels – Supplementary Accommodation: Motels – Youth Hostels – Caravan and Camping sites – Apartment Hotels – Tourist Villages – Tourist Huts – Robot Hotels – Accommodation in India: Dharmasalas, Chaultries, Sarais and Musafirkanas.

Unit - IV: Tourism Organisations: World Tourism Organisation (WTO) – National Tourist Organisation (NTO) – International Air Transport Association (IATA) – International Civil Aviation Organisation (ICAO) – Pacific Area Travel Association (PATA) –Travel Agents Association of India (TAAI)

Unit - V: Role of Government in Promoting Tourism in India: Sargent Committee – Ministry of Tourism – India Tourism Development Corporation (ITDC) – Tamil Nadu Tourism Development Corporation (TTDC) - National Tourism Action Plan 1992

Books for Study:

1. Charles R. Goeldner, Bernard Cohen: *Tourism Principles, Practices, Philosophies*, Wiley Students Edition, Wiley India, New Delhi, 1984
2. Dr. C. Selvaraj, *Principles of Tourism*, CSR Publication, Kanyakumari District
3. Dr. R. Santha Kumari, *Tourism*, Santha Publishers, Chennai,
4. Shashi Prabha Sharma: *Tourism Education: Principles, Theories and Practices*, Kanishka Publishers and Distributors, New Delhi, 2006
5. Krishan K Kamra and Mohinder Chand: *Basics of Tourism: Theory, Operation and Practice*, Kanishka Prakshan, Delhi, 2019.

Books for Reference:

1. Bhatia, A.K: *Tourism Development: Principals and Practices*, Sterling Publishers Pvt, Ltd, New Delhi, 1989
2. Burkart A.J. and Madlik: *Tourism, Past, Present and Future*, Heinemann, London, 1994
3. Ashu Pasricha: *International Tourism*, Concept Publications, New Delhi, 2009
4. Suddhendu Raju Mishra and Sapan Kumar Sadual: *Basics of Tourism Management*, Excel Books, New Delhi, 2009.
5. Leonard J. Lickorish and Carson L. Jenkins: *An Introduction to Tourism*, Reed Educational and Professional Publishing Ltd, Oxford, U.K, 1997.

Percentage of Change: Unit-II: 10%, Unit-III: 10%

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAHI2001	CORE 2	HISTORY OF INDIA FROM 712 A. D. TO 1526 A. D.	4	4

Instructional Objectives:

- (i) To trace the history of the regional states
- (ii) To study the history of Delhi sultanate
- (iii) To analyse the impact of Bhakti movement on Indian Society
- (iv) To study the different dynasties of South India
- (v) To explain the greatness of Vijayanagara and Bahmani kingdoms

Course Outcome:

- (i) Students understand the features of Regional State
- (ii) Students get an idea about first phase of Muslim rule in India
- (iii) Students get knowledge about the Bhakti and Sufi principles
- (iv) Students identify the socio - economic conditions of South Indian states
- (v) Students understand the administration of Vijayanagara and Bahmani kingdoms

Unit - I: Rise of regional States: Palas and Senas of Bengal - Chalukyas - Rastrakutas – Gurjara Pratiharas – Kalachuri Chedis - Gahadavalas and Paramaras - Polity - Administration - Society - Economy – Religion – Literature - Art and Architecture

Unit-II: Coming of the Muslims: Arabs, Ghazni and Ghoris - Foundation of Delhi sultanate: Slave dynasty, Khalji, Tughlaqs, Sayyids and Lodis.

Unit - III: Impact of Muslims: Polity – Administration – Society – Economy – Religion – Education – Literature - Art and Architecture - Bhakti and Sufi Movements - Emergence of Composite Culture

Unit - IV: Southern regional kingdoms: Kakatiyas – Yadavas– Hoysalas - Polity Administration - Society -Economy – Religion – Literature - Art and Architecture

Unit - V: Vijayanagara and Bahmani kingdoms: Sangama - Saluva – Tuluva – Administration - Art and Architecture - Bahmani Sultans – Gulbarga and Bidar - Administration – Art and Architecture - Disintegration of Bahmani Kingdom and emergence of independent states

Books for Study:

1. Basham A. L., *The Wonder that was India*, Rupa & Co, New Delhi, 2001.
2. Mahajan V. D., *Ancient India*, S. Chand & Co, New Delhi.
3. Majumdar R.C., Raychaudri H.C. & Dutta K., *An Advanced History of India*, Macmillan, Chennai 2004.
4. Satish Chandra, *History of Medieval India, vol.1*, Har Anand Publication, New Delhi, 1997.
5. Irfan Habib, *History of Medieval India*, OUP, Delhi, 1999.

Books for Reference:

1. Anderson, P., *Passages from Antiquity to Feudalism*, London, 1981.
2. Chitnis, K.N., *Aspects of Society and Economy in Medieval India*, Pune, 1979.
3. Irfan Habib, *Essays in Indian History – Towards a Marxist Perspective*, Tulika, 1995.
4. Nurul Hasan, S., *Religion, State and society in Medieval India*, Oxford University Press, 2005.
5. Jha, D.N. (ed.), *The Feudal Order*, Manohar Publications, 2002

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAHI2002	CORE 3	HISTORY OF TAMIL NADU UP TO 1336 A.D.	3	3

Instructional objectives:

- (i) To be acquainted with the geographical features of Tamil Nadu.
- (ii) To be familiar with the various sources for the study of Tamil Nadu.
- (iii) To make the students to understand, the socio-economic conditions of ancient Tamil Nadu during different period namely Sangam Age, Kalabhras, Pallavas, Pandyas, Imperial Cholas.
- (iv) Analyse the outcome of the rule of different dynasties and their system of administration in Tamil country.
- (v) To create awareness about the contribution of Jainism and Buddhism to Tamil Nadu.

Learning Outcomes:

- (i) Understand geographical features of Tamil Nadu with early politics.
- (ii) Ability to evaluate the historical significance of Tamil Literature.
- (iii) Identify the contribution of Pallavas to the development of art and architecture.
- (iv) Narrate the Socio, Economic, Cultural and Political Condition of Tamil Nadu during the Cholas and Pandyan Empire.
- (v) Understand the impact of the Jainism and Buddhism on Tamil Society.

Unit - I: Geographical features and Pre-historic Period: Geographical features of Ancient Tamil Nadu – Survey of Sources – Ethnography of Tamils – Pre-history of Tamils – Aryanization

Unit – II: Sangam Age: Literature – Polity – Chieftains – Religious, Social and Economic conditions during the Sangam period– Education and Fine Arts

Unit – III: Kalabhras and Age of the Pallavas: Kalabhra Identity - Rule – Anti-Brahminical attitude – Pallavas – Origin – Early Pallavas - Mahendravarman I - Narasimhavarman I - His Successors - Nandivarman II – Administration – Literature –

Development of Art and Architecture under Pallavas – Bhakthi Movement – Decline of Pallavas

Unit – IV: Age of the Pandyas and the Imperial Cholas: First Pandyan rulers - Literature – Administration – Art and Architecture – Rise of Imperial Cholas – Parantaka I - Rajaraja I – Rajendra I - Chaluya Cholas – Kulotunga I - Successors – Literature – Administration - Art and Architecture – Decline of the Cholas - Second Pandyan Rulers - Marco Polo and Abdullah Wassaf

Unit – V: Jainism and Buddhism in Tamil Country: Jainism in Tamil Country – Contribution to Literature, Philosophy, Society, Education, Art and Architecture – Buddhism in Tamil Country – Contribution to Literature, Art and Architecture – Impact of Jainism & Buddhism on Tamil Society

Books for Study:

1. Devanesan, *History of Tamil Nadu*, Benu Publication, Marthandam, 2004.
2. Manoranjithamani C., *History of Tamil Nadu*, Dave Bery Publications, Tirunelveli, 2012.
3. Pillay K.K, *Historical Heritage of the Tamils*, MJP Publishers, Chennai, 1979.
4. Rajayyan, K., *History of Tamil Nadu, Madurai*, 1982.
5. Subramanian, N., *History of Tamil Nadu, Vol. I.*, Koodal Publishers,

Books for Reference:

1. Champakalakshmi R., *Trade, Ideology and Urbanization in South India*, Oxford University Press, 1996.
2. Kanakasabai V., *The Tamils Eighteen Hundred Years Ago*, The South Indian Saiva Siddhanta works publishing Society, Tirunelveli Ltd., Chennai, 1956.
3. Nilakanta Sastri K.A., *A History of South India*, Oxford University Press, 1955.
4. Noboru Karashima, ed., *A Concise History of South India: Issues and Interpretations*. Oxford University Press, 2014.
5. Rajan Gurukkal, *Social Formation in South India*, Oxford University Press, 2009.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAHIAL21	ALLIED 2	TOURISM RESOURCES OF INDIA	4	3

Objectives:

- To focus the availability of various types of tourist potentials in India
- Create awareness about the copious natural and man-made tourist attractions in India
- To educate the students to identify the tourist spots according to the taste of tourists
- To create interests through focusing the glory of our mixed culture and make them to promote tourist products in and around India

Learning Outcomes:

- The students acquire knowledge about the historical tourist attractions in India
- The students understand the famous National parks of India as a tourist potential.
- The students understand the ornithological and waterfalls as a tourist resources in India.
- The students understand the natural resources as an attractive force of tourists to India
- The students identify the various tourism resources in India with fairs and festivals.

Unit - I: Historical Tourism Resources: Qutub Minar – Fatehpur Sikri - Red Fort – Jantar Mantar – Teen Murti Bhavan – Taj Mahal – Char Dham Yatra, Vaishnavadevi Temple – Bodhgaya – Mount Abu – Ajmer Shareef – Hazrath Nizamuddin Dargah.

Unit - II: National Parks and Wildlife Sanctuaries: Jim Corbett National Park – Kanha National Park – Sanjay Gandhi National Park – Kaziranga National Park – Gir Wildlife Sanctuary – Mudumalai Wildlife Sanctuary

Unit - III: Bird Sanctuaries and Waterfalls: Salim Ali Bird Sanctuary – Porbandar Bird Sanctuary - Nawab Ganj Bird Sanctuary – Nalsarovar Bird Sanctuary – Vedanthangal Bird Sanctuary – Waterfalls: Kunchikal Waterfalls – Jog Falls – Meenmutty Waterfalls – Hogenekkal Waterfalls – Kutralam Waterfalls

Unit - IV: Hill Stations and Beaches: Hill Stations: Shimla – Darjeeling – Nainital – Srinagar – Mussoorie – Ooty – Beaches: Goa Beaches – Havelock Beach – Marina Beach – Kovalam Beach, Trivandrum.

Unit - V: Fairs and Festivals: Id-ul-Fitr – Id-ul-Azha – Dassehra – Christmas – Kumbh Mela – Pushkar – Baisakhi – Pongal – Holi – Durga Puja – Diwali – Sankranti

Books for Study:

1. Revathy Girish, *Indian Tourist Panorama*, Wisdom Press, New Delhi, 2010.
2. D. S. Bhardwaj: *Domestic Tourism in India*, Indus Publishing Company, New Delhi, 1998.
3. Michael George; *Monuments of India, Vol, 1 and 2*, London, 1988
4. Percy Brown: *Indian Architecture: Buddhist and Hindu*, Bombay, 1972.
5. Robinet Jacob, Mahadevan P, Sindhu Joseph: *Tourism Products of India – A National Perspective*, Abhijeet Publications, New Delhi, 2012.

Books for Reference:

1. Manohar Sajnani: *Encyclopedia of Tourism Resources in India*, Vol - I & II, Kalpaz Publications, Delhi, 2013.
2. Arvind Kumar: *Introduction of Travel and Tourism Management & Tourism Resources of India*, Walnut Publication, Bhubaneswar, Odisha, 2019.
3. Oki Morihiro: *Fairs and Festivals*, World Friendship Association, Tokyo, 1988
4. Vikram Bhat: *Hill Stations of India*, Grantha, U.K, 2011.
5. Bikram Grewal (Ed.): *Indian Wildlife*, 1997.

Percentage of Change: Unit-I: 10%, Unit-II: 10%, Unit-III: 10%

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAHIAL22	ALLIED 3	INTELLECTUAL HISTORY OF MODERN INDIA	3	2

Instructional Objectives:

- To know about the Political leaders of Modern India
- To know about the role of Indian leaders in Social Transformation
- To know about the Cultural contribution of great intellectuals of India
- To know about the Communist thinkers and their Ideology
- To know about the Indian Women leaders of India

Learning Outcomes:

- The students are nourished with the ideologies of great political leaders who played a significant role during the Freedom struggle in India.
- The students are enriched with the philosophy of revolutionary social Reformers, great writers and thinkers that shaped the modern Indian culture
- The students are nurtured with the values and ideals of cultural thinkers
- The students are enhanced with the importance of a society based on equality and fraternity.
- The students realise the constructive role played by women.

Unit - I: Political Thinkers: Gopala Krishna Gokhale – Bala Gangadhar Tilak – Mahatma Gandhi – Jawaharlal Nehru – Maulana Abul Kalam Azad - Muhammad Ali Jinnah – Netaji Subhas Chandra Bose - Rajagopalachari

Unit - II: Social Thinkers: Raja Ram Mohan Roy – Jyothirao Phule – Iswara Chandra Vidyasagar - B.R. Ambedkar – Sir Syed Ahmed Khan – Narayana Guru

Unit -III: Cultural Thinkers: Rabindranath Tagore – Allama Iqbal - Subramania Bharathi – Bharathidasan – Kunangudi Mastan Sahib — Thiru. V. Kalyanasundaram

Unit -IV: Economic Thinkers: M. N. Roy – S. A. Dange - E. M. S. Namboodiripad – P. C. Joshi - P. Jeevanandham – Malayapuram Singaravelu

Unit -V: Women Thinkers: Savitribai Phule – Annie Besant – Muthulakshmi Reddy – Sarojini Naidu – Vijaya Lakshmi Pandit – Arundhati Roy

Books for Study:

1. Grover, B. L. & Grover, S., *A New Look at Modern Indian History (from 1707 to the Modern times)*
2. Naravane, V.S.: *Modern Indian Thought*, Orient Longman, New Delhi.
3. Rajmohan Gandhi, *Modern South India: A History from the 17th Century to our Times*, Aleph Book Company, New Delhi, 2018.
4. Ramachandra Guha, *Makers of Modern India*, Harvard University Press, Cambridge, 2013.
5. Sen, S.P.(ED.), *Social and Religious Reform Movements in the 19th and 20th Centuries*, Calcutta Institute of Historical Studies, 1979.

Books for Reference:

1. Agarwal R. C., and Mahesh Bhatnagar, *Constitutional Development and National Movement of India*, S. Chand & Co., New Delhi, 2014.
2. Bali, D.R., *Modern Political Thought*, Sterling Publications, New Delhi, 1993.
3. Bharathi, K.S., *Encyclopedia of Eminent Thinkers: The political thought of B.R. Ambedkar Vol. IX.*, Concept Publishing Company, New Delhi, 1956.
4. Grover B.L., Grover S., *A New Look at Modern Indian History*, S. Chand & Co., New Delhi, 2004.
5. Lal S., *50 Magnificent Indians of 20th Century*, Jaico Publication, Chennai, 2011.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI1001	CORE 1	SOCIAL AND CULTURAL HISTORY OF INDIA UP TO 1206 A. D.	6	5

Instructional Objectives:

- (i) To study the Socio -Cultural conditions of Indus valley and Vedic Culture
- (ii) To understand the influence of Mauryan period
- (iii) To study the evolution of society during Gupta period
- (iv) To study the impacts of Arab invasion.
- (v) To throw light on the socio religious conditions of Early medieval period

Learning Outcomes:

- (i) Students can evaluate the Culture of Indus valley and Vedic civilization.
- (ii) Students can Identify the emergence of Social and religious conditions of Mauryan empire.
- (iii) Students understood the art and architectural development of Gupta's period.
- (iv) Students can Identify the Consequences of Arab invasion.
- (v) Students have the ability to evaluate the early medieval Indian society.

Unit - I: Indus Valley Civilization and Vedic Cultures: Sources for the History of India — Indus Valley Civilization - - Vedic Culture - Position of Women - Caste System - Religious ferment in the 6th Century B.C. - Rise of Jainism and Buddhism - Persian and Greek influences on Indian Society

Unit - II: Mauryan Empire: Social Conditions – Literature - Art and Architecture – Indian between 2nd Century B.C. and 3rd Century A.D. Brahminical Culture and Synthesis - Social and Economic Conditions - Mahayana and Hinayana Buddhism - Gandhara and Mathura School of Arts – Vaishnavism and Saivism

Unit - III: Gupta Empire: Socio-Economic and religious condition- Cultural Florescence - Art and Architecture (Nagara, Vesara and Dravida Style) - Paintings (Ajanta and Ellora Style) - The Age of Harsha – Socio-Economic and religious condition – Hiuen Tsang

Unit - IV: Advent of the Arabs: Condition of India on the eve of Arab Conquest - Effects of Arab Conquest - Invasions of Mahmud Ghazni and Muhammad Ghori and its effect

Unit - V: India between 8th and 12th Century A. D.: Society-Cultural – Religion - Education - Position of women- Slave system-Art and Architecture

Books for Study:

1. Abraham Eraly, *Gem in the Lotus: The Seeding of Indian Civilization*, Penguin, 2000.
2. Basham, A.L. (ed.), *A Cultural History of India*, Oxford University Press, New Delhi, 2006
3. Majumdar R. C., Raychaudhuri H. C., & Datta K., *An Advanced History of India*
4. Mahajan, V.D., *Ancient India*, Sultan Chand, New Delhi, 2000
5. Upinder Singh, *A History of Ancient and Early Medieval India: From the Stone Age to the 12th Century*, Pearson, Delhi, 2008.

Books for Reference:

1. Chandra, Satish., *Essays on Medieval India History*, Oxford University Press, New Delhi, 2004
2. Jha, D.N., *Ancient India*, Manohar Publication, New Delhi, 2004
3. Nilakanta Sastri K.A., (ed.) *The Age of the Nandas and Mauryas* (reprint), 1996
4. Romila Thapar, *Ancient India Social History*, Orient Longman (P) Ltd, New Delhi, 2004
5. Romila Thapar, *Ashoka and the Decline of the Mauryas* (rev. ed.), 1997.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI1002	CORE 2	SOCIAL AND CULTURAL HISTORY OF TAMILNADU UP TO 1565 A. D.	6	5

Instructional Objectives:

- (i) To study the social and cultural history of Tamil Nadu.
- (ii) To study the historical developments from Sangam Age to Imperial Cholas.
- (iii) To study the economic condition of Tamil Nadu in the ancient period.
- (iv) To trace the literary developments in ancient Tamil Nadu.
- (v) To understand the impact of Jainism and Buddhism on Tamil Society.

Course Outcome:

- (i) Understand the physiographic division of the land during ancient Tamil country.
- (ii) Recognise the historical significance of Tamil Literatures.
- (iii) Evaluate the administration of Pallavas, Cholas, Pandyas and Vijayanagar Empire.
- (iv) Analyse the art and architecture of Tamil Kingdoms.
- (v) Estimate the Socio, Economic and Religious conditions under Vijayanagar Empire.

Unit - I: Sangam and post Sangam Age: Sources for the study of Sangam and post Sangam Age – The fivefold physiographic division of land – Sangam Polity – Socio-economic conditions – Religion – Trade – Literature and Fine arts

Unit - II: Pallavas and Pandyas: Administration – Socio-economic conditions – Education – Literature – Art – Sculpture and Painting – Bakthi Movement

Unit III: Impact of Jainism and Buddhism on Tamil Society: Literary Contribution – Social Contribution – Art and Architecture – Impact on Tamil Society

Unit - IV: Imperial Cholas: Local Self-Government – Social Condition – Status of Women – Temples - Economic Condition – Trade – Education and Literature – Religious Condition - Art and Architecture - Iconography – Sculpture and Painting

Unit - V: Age of Vijayanagar: Impact of Vijayanagar Rule – Society – Economic life – Religion – Literature – Art and Fine Arts

Books for Study:

1. Devanesan, *History of Tamil Nadu*, Benu Publication, Marthandam, 2004.
2. Manoranjithamani C., *History of Tamil Nadu*, Dave Bery Publications, Tirunelveli, 2012.
3. Pillay K.K, *Historical Heritage of the Tamils*, MJP Publishers, Chennai, 1979.
4. Rajayyan, K., *History of Tamil Nadu, Madurai, 1982.*
5. Subramanian, N., *History of Tamil Nadu, Vol. I.*, Koodal Publishers.

Books for Reference:

1. Champakalakshmi R., *Trade, Ideology and Urbanization in South India*, Oxford University Press, 1996.
2. Kanakasabai V., *The Tamils Eighteen Hundred Years Ago*, The South Indian Saiva Siddhanta works publishing Society, Tirunelveli Ltd., Chennai, 1956.
3. Nilakanta Sastri K.A., *A History of South India*, Oxford University Press, 1955.
4. Noboru Karashima, ed., *A Concise History of South India: Issues and Interpretations*. Oxford University Press, 2014.
5. Rajan Gurukkal, *Social Formation in South India*, Oxford University Press, 2009.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI1003	CORE 3	HISTORY OF ANCIENT CIVILIZATIONS (Excluding India)	6	4

Instructional Objectives:

- (i) To trace the difference between culture and civilization.
- (ii) To compare and analyze the various river valley civilizations.
- (iii) To assess the contribution of Persian and Hebrew civilizations.
- (iv) To evaluate the classical civilizations and its contribution.
- (v) To realize the importance of Chinese and Japanese civilizations.

Learning Outcomes:

- (i) Explain the difference between culture and civilization.
- (ii) Comprehend the various river valley civilizations.
- (iii) Assess the contribution of Persian and Hebrew civilizations.
- (iv) Evaluate the classical civilizations and its contribution.
- (v) Realize the importance of Chinese and Japanese civilizations.

Unit - I: Introduction: Definition of Civilizations – Comparison between Culture and Civilization - Origin and growth of Civilizations – Prehistoric Cultures: Paleolithic, Mesolithic and Neolithic cultures

Unit - II: River Valley Civilizations: Egyptian Civilization - Mesopotamian Civilization – Sumerian, Babylonian, Assyrian, and Chaldean Cultures

Unit - III: Persian Civilization - Hebrew and Phoenician Civilizations

Unit - IV: Classical Civilizations: Ancient Greece – Legacy of Greece – Hellenistic Civilization – Ancient Rome – Roman Contribution

Unit - V: Chinese Civilization – Japanese Civilization – Maya, Aztec and Inca Civilizations

Books for Study:

1) Swain J.E.: *A History of World Civilizations*, Eurasia Publishing House Pvt. Ltd., New Delhi, 1994

- 2) B.V. Rao: *World History*, Sterling Publishers
- 3) Gokhale, B. K.: *Introduction to Western Civilization*, S. Chand & Co, New Delhi, 1970
- 4) R. K. Majumdar & N. Srivastava: *History of World Civilizations*
- 5) Wells H.G.: *The History of the World*

Books for Reference:

- 1) Will Durant: *The story of Civilizations*, Vol. I & Vol. II
- 2) Schneider. H.: *The World Civilizations*
- 3) Durant, W.: *The History of Civilizations our Oriental Heritage*
- 4) Judd, G.P: *History of Civilization.*
- 5) Toynbee, A.J.: *A Study of History* (12 Volumes)

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI1004	CORE 4	ISLAMIC HISTORY FROM 500 A.D. TO 750 A.D.	6	4

Objectives:

- To study the social, cultural and religious life of the Arabs during the Days of Ignorance.
- To study the life and teachings of Prophet Muhammad (PBUH).
- To enlighten the sacrifices made by the Prophet Muhammad (PBUH) in reforming the society.
- To study the simple life, judicious and ideal administration of the Pious Caliphs
- To study the rise, rule and fall of the Umayyad dynasty.

Learning outcomes:

- Explain the social, cultural and religious life of the Arabs during the Days of Ignorance.
- Comprehend the life and teachings of Prophet Muhammad (PBUH).
- Enlighten the sacrifices made by the Prophet Muhammad (PBUH) in reforming the society.
- Realize the simple life, judicious and ideal administration of the Pious Caliphs
- Elucidate the rise, rule and fall of the Umayyad dynasty.

Unit – I: Pre - Islamic Arabia: Geography of Arabia: Important provinces and cities: Makkah, Madinah and Taif - Inhabitants of Arabia - Jahiliya Period - Political, Social, Cultural and Religious life of the Arabs

Unit - II: Prophet's Life at Makkah: Prophet Muhammad (PBUH): Parentage, Birth, Early life, and Marriage - Revelation of the Holy Quran - Prophethood - Preaching of Islam - Hostility of Quraysh - Emigrations to Abyssinia - Pledges of Aqaba – Hijrat

Unit - III: Prophet's Life at Madinah: Establishment of Brotherhood - Constitution of Madinah - Political, Religious and Social institutions - Five Pillars of Islam - Battle of Badr - Battle of Uhud - Battle of Ditch - Treaty of Hudaibiyah - Conquest of Khaybar - Fulfilled Pilgrimage - Battle of Muthah - Conquest of Makkah - Battle of Hunayn - Campaign of Tabuk - The Farewell Pilgrimage - Administration under the Prophet - Prophet as a Multifaceted Personality - Quran and Hadith

Unit - IV : Pious Caliphate: Hazrat Abu Bakr: His services to Islam - Nomination as Caliph - Condition of Arabia after the demise of the Prophet - False Prophets - Apostasy Movement - His Administration - Hazrat Umar: His services to Islam - Nomination as Caliph - Expansion of Islam and Conquests - Administration - Hazrat Usman: His services to Islam - Nomination as Caliph -Administration - Hazrat Ali: His services to Islam - Nomination as Caliph - Battle of Jamal - Battle of Siffin - Administration - Fall of Pious Caliphate

Unit – V: Umayyad Dynasty: Establishment of Umayyad Dynasty: Hazrat Amir Muawiyah: Yazid I - Tragedy of Karbala - Abdul Malik and His Reforms - Al-Walid I - Hajjaj bin Yusuf - Umar bin Abdul Aziz - Cultural Progress under the Umayyads: Literature – Art and Architecture – Downfall of the Umayyads

Books for Study:

1. Abdur Rahim Khan, *Muslim Contribution to Science and Culture*, New Delhi, 1946.
2. Ali K., *A Study of Islamic History: Mohammad Ahmad*, Idara - e - Adabiat - I - Delli, New Delhi, 2009.
3. Ameer Ali Syed, *History of the Saracens*, Kitab Bhawan, New Delhi, 1995.
4. Ameer Ali Syed, *The Spirit of Islam*, Idara-i-Adabiat - I - Delli, New Delhi, 1997.
5. Syed Shahabuddeen Dr., *Arabia Varalarum Panpadum*, Ahmed Publications, Vaniyambadi 2001.

Books for Reference:

1. Abbas Ali, *Civilization in Islam*, Reference Press, New Delhi, 2005.
2. Arnold Thomas, *The Legacy of Islam*, Oxford University Press, London, 1931.
3. Ehsan Masood, *Science, and Islam – A History*, Icon Books, London, 2009.
4. Hitti Philip K., *History of Arabs*, Mac Millan India, New Delhi, 1974.
5. Zaydan Juriji, *History of Islamic Civilization*, Kitab Bhawan, New Delhi, 1978.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHIEP11	ELECTIVE 1	TRAVEL MANAGEMENT	6	4

Instructional Objectives:

- (i) To create awareness on the various tasks in Travel and Travel Business
- (ii) To understand the Travel related services and opportunities
- (iii) To understand the job potentiality in travel and tourism industries both employment and
- (iv) Self-employment
- (v) To educate the students on various techniques practiced practically in the travel industries

Learning Outcomes:

- (i) The students understand the evolutionary process of the development of travel.
- (ii) The students acquire knowledge about the travel agency.
- (iii) The students acquire skills in the necessary documents for travel.
- (iv) The students acquire skills in the formalities of travel.
- (v) The students acquire skills in airline travel and ticketing techniques.

Unit - I: Introduction: Post-War Boom in Travel – Modes of Travel: Roadways, Railways, Waterways and Airways.

Unit - II: Travel Agency: Types of Travel Agency - Departments of Travel Agency - Functions of Travel Agency - Travellers Cheque – Hotel Coupons – Travel Guide Book – Public Transport Timetable

Unit - III: Travel Documents: Passport - Types of Passports – Procedure for acquiring/renewal of Passport in India – Visa – Types of Visas – Health Requirements and Vaccines – Taxes – Travel Insurances

Unit - IV: Travel Formalities: Money Exchange and Currency Conversion – Luggage and Baggage – Immigration and Emigration Formalities - Customs Formalities - Airport Information Services – Transit Areas

Unit - V: Airline Travel Techniques: Airline Geography – Types of Journey – ABC World Guideline in Ticketing – Preparation of Air Route Itinerary – Fare Constructions: Class of Services – Fare Basis – Air Transportation Taxes - Time Calculations from GMT – GDS through CRS with special reference to Galileo, Amadeus & Sabre – Online Bookings: Flight, Hotel, Train and Car Bookings

Books for Study:

- 1) Jagmohan Negi, *Air Travel Ticketing and Fare Construction*, Kanishka Publishers, New Delhi, 2008
- 2) Dr. Devanesan, *Travel Management*, Renu Publications, Kanyakumari District
- 3) A.K. Bhatia: *The Business of Travel Agency & Tour Operations Management*

- 4) Pram Nath Seth, *Successful Tourism Management*, Sterling Publishers Pvt. Ltd., New Delhi, 1967.
- 5) Pram Nath Seth and Sushma Seth Bhat, *An Introduction to Travel and Tourism*, Sterling Publishers Pvt. Ltd., New Delhi, 1967.

Books for Reference:

- 1) Md Abu Barkat Ali: *Travel and Tourism Management*, PHI Learning Pvt Ltd., Delhi, 2015
- 2) Biswanath Ghosh: *Tourism and Travel Management*, Vikas Publishing House Pvt Ltd, New Delhi, 2001
- 3) Peter Robinson, Paul Fallan, Harry Cameron & John Crafts: *Operations Management in the Travel Industry*, CAB International, Oxfordshire, UK
- 4) James W, Morrison, *Travel Agents & Tourism – A Manual of Travel Agency Operation* ARCO Publishing Co, NYC.
- 5) Lickorish, L.J & Kershaw, A.G, *The Travel Trade*, Practical Press Ltd., London, 1958

Unit-III : 10%^s

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHIEP12	ELECTIVE 1	FUNDAMENTALS OF DEFENCE AND STRATEGIC STUDIES	6	4

Instructional Objectives:

- i) To Study the concepts of Defence and Strategic Studies
- ii) To discuss the History of Warfare
- iii) To study the importance of International Relations
- iv) To analyze the approaches to peace

Learning Outcomes:

- (i) The students acquired the knowledge about definition of security and Defence strategy
- (ii) The students understand the Historical evolution of warfare and its scope and types.
- (iii) The students acquired the knowledge about the needs of International Relations
- (iv) The students acquired knowledge about the importance of peace and its typology of peace approaches.
- (v) The students understand the various International Organisations and its achievements.

Unit - I: Introduction and Conceptual Formulations: Introduction to the discipline of defence and Strategic studies – Its subject contents – contemporary relevance and significance - Basic Concepts of war, battle, campaign etc. - Definition of security, Defence Strategy, Peace etc.

Unit - II: History of Warfare: Historical evolution of Warfare – Its features and significance: Principles of War, Causes of War, Functions of War: Types of War and Scope

Unit - III: Basics of International Relations: Nature and Scope of International Relations; Features of International Political System – Structure of International Political System (Uni, Bi and Multi polar) – Actors in International Political System – State and Non-State Actors; World Governments (UNO) – Security Features in International Political System – Collective Security, Balance of Power, Hegemony, Regionalism etc.

Unit - IV: Introduction to Peace: Meaning and Definition of peace; Typology of peace – Approaches to peace – Disarmament, International Law – Peace Movements, Peace Research, Peace-making, peace building, peace keeping

Unit - V: Mechanics of Peace: Role and Functions of International Organisations – League of Nations, United Nations Organisations – Amicable means to settle Inter-State Conflicts; Diplomacy scope and function; types of diplomacy – its features

Books for Study:

- 1) Gautam Banerjee, *The 21st Century Army: Strategies for Future*, 2012
- 2) Anil Chauhan, *Aftermath of A Nuclear Attack*, 2010
- 3) Ravi Ranjan, *Armed Conflict and Security in South Asia*, 2012

Books for Reference:

- 1) Sushma Sood, *Armed Forces and Nation Building*, 1998
- 2) Barun De Jomini, *Art of War*, 2012
- 3) Rameshwar Prasad, *The Army Logistics and War*, 2011

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI2001	CORE 5	SOCIAL AND CULTURAL HISTORY OF INDIA FROM 1206 A.D TO 1857 A. D	5	5

Objectives:

- (i) To study the Culture of Delhi Sultanate
- (ii) To focus on the Principles of Bhakti and Sufi movements
- (iii) To highlight socio and cultural development of Vijayanagara and Bahmani kingdoms
- (iv) To highlight on the importance of Mughal Culture.
- (v) To make aware of the British social and education policies in India

Course Outcomes:

- (i) Students understood the Social and Culture of Delhi sultanate.
- (ii) Students aware about influence of Bhakti and Sufi movement on Indian society
- (iii) Students got an idea about the art and architectural development of Vijayanagara and Bahmani kingdoms.
- (iv) Students can evaluate the Cultural development during Mughal period
- (v) Students came to know about Social, Cultural and Education Policies of British India.

Unit – I:Delhi Sultanate: Sources - Social Condition - Status of Women – Slave system- Religion – Cultural Condition: Education-Literature- Art and Architecture

Unit - II:Bhakti and Sufi Movements: Introduction - Bhakti Cult - Sufi Movement: Introduction - Sufi Orders: Chistiya, Suharwardiya, Qadiriya and Naqshbandiya its impact on Indian Society.

Unit - III: Vijayanagara and Bhamani kingdoms: Social and Cultural life under the Vijayanagara-Development of Learning –Literature-Art and Architecture of Vijayanagara. Bahmani kingdom: Social and Cultural life - Literature, Learning, - Art and Architecture

Unit - IV: Mughal Empire: Social and Cultural Conditions - The Ruling Class – Mansabdars, Jagirdars, Zaminadars – Peasants - Status of Women – Religion - Cultural developments: Literature, Education - Painting - Music - Art and Architecture

Unit - V: European Penetration: Growth of Indology - Social and Cultural Policy of East India Company - Activities of Christian Missionaries - Growth of Humanitarianism - Education in British and Independent India: Traditional Hindu and Muslim Educational

System under the Europeans - Patshalas and Madrasas - Introduction of Western Education - Wood's Despatch - Universities of 1857.

Books for Study:

- 1) Chandra, Satish, *Essays on Medieval India History*, Oxford University Press, New Delhi, 2004
- 2) Chandra, Satish, *Medieval India from Sultanate to Mughal – Part – 1, 1206 – 1526*, Har Anand Publications, New Delhi, 1975.
- 3) Mahajan, V. D., *History of Delhi Sultanate*, Sultan Chand, New Delhi, 2000

Books for Reference:

- 1) Mehta, J. L., *An Advance History of Medieval India (1526-1707)*
- 2) Bose, M. L., *Social and Cultural History of India*, Concept Publication, New Delhi, 1989
- 3) Basham, A.L., *A Cultural History of India*, Oxford University Press, New Delhi, 2006

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI2002	CORE 6	SOCIAL AND CULTURAL HISTORY OF TAMIL NADU FROM 1565 A.D. TO 2016 A.D.	6	5

Objectives:

- i) To discuss about the Socio-Cultural condition of Medieval and Modern Tamil Nadu.
- ii) To analyse the importance of Reform Movements in Tamil Nadu.
- iii) To assess the Contribution of Tamil Nadu to India's Freedom Struggle.
- iv) To trace the impact of Dravidian Movement.
- v) To describe the administration of Rajaji and Kamaraj.

Course Outcomes:

- i) Evaluate the Rule of Nayakas and Marathas.
- ii) Identify the emergence of Social Reform Movements in Tamil Nadu.
- iii) Understand the role of Tamil Nadu in Freedom Struggle.
- iv) Identify the impact of protests against the British rule.
- v) Ability to evaluate the rule of Congress and Dravidian Parties.

Unit – I: Nayaks and Marathas: Social and Economic conditions – Religious Conditions – Education and Literature – Art and architecture

Unit – II: Reform Movements: Social Reform Movement – Justice Party – Self-Respect Movement – Women's Movement and Social Legislations – Anti-Hindi Agitations – Educational Policies – Development of Science and Technology and Professional Education

Unit – III: Tamil Nadu in the Freedom Struggle: Tamil Nadu during 19th & 20th Centuries – Vellore Mutiny – V. O. Chidambaram Pillai – Subramani Siva - Barathiyar - Role of Tamil Literature and Press – Simon Commission – Civil Disobedience Movement – Quit India Movement

Unit – IV: Tamil Nadu under Rajaji and Kamaraj: Administration – Society – Education – Industry – Agriculture – Polity

Unit – V: Tamil Nadu after Independence: Justice Party – Self-Respect Movement – Rise of DMK to Power – Administration of DMK – Administration of AIADMK – Rise of AIADMK to Power – Planning commission – Social Justice and Reservation Policies – Industrial growth – Impact of Globalisation on Tamil Nadu economy.

Books for Study:

- 1) K.K. Pillai: A Social History of Tamils – Tamil Nadu History – Its People and Culture
- 2) Chitra Madhavan: History and Culture of Tamil Nadu. 1310 to 1885 A.D, 2005
- 3) N. Jeyapalan: Social and Cultural History of Tamil Nadu
- 4) K. Rajayyan: History of Tamil Nadu
- 5) S. Varghese Jeyaraj: Socio – Economic History of Tamil Nadu

Books for Reference:

- 1) N. Subramanian: History of Tamil Nadu.
- 2) K. A. Neelakanda Sasthri: The history of Cholas
- 3) Nambiarooran, K.A: Tamil Renaissance and Dravidian Nationalist

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI2003	CORE 7	HISTORY OF MEDIEVAL CIVILIZATIONS	6	4

Instructional Objectives:

- i) To analyse the transition of world order from ancient to medieval
- ii) To analyse the contribution of Religion to civilize the people and society
- iii) To assess the formation and services of the various Monastic orders and their impacts
- iv) To trace the formulation of formal educational system

Learning Outcomes:

- i) The student can understand the relationship between the state and the Church in the Middle Ages
- ii) The student traces the background of the birth of Islam. They acquired knowledge of pious caliphates and their contribution to the spread of Islamic culture.
- iii) The students acquired the knowledge about the nature and functions of the Feudal system
- iv) The students understand that the arrival of Universities in the Middle Ages was conducive to intellectual development.

Unit - I: Christianity: Rise and Spread of Christianity – The Papacy - Monastic Orders: Byzantine and Benedictine Monasticism – Monastic Reforms - Contribution of Byzantine Empire

Unit - II: Islamic Civilization: Rise of Islam – Tenets of Islam - Islamic Empires – Administrative features of Pious Caliphate - Literature and learning – Development of Science – Muslims contribution to Humanity

Unit - III: Feudalism: Origin – Feudal Hierarchy: Lord, Vassal and Knighthood – Merits and demerits of Feudalism – Crusades – Causes and results of Crusades

Unit - IV: Medieval Europe: Life in Medieval Cities - Markets, Guilds, Municipal Services and Crimes

Unit - V: Medieval Universities: Important Universities – University of Cordoba, Subjects of study – Relation between Teachers and students – Life in the Medieval Universities

Books for Study:

- 1) R. K. Majumdar & N. Srivastava: *History of World Civilizations*
- 2) Wall blank, T.W: *Civilization- Past and Present*

3) Will Durant: *The story of Civilizations*, Vol-I & Vol-II

Books for Reference:

1) Edward. Said; *History of World Civilizations*.

2) Judd, G.P: *History of Civilization*.

3) Will Durant: *The Story of Civilisation (Vol. I &. II)*

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHI2004	CORE 8	ISLAMIC HISTORY FROM 750 TO 1258 A.D.	5	4

Instructional Objectives:

1. To study the establishment and administrative features of the Abbasid dynasty.
2. To study the scientific developments under the Abbasids.
3. To discuss the causes, course and results of the Crusades.
4. To study the cultural progress under the Moors of Spain.
5. To study the cultural contribution of the Fatimids of Egypt

Learning outcome

1. Elucidate the administrative features of the Abbasid dynasty.
2. Comprehend the scientific developments under the Abbasids.
3. Discuss the causes, course and results of the Crusades.
4. Realize the cultural progress under the Moors of Spain.
5. Expound the cultural contribution of the Fatimids of Egypt

Unit – I: Abbasid Rule I: Establishment of the Dynasty - Abbasid Revolution - Abul Abbas as-Saffah - Unique features of the Abbasids Rule - Abu Jafar al-Mansur: Conquests - Contribution - Al-Mahdi - Al-Hadi

Unit – II: Abbasid Rule II: Harun al-Rasheed: Rise and fall of Barmakids - Administration - Character - Mamun al-Rasheed: Civil war between Ameen and Mamun - Achievements - Al-Mutawakkil: Achievements - Contribution of Arabs to Science - Muslims Scientists and Historians - Downfall of Abbasids

Unit – III: Crusades: Causes and Course of the Crusades - Imaduddin Zengi - Conquest of Edessa - Nuruddin Mahmud - The Second Crusades - Expedition of Egypt - Sultan Salahuddin Ayyubi - Results of the Crusades

Unit – IV: Moors in Spain: Abdul Rahman I: Administration - Character and Achievements - Abdul Rahman II: Character and Achievements - Abdul Rahman III: Administration - Character and Achievements - Development Education, Science and Technology, Literature, Art and Architecture - Downfall of the Moors in Spain

Unit – V: Fatimids of Egypt: Establishment - Ubaydullah al-Mahdi - Conquests - Al-Muiz: Accession and conquests - Al-Aziz: Accession and conquests - Cultural Contribution - Downfall of the Fatimids

Books for Study:

1. Abdur Rahim Khan, Muslim Contribution to Science and Culture, New Delhi, 1946.
2. Ameer Ali Syed, The Spirit of Islam, Idara -I - Adabiat - I - Delli, New Delhi, 1997.
3. Ameer Ali Syed, History of the Saracens, Kitab Bhawan, New Delhi, 1995
4. Syed Mahmudun, Islam its concept and History, Kitab Bhawan, New Delhi, 1981.
5. Syed Shahabuddeen Dr., Islamia Varalarum Panpadum (Tamil), Ahmed Publications, Vaniyambadi, 2001.

Books for Reference:

1. Abbas Ali, Civilization in Islam, Reference Press, New Delhi, 2005.
2. Arnold Thomas, The Legacy of Islam, Oxford University Press, London, 1980.
3. Hitti Philip. K., History of Arabs, MacMillan India, New Delhi, 1974.
4. Khuda Baksh. S., The Orient under the Caliphs, Idara - I - Adabiat - I - Delli, New Delhi, 1893.
5. Syed Shahabuddeen Dr., Contributions of Muslims to Humanity, Vijay Nicole Imprints Pvt. Ltd. Chennai, 2016.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHIEP21	ELECTIVE 2	HOTEL MANAGEMENT	6	4

Objectives:

- To educate the students about the classification of Hotels on various parameters on the basis of changing trends in the Hospitality Industry
- To create awareness about the systemized operational functions of Hotel Industry
- To analyze the types of Hotels and their functions according to the modern scenario
- To understand the changing trends in the services offered by Hotel Industries and make them ready for employments in the hotel/hospitality industry.
- To understand the various other auxiliary departmental functions in Hotel.

Learning Outcomes:

- The students understand the parameters for the classification of Hotels.
- The students acquire skill about the Front office manners and procedures.
- The students understand the necessity of Housekeeping in Hospitality Industry.
- The students acquire knowledge about the various Food and Beverage services in Hotel.
- The students acquire knowledge about the overall departmental functions in Hotel Industry

Unit - I: Classification of Hotels: Different Types of Star Hotels – International Hotel Chains – Indian Hotel Chains – Public and Private Sector Hotels in India – Rules and Regulations Governing Hotel Business in India

Unit - II: Front Office: Dressing sense - Reservations: Reservation Techniques – Phone Service and Telephonic etiquettes – Finance and Accounting

Unit - III: Housekeeping Procedures: House Keeping: Making Beds - Tidying Rooms - Cleaning and Polishing - Washing and Removing Stains - Vacuuming – Handling of Drunken Guests

Unit - IV: Food and Beverages: Food and Beverage Service: Quick Service, Table Service, Specialty Restaurants, Coffee Shops, Buffets and Banquets, Wedding and Birthday Services

Unit - V: Miscellaneous Functions: Other Departments of a Hotel: Sales and Marketing Division, Accounting Division, Engineering and Maintenance Division, Security Division, Human Resources Division

Books for study:

- 1) James A Bardi: *Hotel Front Office Management*, John Wiley & Sons, 2011.

- 2) Sudhir Andrews: *Hotel Front Office: A Training Manual*: TATA McGraw Hill (India) Pvt Ltd., 2013.
- 3) Singaravelavan: *Food and Beverage Services*, Oxford University Press, India, 2011.
- 4) Arihant Experts : *Guide for Hotel Management*, Arihant Publications, 2020.
- 5) Philip T. Kotler, John T. Bowen, James Makens, Seyhmus Baloglu : *Marketing for Hospitality & Tourism*, Pearson Education Limited, 2016.

Books for Reference:

- 1) V Prakash Kainthola, *principles of Hotel Management*, Gyan Books Pvt. Ltd, New Delhi, 2006.
- 2) Jatashankar R. Tewari, *Hotel Front Office: Operations and Management*, Oxford University Press, India, June 2009
- 3) Alan T Stutis, James F Wortman: *Hotel and Lodging management*.
- 4) Michael J. O'Fallon, Denney G. Rutherford: *Hotel Management and Operations*, 5th Edition, John Wiley & Sons Inc., New Jersey, USA, 2011.
- 5) Jr Tewari: *Hotel Front office: Operations and Management*, Oxford University Press, India, 2009.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAHIEP22	ELECTIVE 2	FUNDAMENTALS OF NATIONAL SECURITY	6	4

Instructional Objectives:

- i) To study the significance of study of National Security
- ii) To discuss key features of Foreign and Defence Policy
- iii) To Know different approaches to National Security
- iv) To highlight on the significance of India's Defence Security

Learning Outcomes:

- i) The students acquired became aware of their policy and goal of national security boundary
- ii) The students understand definition and scope of the India's Foreign and Defence Policies
- iii) The students acquired the knowledge about approaches to national security and difference mechanisms in dealing with them.
- iv) The students acquired the knowledge scope and policies of India's strategic environment
- v) The students understand India's warlike policies and relations with its neighbours

Unit - I: Introduction: Definition, Scope and features of the concept of National Security – Concept of National Power – Elements of National Power (Tangible and Intangible) – Fundamental factors – Values – Goals and Policies that determine National Security

Unit - II: Foreign Policy and Defence Policy: Definition – Meaning – Scope of foreign policy and Defence policy – Determinants of Foreign policy and Defence policy – Instruments of Foreign policy and Defence policy – Diplomacy and Defence

Unit - III: Approaches to National Security: Coercive and Non-Coercive Approach – Meaning and Scope – Coercive means – Threats – Threat perception and defence apparatus – Armed forces – Its organisations and functions (India) – Non-coercive means – Peace mechanics – Peace making; Peace building

Unit - IV: Strategic Environment of India: Feature of Strategic Environment – Its scope in Policy making – India's Strategic Environments – Immediate Neighbours – Adjacent Regions in Indian Ocean and Global Structure – India's Military preparedness – Defence Budget – Force Structure and Organisation

Unit - V: India's Strategic Relationship (Salient Features): India – Pakistan Politics – Strategic Relations – Indi-China Politics – Strategic Relations – India and World Powers

Books for Study:

- 1) Gautam Banerjee, *The 21st Century Army: Strategies for Future*, 2012.
- 2) Anil Chauhan, *Aftermath of A Nuclear Attack*, 2010.
- 3) Ravi Ranjan, *Armed Conflict and Security in South Asia*, 2012.

Books for Reference:

- 1) Sushma Sood, *Armed Forces and Nation Building*, 1998.
- 2) Barun De Jomini, *Art of War*, 2012.
- 3) Rameshwar Prasad, *The Army Logistics and War*, 2011

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAHI01	CORE I	RESEARCH METHODOLOGY	5	5

Instructional Objectives:

1. To introduce the scholars the latest trends in research methodology
2. To promote a spirit of inquiry among the scholars
3. To know the scholars about the sources available and methods of data collection
4. To train the scholars to analyze and document the data

Learning outcomes:

1. Explain the importance of Research
2. Identify the various trends in Research Methodology and Research Process
3. Able to collect data for research from repositories and data arrangement
4. Learn to differentiate between the subjectivity and objectivity in analyzing data
5. Gain knowledge about the presentation of data in an ethical manner

Unit I: Introduction: Meaning - Characteristics of Research –Objectives of Research- Importance of Research- Classification of Research- Steps in Research- Identification of Research Problem

Unit II: Trends in Research Methodology: Scientific method as applied in history - Heuristics & Hermeneutics — Quantitative and Qualitative Methods — Textual Analysis — Oral Traditions - Semiotics and Studies of Symbols — Inter - Disciplinary Approaches- **Research Process:** Selection of Topic — Feasibility — Methods of authentication — Research plan and working Hypothesis

Unit III: Data Collection: — Methods of data collection-Sources- **Repositories of Sources:** Libraries - Archives — Digital Information — Possibilities of field Research — **Data Arrangement:** Manual Card system — Word Processor — Files and Folders

Unit IV: Data Analysis: Source Analysis — Content Analysis –Objectivity and Subjectivity — Fallacies - Generalizations and Explanations – Ordering of the Data - Conceptual Linkages — Method of Explanation –**Hypothesis:** Types of Hypotheses — Characteristics of Hypotheses-Formulation of the final argument

Unit - V: Documentation: Chapterization — Logical Arrangement of chapters — Citations — Acknowledgement of sources - References - Bibliography — Tabulation- Charts and Maps — Analytical Writing — Language —Consistency and terminal Clarity — Glossary and Index

Books for study:

1. *Kate Turabian: A manual for the writers of term papers, theses and dissertations*

2. William Good and Paul Hatt: *The methods of Social Research*
3. March Bloch: *The Historian Craft*

Books for Reference:

1. Roderick Floud, *An Introduction to Quantitative Methods for Historians*, London, 1993
2. Malcolm Williams, *Science and Social Science: An Introduction*, London, New York and Routledge, 2000
3. M.L.A. *Hand Book for Researchers Thesis & Assignment Writing*, Wily Eastern, New Delhi, 1990

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAHI02	CORE II	HISTORIOGRAPHY	5	5

Instructional Objectives:

- i) To introduce the scholars the nature scope and functions of History
- ii) To relate the connectivity between History and other disciplines
- iii) To study the use and abuses of History
- iv) To study the various trends of Historiography

Course Outcomes:

1. Able to explain the nature, scope and functions of History
2. Identify the various branches of History and allied sciences
3. Discuss and understand the uses and abuses of History
4. Gain knowledge about the historiography from earliest time to medieval times
5. Understand the modern trend in Historiography

Unit - I: Introduction: Meaning- Nature, Scope and functions of history- Factors influencing history

Unit - II: History and Allied Disciplines: Economics, Sociology, Geography, political science and Ethics

Unit - III: Value and Subject matter of History: Use and Abuses of History, History is Science or an Art

Unit – IV: Early Trends in Historiography: Greco-Roman Historiography - Ancient & Medieval Indian Historiography – Church Historiography – Arab Enlightenment

Unit – V: Modern Trends in Historiography: Romanticist — Scientific Theory- Materialist theory — Structuralism — Post structuralism – Post Modernism

Books for Study:

1. E.H. Carr: What is History?
2. R.G. Collingwood: The Idea of History
3. B. Sheik Ali: History its theory and Methods

Books for Reference:

1. Harvey Key: Indian Polity
2. Stein, Burton: A History of India
3. Champakalakshmi, R: Trade, Ideology and Urbanization: South India
300 B.C. to A.D.1300

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAHI03	CORE III	RESEARCH AND PUBLICATION ETHICS	5	5

Overview of the Course:

This course focusing on basis of philosophy of science and ethics, research integrity, publication ethics. Hands -on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Unit 1: Philosophy and Ethics

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgement and reactions.
3. Intellectual honesty and research integrity
4. Scientific misconducts: Falsification. Fabrication and plagiarism.
5. Redundant publications: duplicate and overlapping publication,
6. Selective reporting and misrepresentation of data

Unit 2: Publication Ethics

1. Publication ethics: definition, introduction and importance
2. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
3. Violation of publication ethics, authorship and contributorship
4. Identification of publication misconduct, complaints and appeals
5. Predatory publishers and journals

Unit 3: Open Access Publishing

1. Open access publications and initiatives
2. SHERPA/ROMEO online resource to check publisher copyright & self-archiving policies.
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/Journal suggestion tool viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Unit 4: Publication Misconduct

- A. Group Discussions
 1. Subject specific ethical issues, FFP, authorship
 2. Conflicts of interest.

3. Complaints and appeal: example and fraud from india and abroad
- B.** Software tools
Use of plagiarism software like Turnitin, Urkund and other open source software tools

Unit 5: Databases and Research Metrics

- A.** Databaseses
 1. Indexing databases
 2. Citation databases: Web of Sciences, Scopus, etc.
- B.**
 1. Impact Factor of Journal as per Journal Citation report, SNIP,SJR, IPP Cite Score
 2. Metrics: h-index, g index, i10 index, altmetrics

Books for Reference

1. Handbook of Research Ethics and Scientific Integrity, R Iphofen - 2020 - Springer
2. Planning ethically responsible researchJE Sieber, MB Tolich - 2012 - books.google.com
3. Tales of Research Misconduct: A Lacanian Diagnostics of Integrity Challenges in Science Novels. Authors: **Zwart**, Hub. 2017
4. Publication misconduct: changing the conversation research publishing By: Suzanne Farley, 2018
5. Violation of publication ethics: A growing concern for Journal editors By Zafar Ali, Asif Ali, 2017.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAHI04	COURE COURSE IV	MAIN CURRENTS IN 20 TH CENTURY TAMIL NADU	5	5

Instructional Objectives

1. To study the impact of national movement in Tamil Nadu
2. To analyze the contribution of Dravidian movement in the national movement
3. To study the post independent development in Tamil Nadu
4. To identify the socio-cultural progress in 20th century Tamil Nadu

Learning Outcomes:

1. Understand the condition of National Movement in Tamil Nadu and participation of various leaders in the national movement
2. Able to understand the early resistance to British Government
3. Assess and study the rise of Dravidian parties in the post independent Tamil Nadu
4. Identify the various schemes implemented during Dravidian rule
5. List the recent development and progress in the post independent Tamil Nadu

Unit I: National Movement in Tamil Nadu- Introduction-Impact of Indian National Congress – Surat split - Swadeshi Movement - V.O. Chidambaram Pillai – Subramania Siva —

G. Subramania Iyer – Subramania Bharathi - Terrorist and Extremist activities —South Indian Liberal Federation - Home Rule Movement – Justice Party Government of 1919

Unit II: Gandhian Era: Khilafat Movement - Jallianwala Bagh Massacre — Non - Co-operation Movement – Provincial Congress Governments- Simon Boycott - Civil Disobedience Movement - Vedaranyam March — E. V. Ramaswamy Naicker — Dravida Kazhagam — Quit India Movement — India's Independence

Unit III: Post-Independent Tamil Nadu: Origin and growth of DMK - Congress Governments — Rajaji — Kamaraj — Socio-Economic policies — Anti Hindi Agitations — Fall of Congress — Emergence of Dravidian parties — Elections of 1967

Unit IV: Dravidian Rule: Annadurai — Kalaingar Karunandhi - Emergency — M.G. Ramachandran — Rise of J. Jayalalitha as Chief Minister of Tamil Nadu

Unit V: Recent Developments: Development of Science and Technology – Growth of education, press and literature-Economic Progress- Agricultural and Industrial growth — River water Disputes

Books for Study

1. Chellam, V.T.: Tamizhaga Varalarum Panpadum
2. K.K. Pillai: Social History of the Tamils.
3. Subramanian, P: Social History of the Tamils.

Books for Reference:

1. Ramamurthi, P: The Freedom Struggle and Dravidian Movement
2. Sivagananam M.P: Viduthalai Poril Tamilagam
3. Nambi Aarooran, K: Tamil Renaissance and Dravidian Nationalism

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABA1001	CORE 1	PRINCIPLES OF MANAGEMENT	7	6

Course Objectives

1. Teach the basic elements of Management, that students must be aware of.
2. Educate the conceptual knowledge of Planning that students must be familiar with.
3. Impart the procedural knowledge of Organization that students must be accustomed to.
4. Prepare the students with procedural knowledge of Control.
5. Enlighten the metacognitive knowledge of Coordination.

Course Outcomes

1. Recall and describe the basic elements of Management.
2. Interpret and explain the conceptual knowledge of Planning.
3. Independently organize during the course of business.
4. Self-reliantly Control resources related to business.
5. Explore the Coordination function of Management.

Unit-I	Introduction to Management	25 Hours
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Management – Definition – Nature - Scope - Importance – Process - Role - Levels of Management - Functions of a Manager - Management Vs. Administration - Management as an Art or Science - Management as a Profession - Management Approaches - Contributions of Henry Fayol - F.W.Taylor - Elton Mayo.

Unit-II	Planning	20 Hours
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Planning: Definition - Nature – Importance - Steps - Types – Objectives – Policies & Procedures: Definition - Methods - Nature - Types - Decision Making: Definition - Process - Types - Problems.

Unit-III	Organizing	20 Hours
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Organizing: Structure - Work specialization - Chain of command - Authority, responsibility, and accountability - Delegation - Types of authority (and responsibility) - Span of management -- Tall versus flat structure - Centralization, decentralization, and formalization - Departmentalization - Importance of organizing

Unit-IV	Controlling	20 Hours
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Controlling: Definition - Characteristics - Elements - Importance - Process - Classifications - Open- and closed-loop control - Human and machine control - Organizational and operational control - Problems - Information flow - Setting standards

Unit-V	Coordinating	20 Hours
Coordination: Meaning – Features – Importance – Advantages – Disadvantages - Principles – Techniques – Functions – Types: Internal – External		
<p align="center">Books for Study:</p> <p>Guptha CB- Business Management Peter-F,Drucker- Principles of Management Harold Koontz-aryasri & heniz weirich- Principles of Management- Tata Mc.Graw Hill</p>		
<p align="center">Books for Reference:</p> <p>P.C Tripathi & P.N.Reddy -Principles of Management-Tata Mc.Graw Hill Prasad L.M- Principles and Practice of Management R.N. Gupta- Principles of Management- S.Chand Pub.</p>		
<p>E-Contents:</p> <p>1.https://en.wikipedia.org/wiki/Management</p>		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABAAL11	CORE 1	BUSINESS MATHEMATICS & STATISTICS – I	7	6

Course Objectives		
To apply the concepts of Statistics & Mathematics in Business		
Course Outcomes		
1. Understand the concept and need of statistics 2. Classify the significance of diagrams and graphs. 3. Understand the use of measures of central tendency. 4. Construct mean and standard deviation. 5. Solve the problems of simple interest, compound interest and annuities 6. Solve the problems in differentiation and derivatives.		
Unit-I		20 Hours
Mathematics for Finance – Simple and Compound Interests – Annuities – Immediate Annuity – Annuity Due – Perpetuity – Sinking Funds – Discounts on Bills – Present Values.		
Unit-II		20 Hours
Basic Calculus – Rules of Differentiation – Application of Derivatives – Marginal Cost – Marginal Revenue – Elasticity of Demand – Maxima and Minima and their Application to Business.		
Unit-III		20 Hours
Statistics – Definition – Functions – Scope of Statistics – Limitations – Collection of Data – Presentation – Classification – Types – Tabulation – Charting Data – Diagrams – Types – Graphs – Limitations.		
Unit-IV		20 Hours
Measures of Central Tendency – Objectives – Characteristics – Arithmetic Mean – Median – Mode – Geometric Mean – Harmonic Mean – Advantages and Limitations.		

Unit-V		25 Hours
Measures of Variations – Range – Merits and Limitations – Uses – Quartile Deviation – Computation – Merits and Limitations – The Mean Deviation – Computation – Ungrouped and Grouped Data – Merits and Limitations – The Standard Deviation – Calculation – Mathematical Properties – Correcting incorrect value of Standard Deviation - Co-efficient of Variation – Measures of Skewness – Karl-Pearson’s, Bowley’s and Kelly’s Methods.		
<p style="text-align: center;">Note : The proportion between theory and problems shall be 20 : 80</p> <p style="text-align: center;">Books for Study:</p> <ol style="list-style-type: none"> 1. S. P. Gupta & M. P. Gupta - BusinessStatistics 2. S. P. Gupta - StatisticalMethods 3. P. A. Navnitham - Business Mathematics andStatistics 4. P. R. Vittal - Business Mathematics andStatistics 5. S. P. Rajagopalan and R. Sattanathan.- BusinessMathematics 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UASKB202	SKILL BASED 2	PROFESSIONAL ENGLISH FOR COMMERCE AND MANAGEMENT	4	3

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar
(Outcomes based on guidelines in UGC LOCF – Generic Elective)

NB: All four skills are taught based on texts/passages.

UNIT 1 : COMMUNICATION

- Listening** : Listening to audio text and answering questions
- Listening to Instructions
- Speaking** : Pair work and small group work
- Reading** : Comprehension passages –Differentiate between facts and opinion
- Writing** : Developing a story with pictures.
- Vocabulary** : Register specific - Incorporated into the LSRW tasks

UNIT 2 : DESCRIPTION

- Listening** : Listening to process description - Drawing a flow chart.
- Speaking** : Role play (formal context)
- Reading** : Skimming/Scanning-
Reading passages on products, equipment and gadgets.
- Writing:** Process Description –Compare and Contrast
Paragraph-Sentence Definition and Extended definition-
Free Writing.
- Vocabulary** : Register specific -Incorporated into the LSRW tasks.

UNIT 3: NEGOTIATION STRATEGIES

Listening : Listening to interviews of specialists / Inventors in fields
(Subject specific)

Speaking : Brainstorming (Mind mapping)

Small group discussions (Subject- Specific)

Reading : Longer Reading text.

Writing : Essay writing (250 words)

Vocabulary : Register specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS

Listening : Listening to lectures.

Speaking : Short talks

Reading : Reading Comprehension passages

Writing : Writing Recommendations

Interpreting Visuals inputs

Vocabulary : Register specific -Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS

Listening : Listening comprehension- Listening for information

Speaking : Making presentations (with PPT- practice).

Reading : Comprehension passages – Note making.

Comprehension: Motivational article on Professional Competence,
Professional Ethics and Life Skills)

Writing : Problem and Solution essay– Creative writing –Summary writing

Vocabulary : Register specific - Incorporated into the LSRW tasks

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABA2001	CORE 2	MARKETING MANAGEMENT	4	4

Course Objectives

1. Teach the basic elements of Marketing, that students must be aware of.
2. Educate the conceptual knowledge of Product Strategies that students must be familiar with.
3. Impart the procedural knowledge of Pricing Strategies that students must be accustomed to.
4. Prepare the students with procedural knowledge of Product Promotion.
5. Enlighten the various trends in Digital Marketing.

Course Outcomes

1. Recall and describe the basic elements of Marketing.
2. Interpret and explain the conceptual knowledge of Product Strategies.
3. Independently fix Price of Products during the course of business.
4. Self reliantly do Promotion of Products.
5. Explore the various trends in Digital Marketing.

Unit-I	Introduction	15 Hours
Fundamentals of Marketing – Role of Marketing- Relationship of Marketing with other functional areas- Marketing Mix - Marketing Approaches- Environmental Factors - Green Marketing- Direct Marketing; Market segmentation - Need and basis - Marketing Strategy.		
Unit-II	Product Strategies	10 Hours
The Product- Characteristics- Classification- Consumer goods- Industrial goods-New product development-process- Product Life Cycle- Product line and product mix decisions- Branding- Packaging.		
Unit-III	Pricing & Promotional Strategies	10 Hours
Pricing- Factors– Pricing objectives – Pricing policies – Pricing strategies; Promotion: Advertising – Public Relations (PR) – Personal Selling – Sales Promotion		
Unit-IV	Distribution Strategies	10 Hours
Channels of Distribution – Definition-Importance- Types-Factors– Classification of middle men –Wholesaler- Retailer- Functions		

Unit-V	Online Marketing Strategies	15 Hours
Online methods used to build brand awareness:Search engine optimization (SEO) - Search engine marketing (SEM) - Social media marketing - Content marketing - Developments and strategies		
Books for Study: <ol style="list-style-type: none"> 1.RajanNair :Marketing 2.J.Jayasankar :Marketing 3. Sontakki :Marketing Management 4. RajanSaxena :Marketing Management 		
Books for Reference: <ol style="list-style-type: none"> 1.Philip Kotler & Armstrong :Marketing Management 2..Ramaswamy and Namakumari : MarketingManagement 3.Varshney and Gupta S L : MarketingManagement 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABA2002	CORE 3	BANKING & FINANCIAL SYSTEM	3	3

Course Objectives

1. Teach the basic elements of Banking & Finance, that students must be aware of.
2. Educate the functions of Commercial Banks that students must be familiar with.
3. Enlighten the students with digital trends in banking practices.
4. Prepare the students with procedural knowledge of Financial Markets & Systems.
5. Impart the conceptual knowledge of Financial Services.

Course Outcomes

1. Recall and describe the basic elements of Banking & Finance.
2. Elucidate the various activities of Commercial Banks.
3. Identify and apply the digital tools in banking activities.
4. Illustrate the essential components of Financial Markets & Systems
5. Explore and relate the various Services offered by Financial Institutions.

Unit-I	Introduction to Banking	10 Hours
Definition – Origin of banks – Types – Unit bank – Merits and Demerits – Branch bank – Merits and Demerits – Mixed banking – Retail banking – Wholesale banking – Universal banking.		
Unit-II	Commercial Banks	10 Hours
Functions of Modern Commercial Banks - Savings Account – Current Account – Difference between Savings Account and Current Account – Fixed Deposit – Recurring Deposit – Granting of loan – Clean loan – Secured loan – Over draft – Cash credit.		
Unit-III	Digital Banking	10 Hours
Delivery Channels: ATM – EFTPOS - Internet Banking - Mobile Banking - Credit Cards - Debit Cards - Smart Cards - NEFT/RTGS - IMPS - Payment Gateway - Authentication of payment and OTP		

Unit-IV	Financial Markets & System	10 Hours
Meaning of Financial System- Components – Financial Institutions – Financial Markets – Money Market – Capital Market - Financial Instruments: Promissory Note - Bill of Exchange - Cheque.		
Unit-V	Financial Services	5 Hours
Meaning - Types: Factoring – Leasing - Hire Purchase - Merchant Banking – Underwriting - Project Appraisal.		
Books for Study:		
<ol style="list-style-type: none"> 1. B.Santhanam, Sundaram & Varshney, Banking and financial system, Margham Publications 2. B.Santhanam, Banking theory law and practice, Margham Publications 3. R Parameswaran, Indian Banking, S.Chand 4. B.Santhanam, Financial Services (Indian financial system), Margham Publications 5. Pathak Bharti, Indian Financial System, Pearson 		
Books for Reference:		
<ol style="list-style-type: none"> 1. Sundaram & Varshney Banking Theory Law & Practice, Sultan Chand & Sons 2. Mishra Sukhvinder, Banking Law and Practice, S.Chand 3. M.Y.Khan, Indian Financial System Mc Graw Hill 4. E.Gordon, K.Natarajan, Financial Markets and Services, Himalaya Publishing House 5. Digital Banking Indian Institute of Banking & Finance Taxmann 		
E-Contents:		
<ol style="list-style-type: none"> 1. https://www.tutorialspoint.com/bank_management/bank_management_tutorial.pdf 2. https://www.slideshare.net/abbasvattoli/banking-and-financial-institutions 3. https://www.youtube.com/watch?v=E-HOz8T6tAo 4. https://www.youtube.com/watch?v=STGgoK4v3xE 5. https://www.youtube.com/watch?v=28HpCMWfc7k 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABAAL21	ALLIED 2	BUSINESS MATHEMATICS AND STATISTICSII	4	3

Course Objectives		
To apply the concepts of Statistics & Mathematics in Business		
Course Outcomes		
1. Identify the types of matrices. 2. Solve simultaneous equations. 3. Solve the correlation and regression problems. 4. Understand and measure the trends. 5. Construct Index Numbers.		
Unit-I		15 Hours
Matrices – Definition – Types – Algebraic Operations – Determinant of a Square Matrix – Minors and Co factors – Adjoint Matrix – Inverse of a Square Matrix.		
Unit-II		10 Hours
Solution to system of Linear Equations through Matrix Method – Integration and their Application to Business.		
Unit-III		10 Hours
Linear Simple Correlation – Karl Pearson's Co-efficient of Correlation – Spearman's Rank Correlation Co-efficient – Concurrent Deviation – Simple Regression Analysis – Regression Co-efficient – Properties.		
Unit-IV		10 Hours
Analysis of Time Series – Components – Methods of Measuring Trends – Semi-average, Moving-average Methods – Method of Least Squares – Seasonal Variations.		
Unit-V		15 Hours
Index Numbers – Uses and Limitations – Classification – Methods of Constructing Index Numbers – Unweighted – Weighted – Tests for Perfection – Time Reversal Test and Factor Reversal Test – Consumer Price Index Number – Cost of Living Index Number		

Note : The proportion between theory and problems shall be 20 : 80

Books for Study:

1. S. P. Gupta & M. P. Gupta - Business Statistics
 2. S. P. Gupta - Statistical Methods
 3. P. A. Navnitham - Business Mathematics and Statistics
 4. P. R. Vittal - Business Mathematics and Statistics
- S. P. Rajagopalan and R. Sattanathan.- Business Mathematics

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABAAL22	ALLIED 3	CONSUMER BEHAVIOUR	3	2

Course Objectives

To impart the role of consumer behaviour in marketing and to illustrate the qualitative and quantitative methods of measuring consumer behaviour.

Course Outcomes

1. Identify the scope and need for studying consumer behaviour
2. Construct models of consumer behaviour
3. Identify the major internal factors influences in consumer behaviour.
4. Recognises social and ethical implications of marketing actions on consumer behaviour
5. Distinguish between high and low involvement decision making.

Unit-I	INTRODUCTION	10 Hours
Meaning – Definition - Significance – Scope - Need for studying Consumer Behaviour - Stages in the development of consumer behaviour - Buying Motives.		
Unit-II	CONSUMER BEHAVIOR MODELS	10 Hours
Industrial and Individual Consumer Behaviour Models – Howard – Kollat, Webster and Wind– Implications of the Models on Marketing Decisions.		
Unit-III	INTERNAL & EXTERNAL INFLUENCES	10 Hours
Psychological Influences on Consumer Behaviour – Motivation – Learning and Attitude - Self Image and Lifestyles– Consumer expectation and satisfaction-Socio-Cultural, Cross Culture- Family group – Reference group –Communication.		

Unit-IV	PURCHASE DECISION PROCESS	10 Hours
Consumer Involvement - Types of Involvement – Distinguish between High and Low Involvement Decision Making- Post-purchase Behaviour.		
Unit-V	ONLINE MARKETING	5 Hours
Online Channels – Types – Online Marketing – Meaning – Definition – Characteristics – Advantages – Challenges of Online Marketing.		
Books for Study: <ol style="list-style-type: none"> 1. Dr. L. Natarajan, Margham Publication. - ConsumerBehaviour 2. Ramanuj Majumdar - Consumer Behaviour 3. S. H. H. Kazmi - ConsumerBehaviour 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACO1001	CORE 1	FINANCIAL ACCOUNTING I	7	6

Instructional Objectives

1. To enlighten the students with various Concepts in Accounting.
2. To impart theoretical framework of Accounting Principles and Conventions.
3. To impart practical knowledge in the Preparation of Accounts.

Course Outcomes

- CO 1. Pass Journal Entries; Prepare Ledger Accounts, Trial Balance and Final Accounts.
CO 2. Prepare Bank Reconciliation Statement.
CO 3. Calculate Depreciation and Prepare Depreciation Account.
CO 4. Prepare Statement of Affairs and Statement of Profit or Loss in Single Entry

System.

- CO 5. Calculate Average Due Date.

- CO 6. Compute Fire Insurance Claims.

CO 7. Prepare Revaluation Account, Capital Account and Balance Sheet while admission or retirement of a partner.

Unit-I Accounting Framework

21 Hours

Conceptual Framework: Accounting Principles - Accounting Concepts - Accounting Conventions – Introduction to Accounting Standards and Indian Accounting Standards – Accounting Process: Journal – Ledger – Trial Balance – Meaning and Types of Accounting Errors. Preparation of Final Accounts – Trading Account – Profit & Loss Account – Balance Sheet – Adjustments in Final Accounts: Outstanding Expenses – Prepaid Expenses – Accrued Income - Income Received in Advance - Depreciation and Appreciation of Fixed Assets – Interest on Capital – Interest on Drawings.

Unit-II BRS & Depreciation Accounting

21 Hours

Bank Reconciliation Statement – Meaning – Need – Preparation of Bank Reconciliation Statement. Meaning of Depreciation – Causes of Depreciation – Methods of providing Depreciation – Straight Line Method – Diminishing Balance Method – Annuity Method – Sinking Fund Method (Simple Problems only) – Depreciation under The Companies Act, 2013.

Unit-III	Single Entry System	21 Hours
Meaning – Objectives – Features – Limitations – Differences between Single Entry and Double Entry System – Ascertainment of Profit through Networth Method (Statement of Affairs) and Conversion Method.		
Unit-IV	Average Due Date and Fire Insurance Claims	21 Hours
Meaning of Average Due Date – Determination of Due Date – Calculation of Interest. Meaning of Fire Insurance – Need for Fire Insurance – Computation of Claims to be lodged for loss of stock – Average Clause.		
Unit-V	Partnership Accounts	21 Hours
Partnership – Meaning – Features – Types of Partners - Admission of a Partner – Retirement of a Partner - Calculation of Goodwill – Preparation of Revaluation Account, Capital Account and Balance Sheet. Meaning of Dissolution – Dissolution of a Partnership and Dissolution of a Firm (Concepts Only).		
<p>Books for Study:</p> <ol style="list-style-type: none"> 1.R.L.Gupta and M. Radhaswamy, Financial Accounting, Sultan Chand & Sons., New Delhi. 2. S. Thothadri and S. Nafeesa, Financial Accounting, McGraw Hill Education, Chennai. 3. T.S. Reddy and Murthy, Financial Accounting, Margham Publications, Chennai. 4.V.K.Goyal, Financial Accounting, Excel Books, New Delhi. 5.V.K.Goyal and Ruchi Goyal, Financial Accounting, PHI, New Delhi. 		
<p>Books for Reference:</p> <ol style="list-style-type: none"> 1. M.C.Shukla, T.S.Grewal, S.C. Gupta, Advanced Accounts – Volume I, S.Chand& Co., - New Delhi. 2. S.P. Jain and K.L.Narang, Financial Accounting, Kalyani Publishers, Ludhiana. 3. Mukherji & M. Hanif, Financial Accounting, Tata McGraw Hill Pub. Co. Ltd., New Delhi. 4. Dhanesh Khatri, Financial Accounting, McGraw Hill Education, Chennai. <p>S.M. Shukla, Financial Accounting, Sahitya Bhawan Publications, Agra.</p>		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACOAL11	ALLIED 1	BUSINESS ECONOMICS	7	6

Instructional Objectives

1. To familiarize students with basic concepts in economics.
2. To acquaint students with various laws of Economics.
3. To enlighten on the various application of economics theories.

Course Outcomes

- CO 1. Understand the discipline of business economics, Micro and Macro Economic aspects.
- CO 2. Utility analysis- cardinal, ordinal and law of diminishing marginal utility, law of equi-marginal utility.
- CO 3. Introduce the marketing concept and various types of marketing structure.
- CO 4. Help the student to understand the demand, supply, types and factors that influence of demand and supply.
- CO 5. Evaluate the production and cost analysis, law of variable of proportions and break-even analysis.
- CO 6. Develop the skills to use theories of profit and Provide an idea regarding National Income and its difficulties.
- CO 7. Know the procedure in calculating GDP, NDP, NNP, Per Capita Income.

Unit-I INTRODUCTION

21 Hours

Business Economic – Definition – Characteristics –Importance – Scope – Differences between Micro Economics and Macro Economics – Role and Responsibilities of a Business Economist – Economic system and its types - Basic economic problems common to all economies.

Unit-II UTILITY ANALYSIS AND MARKET STRUCTURE

21 Hours

Meaning – Characteristics – Cardinal – Ordinal – Total utility – Marginal utility – Law of Diminishing Marginal Utility – Law of Equi-Marginal Utility. Market Structure - Monopoly – Duopoly - Oligopoly - Monopolistic Competition – Perfect Competition (Meaning and Features only).

Unit-III DEMAND AND SUPPLY

21 Hours

Demand – Definition – Characteristics – Types of Demand - Factors determining Demand – Law of Demand - Assumptions and Exceptions - Elasticity of demand – Types – Demand Forecasting – Meaning – Methods- Supply - Meaning – Factors affecting supply – Law of Supply – Elasticity of Supply – Determinants of Elasticity of Supply.

Unit-IV	PRODUCTION AND COSTS	21 Hours
Production – Factors – Production Function – Law of Variable Proportions –Economies of Scale – Break-Even Analysis. Cost and Revenue Functions- Types – Short Run – Long Run – Areas of Cost Control		
Unit-V	PROFIT THEORIES AND NATIONAL INCOME	21 Hours
Theories of Profit – Rent, Risk and Uncertainty - National Income - Definition – Circular flow – Measurement of National Income – Gross Domestic Product – National Domestic Product – Gross National Product – Net National Product – Difficulties in measurement of National Income – National Income and Welfare		
Books for Study: <ol style="list-style-type: none"> 1. Sankaran S, Business Economics, Margham Publications, Chennai. 2. Ahuja H.L, Business Economics, S.Chand & Co. Ltd., New Delhi. 3. Ray, N.C, An introduction to Microeconomics, Macmillan Company of India Ltd: New Delhi. 4. ManabAdhikary, Anurag , Business Economics, Jain Publishers, New Delhi, 2008. 5. Datt, R. and K.P.M. Sundharam , “Indian Economy”, S. Chand & Company Ltd., New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. Agarwal M.D, and Som Deo, Business Economics, Ramesh Book Depot, New Delhi. 2. Mehta P.L, Managerial Economics, Sultan Chand & Sons., New Delhi 3. Mithani, D.M, Managerial Economics – Theory and Application, Himalaya Publishing House Pvt. Ltd., Mumbai. 4. Varian H.R, Intermediate Microeconomics: A Modern Approachl, East West Press Pvt., Ltd, New Delhi, Eighth Edition, 2015. 5. Ahluwalia, I.J. and I.M.D. Little (Eds.) (1999), India’s Economic Reforms and Development (Essays in honour of Manmohan Singh), Oxford University Press, New Delhi. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACO2001	CORE 2	FINANCIAL ACCOUNTING II	4	4

Instructional Objectives

1. To enlighten the students with various Concepts in Accounting.
2. To impart theoretical framework of Functional Accounting.
3. To impart practical knowledge in the Preparation of Accounts.

Course Outcomes

- CO 1. Prepare Branch Account.
CO 2. Prepare Departmental Trading and Profit & Loss a/c.
CO 3. Pass Journal Entries, prepare Ledger Accounts in the books of Hire Purchaser & Vendor.
CO 4. Distinguish between Hire Purchase and Instalment Purchase System.
CO 5. Prepare Receipts and Payments Account.
CO 6. Prepare Income and Expenditure Account.

Unit-I	Branch Accounting	12 Hours
Meaning and Types of Branches – Branch Accounting – Objectives of Branch Accounting - Accounting for Dependent Branches – Debtors System – Stock and Debtors System – Final Account System.		
Unit-II	Departmental Accounting	12 Hours
Distinction between Departments and Branches – Allocation of Common Expenses – Expenses which cannot be allocated – Preparation of Departmental Accounts – Inter Departmental Transfers at cost price. (Simple Problems only).		
Unit-III	Hire Purchase System	12 Hours
Hire Purchase System – Meaning and Features – Accounting Treatment in Hire Purchase System – Calculation of Interest – Journal Entries and Ledger Accounts in the books of Hire Purchaser and Hire Vendor – Meaning of Default and Repossession (Concepts only).		
Unit-IV	Instalment Purchase System	12 Hours
Instalment Purchase System – Meaning and Features – Distinction between Hire Purchase and Instalment Purchase System.		

Unit-V	Accounting for Non-Profit Organizations	12 Hours
Preparation of Receipts and Payments Account – Preparation of Income and Expenditure Account. (Simple Problems only).		
Books for Study: <ol style="list-style-type: none"> 1. R.L.Gupta and M. Radhaswamy, Financial Accounting, Sultan Chand & Sons., New Delhi. 2. S. Thothadri and S. Nafeesa, Financial Accounting, McGraw Hill Education, Chennai. 3. T.S. Reddy and Murthy, Financial Accounting, Margham Publications, Chennai. 4. V.K.Goyal, Financial Accounting, Excel Books, New Delhi. 5. V.K.Goyal and Ruchi Goyal, Financial Accounting, PHI, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. M.C.Shukla, T.S.Grewal, S.C. Gupta, Advanced Accounts – Volume I, S.Chand & Co., New Delhi. 2. S.P. Jain and K.L.Narang, Financial Accounting, Kalyani Publishers, Ludhiana. 3. Mukherji & M. Hanif, Financial Accounting, Tata McGraw Hill Pub. Co. Ltd., New Delhi. 4. Dhanesh Khatri, Financial Accounting, McGraw Hill Education, Chennai. 5. S.M. Shukla, Financial Accounting, Sahitya Bhawan Publications, Agra. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACO2002	CORE 2	BUSINESS ORGANISATION	3	3

Instructional Objectives

1. To acquaint students with basic concepts of business and commercial organisations.
2. To enlighten the students on both traditional and modern forms of business and their combinations.
3. To acquaint the students with emerging opportunities in Business.

Course Outcomes

CO1: Understand the concept of business and Classify its activities.

CO2: Distinguish Businesses based on their size and enumerate the benefits available to MSMEs.

CO3: Understand the different forms of business organization along with their relative Features, Benefits and Limitations .

CO4: Discuss emerging opportunities in business.

CO5: Understand various types and forms of business combinations.

Unit-I	Nature of Business	9 Hours
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Business - Meaning – Characteristics – Objectives - Classification of Business Activities - Industry - Commerce - Trade - Distinction between Trade and Commerce.

Unit-II	Size of Business Units	9 Hours
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Criteria for measuring size of business – Factors determining the size – Classification of business according to size – Micro – Small – Medium – Large – Importance of MSME units – Benefits available to MSMEs

Unit-III	Forms of Business Enterprises	9 Hours
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Forms of Business Organisation (meaning, features, benefits and limitations of each type) - Sole Proprietorship – HUF-Partnership Firm – Limited Liability Partnership - Co-operative societies - Joint Stock Companies - Public Enterprises - Public Utilities – One Person Company - Public Private Partnership – MNCs.

Unit-IV	Business Combinations	9 Hours
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Business Combinations – Meaning – Advantages – Limitations – Types – Forms.

Unit-V	Emerging Opportunities in Business	9 Hours
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Franchising – Licensing – BPO – KPO - LPO – E-Business – E-Commerce – M-Commerce.

Books for Study:

1.C.B.Gupta, Business Organisation and Management, Sultan Chand & Sons, New Delhi.

2. **C.D. Balaji and G. Prasad**, Business Organisation, Margham Publications, Chennai.
3. **K. Sundar**, Business Organisation, Vijay Nicole Imprints (P) Ltd., Chennai
4. **M. C. Shukla**, Business Organisation and Management, S.Chand Publishing, New Delhi.
5. **R.N. Gupta**, Business Organisation and Management, Taxmann, New Delhi.

Books for Reference:

1. **Bhushan Y.K.**, Fundamentals of Business Organisation & Management, Sultan Chand & Sons, New Delhi.
2. **Motihar**, Business Organisation, Vrinda Publications (P) Ltd., Delhi.
3. **Rajendran, J.P. Maheshwari, Mahajan**, Business Organisation, International Book House Pvt. Ltd., New Delhi.
4. **P.N. Reddy**, Principles of Business Organisation and Management, S.Chand Publishing, New Delhi.
5. **K. Abirami Devi, M. Alagamani**, E-Commerce, Margham Publications, Chennai.

Electronic and Web Resources:

1. Website of Ministry of Corporate affairs, Government of India,
<http://www.mca.gov.in/MinistryV2/homepage.html>
2. Website of the Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry, Government of India, <https://dipp.gov.in/>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACOAP21	ALLIED PRACTICAL 1	COMPUTER APPLICATIONS IN BUSINESS	5	4

Instructional Objectives

1. To impart theoretical and practical knowledge in Computers.
2. To provide practical knowledge in creating business documents.
3. To make the students understand the role of computers in various fields of business.

Course Outcomes

CO1. Understand the basic concepts of Computers.
CO2. Identify different components of a computer system: Storage Device, Input Devices & Output Devices.
CO3. Prepare and present the business documents using Word Document.
CO4. Prepare and present the business documents using Excel Sheet.
CO5. Prepare PPT- Power Point Presentation using various Transitions, Animations and other layouts.

Unit-I	Introduction to Computer	15 Hours
<p>Introduction to computers - An overview of computer system - Types of computers. Hardware: Basic components of a computer system – Control unit – ALU - Input/output functions. Software: Types of Software - Memory – RAM – ROM – EPROM - PROM and Other types of memory.</p> <p>Networking – Types – LAN-WAN-WLAN- MAN. Internet & Intranet. (Concepts only).</p>		
Unit-II	Role of Computers in Business	15 Hours
<p>Role of Computers in different areas of Business activities: Accounts & Finance – Marketing – Production- Distribution – Inventory Management – HRM -Payroll Management – Advertisement & Sales Promotion - Retail Management.</p>		
Unit-III	Word Document	15 Hours
<p>Introduction to word Processing, Word processing concepts, Use of Templates, Working with word document: Editing text, Find and replace text, Formatting, spell check, Autocorrect, Auto text; Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables: Inserting, filling and formatting a table; Inserting Pictures and Video; Mail Merge: including linking with Databases and spreadsheet files; Printing documents; Citations and Footnotes – Short Keys/Function Keys.</p>		

Unit-IV	Spreadsheet and its Business Applications	15 Hours
Introduction to Spreadsheet – Application of work sheet/spread sheet in Accounting, Finance and Marketing functions of Business – Spreadsheet basics – Parts of Spreadsheet Menus & Tool bars - Creating a worksheet - Cell referencing - Worksheet to analyze data with graphs, Charts & diagrams – Advanced tools: Functions – Formulae – Formatting numbers - Sorting- Filtering – Validation & Consolidation of Data – Invoice Generation – Budget Preparations – Financial Statements.		
Unit-V	PowerPoint Presentations	15 Hours
Creating Presentations – Master Template Creation-Importing Images - Insertion of Objects and Charts in slides -Transition and build effects - Types of slides - Slide Views - Formatting – Custom Animation and Transition Making Slideshow - Creating Business Presentation. (Preferably latest version of Power Point presentation).		
Books for Study: <ol style="list-style-type: none"> 1. Parameswaran R, Computer Applications in Business, S. Chand & Sons, New-Delhi 2. Sanjay Saxena, Introduction to Computers & MS Office, Vikas Publishing House Pvt. Ltd., New Delhi. 3. Ananthi Sheshasaayee & Sheshasaayee, Computer Applications in Business and Management Margham Publications, Chennai. 4. Sushila Madan, Computer Applications in Business, Scholar Tech Press, New Delhi. 5. H.N Tiwari and Hem Chand Jain, Computer Applications in Business, Taxmann Publication, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. Alexis Leon & Mathews Leon, Computer Applications in Business, Vijay Nicole Imprints Pvt.Ltd., Chennai. 2. Srinivasa Vallabhan, Computer Applications in Business, Sultan Chand & Sons, New Delhi. 3. Ed Bott, woody Leonhard, Using Microsoft Office 2007, Pearson Education, New Delhi. 4. K. Mekala Sharmini,T. Sarah JebaJency,Computer Applications in Business,Charulatha Publications, Chennai 5. Pooja Mathur, Dr. Shruti & Jain, Computer Applications in Business, Galgotia Publishing Company, New Delhi. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACOAL21	ALLIED 2	E-COMMERCE	2	1

Instructional Objectives

1. To explain the concepts of E-Commerce.
2. To familiarise students the technology behind E-Commerce.
3. To impart knowledge on future tools and techniques related to E-Commerce.

Course Outcomes:

CO1. Set sound goals and objectives for building the e-commerce websites.
CO2. Design appropriate e-commerce business models suitable for the business.
CO3. Understand builds of web sites, security systems and payments.
CO4. Understand the e-commerce marketing concepts and online retailing.
CO5. Know the uses of Social Network, Online communication and online auction.

Unit-I	Introduction to E-Commerce	6 Hours
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E-Business – E-Commerce – Features – Components - E-Commerce vs. Traditional Commerce – Advantages – Limitations – Ethical, Social & Political Issues.

Unit-II	E-Commerce Models	6 Hours
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Models based on Transacting Parties – B2B – B2C – C2C –B2G – G2B – G2C- Models based on Transaction type – Definition of Storefront, Marketplace, Online Auction, Online Advertising, Info-mediary, Online Brokerage, Freemium, Virtual Communities, Subscription, Access Charge Models.

Unit-III	Building E-Commerce Presence	6 Hours
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Systematic Approach to Building E-Commerce Presence – Choosing Software – Choosing Hardware – Planning & Building Mobile Presence – Design, Cost & Performance Considerations - Security threats to E-Commerce – Technology Solutions to counter Security threats.

Unit-IV	EDI & Online Shopping	6 Hours
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EDI – Scope – Components – Process – Benefits- Online Shopping & E-Tailing – Product Delivery modes – Advantages – Disadvantages – Modes of Payment.

Unit-V	E-Commerce: Past, Present & Future	6 Hours
E-Commerce - Evolution & Growth –Services offerings through E-Commerce – Future Prospects – Government of India’s Policy on FDI in E-Commerce - Definitions of Modern Terminology: M-Commerce – U-Commerce – O2O – IoT – Intelligent Assistants – Artificial Intelligence, Deep Learning & Machine Learning.		
Books for Study:		
<ol style="list-style-type: none"> 1. K. Abirami Devi & Dr. M. Alagammai, E-Commerce, Margham Publications, Chennai. 2. Kenneth C. Laudon & Carol Guercio Traver, E-Commerce, Pearson Education India, Delhi 3. P.T.Joseph, S.J., E- Commerce – An Indian Perspective, Prentice Hall of India, New Delhi. 4. Dr. S. V. Srinivasa Vallabhan, E-Commerce, Vijay Nicole Imprints Pvt Ltd, Chennai 5. Dr. P. Rizwan Ahmed, E- Business & E- Commerce, Margham Publications, Chennai. 		
Books for Reference:		
<ol style="list-style-type: none"> 1. Elias M. Awad, Electronic Commerce, Prentice Hall of India, New Delhi. 2. S. J. Joseph, E-Commerce: an Indian perspective, PHI 3. Greenstein &Merylin, Electronic Commerce, Tata Mc.Graw Hill, New Delhi. 4.Rahul Srivastava & U S Pandey, E-Commerce and Mobile Commerce Technologies, S. Chand & Co. Ltd. New Delhi 5. Kenneth C. Laudon, E-Commerce: Business, Technology, Society, 4th Edition, Pearson. 		
Electronic & Web Resources		
<ol style="list-style-type: none"> 1.Consolidated FDI Policy Circular of 2017, Website of Department for Promotion of Industry and Internal Trade, Government of India, https://dipp.gov.in/sites/default/files/CFPC_2017_FINAL_RELEASED_28.8.17_0.pdf 2. Press Note No. 2 (2018): Review of the Policy on FDI in E-Commerce, Website of Department for Promotion of Industry and Internal Trade, Government of India,https://dipp.gov.in/sites/default/files/pn2_2018.pdf 3.Wikipedia Page on E-Commerce,https://en.wikipedia.org/wiki/E-commerce 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO1001	CORE 1	MARKETING MANAGEMENT	6	5

Instructional Objectives

1. To provide insight into the Marketing Concepts
2. To enlighten various tools & techniques used in Marketing
3. To impart theoretical knowledge of Marketing Management

Course Outcomes

- CO 1. Comprehend the concept and functions of Marketing and Marketing Management
- CO 2. Analyze Marketing Environment and Illustrate the process of Marketing Research
- CO 3. Classify Products, Describe the process of New Product Development, Analyze various stages of Product Life Cycle.
- CO 4. Analyze the Pricing Methods and factors influencing Pricing Decisions
- CO 5. Comprehend the role of different Channels of Distribution and Analyze the Promotion Mix and Factors influencing Promotion Mix
- CO 6. Distinguish between Products and Services and Comprehend the difficulties in Marketing of Services
- CO 7. Analyze the pros and cons of e-Marketing, Realize the significance of CRM and identify Ethical Issues in Marketing.

Unit-I	Introduction	18 Hours
Marketing – Definition - Scope – Functions – Marketing Concepts – Selling vs. Marketing – Marketing Approaches - Marketing Management – Areas of Marketing Management.		
Unit-II	Marketing Environment, Segmentation & Marketing Research	18 Hours
Marketing Environment – Micro and Macro Environment. Market Segmentation – Target Market – Positioning – Introduction to Marketing Mix for Products and Services. Marketing Research – Importance – Process of Marketing Research.		

Unit-III	Product and Pricing Decisions	18 Hours
Product – Concept – Classification – Product Mix - New Product Development Stages - Product Life Cycle – Branding – Packaging – Labelling. Pricing – Objectives – Factors influencing Pricing Decisions – Pricing Methods – Pricing a new product.		
Unit-IV	Distribution and Promotional Decisions	18 Hours
Channels of Distribution – Objectives – Importance - Functions – Intermediaries - Wholesalers – Retailers. Promotion – Role of Promotion in Marketing – Promotion Mix – Factors influencing Promotion Mix – Personal Selling – Sales Promotion – Advertising – Direct Marketing – Public Relations.		
Unit-V	Trends in Marketing	18 Hours
Service Marketing – Differences between Goods and Services – Difficulties in Marketing of Services – Demarketing – Remarketing - e-Marketing - Benefits and Limitations – Viral Marketing - Green Marketing – Customer Relationship Management – Rural Marketing - Ethical Issues in Marketing.		
Books for Study: <ol style="list-style-type: none"> 1. Ramaswamy V S and Nandakumari S, Marketing Management, McMillan, Delhi. 2. Varshney R L and Gupta S L, Marketing Management, Sultan Chand & Sons., New Delhi. 3. Rajan Saxena, Marketing Management, Tata McGraw Hill, Chennai. 4. C.B.Gupta, Marketing Management – Text & Cases, Sultan Chand & Sons, New Delhi. 5. Kavita Sharma and Swati Aggarwal, Principles of Marketing, Taxmann, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. Philip Kotler, Marketing Management, Prentice Hall of India Pvt. Ltd., New Delhi. 2. Bagozzi R P, Principles of Marketing Management, Science Research Associates, Chicago. 3. Govindarajan M, Marketing Management, Prentice Hall of India Pvt. Ltd., New Delhi. 4. Winer and Dhar, Marketing Management, Pearson India, New Delhi. 5. Kotler, Kartajaya and Setiawan, Marketing 4.0: Moving from Traditional to Digital, Wiley, Canada. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO1002	CORE 2	ADVANCED MANAGEMENT ACCOUNTING	6	5

Instructional Objectives

1. To equip the students with the concepts, methods and techniques of management accounting.
2. To calculate the ratios and their analysis, preparation of Fund flow and cash flow statements, preparation of budgets and marginal cost statement for decision making.
3. To familiarize the students with various Tools used in Decision Making

Course Outcomes

CO1: Understand thoroughly the conceptual framework of Management Accounting and identification of differences between different branches of accounting.

CO2: Gain knowledge on the concept of Marginal costing, Cost-volume-profit analysis, Break-even analysis and their applications in businesses.

CO3: Analyse and take decisions on Price fixation, Make or Buy and Product Mix.

CO4: Apply the Ratio analysis to evaluate the financial performance of an organization.

CO5: Analyse the change in flow of cash in business through preparation of Fund flow and Cash flow statements.

CO6: Describe Budgetary control system as a tool of managerial planning and control and prepare various types of budget.

CO7: Prepare Cash, Flexible and Master budget and Compose reports.

Unit-I	Management Accounting	18 Hours
Management Accounting–Meaning - Objectives –Advantages and disadvantages– Financial Accounting vs. Management Accounting - Role of Management Accountant- Ratio Analysis – Advantages and disadvantages – Classification of ratios – Computation of Ratios		
Unit-II	Funds Flow Statement	18 Hours
Funds Flow Statement - Concept - Uses and Limitations - Schedule of Changes in Working Capital - Calculation of Funds From Operations - Statement of Sources and Application of Funds.		

Unit-III	Cash Flow Statement	18 Hours
Cash flow statement – Concept - Distinction between Fund flow statement and Cash flow statement - Utility – Preparation of Cash Flow Statement as per AS 3		
Unit-IV	Budget and Budgetary Control	18 Hours
Budget – Meaning – Objectives – Classification of Budgets – Budgetary Control - Essentials of Budgetary Controls – Classification of Budgets – Preparation of Cash Budget and Flexible Budget- Functional budgets – Fixed budget – Zero base budget		
Unit-V	Marginal costing	18 Hours
Marginal costing – Meaning – Advantages and disadvantages - Profit Volume Ratio - Break Even Point - Margin of Safety - Application of Marginal costing in Decision-making to Make or Buy - Problem of Limiting or Key factor and Choice of Profitable Mix.		
<p align="center">Note: Weightage of marks problems 80% theory 20%</p> <p>Books for Study:</p> <ol style="list-style-type: none"> 1. R.K. Sharma, Shashi k Gupta (2015).Cost & Management Accounting. New Delhi:Kalyani Publishers. 2. R.S.N.PillaiBagavathi Management Accounting S. Chand & Company LTD. New Delhi. 3. S N Maheswari, Management Accounting, Sultan Chand & Sons, New Delhi. 4.I M Pandey, Management Accounting, Vikas Publishing House. 5.E.Gordon, Sundram.N (2011).Management Accounting. Mumbai: Himalaya Publishing House. 		
<p>Books for Reference:</p> <ol style="list-style-type: none"> 1.Dr.R.Ramachandran and Dr.R. Srinivasan, Management Accounting Sriram Publications- Trichy. 2.Khan and Jain, Management Accounting, Tata McGraw Hill, New Delhi 3. Ravi M Kishore, Management Accounting, Taxman Publication, New Delhi 4. Robert S Kaplan and Anthony Atkinson, Advance Management Accounting, Prentice Hall, New Delhi. 5. Arora,M.N. (2012).Cost and Management Accounting. Mumbai: Himalaya Publishing House.. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO1003	CORE 3	ADVANCED BUSINESS STATISTICS	6	4

Instructional Objectives

1. To familiarize students with concepts and applications of Statistics in Business
2. To educate students about the Multiple Correlation and Regression Analysis
3. To acquaint students with Inferential Statistical Tools used for Business Decision Making

Course Outcomes

CO 1. Define Statistics and discuss its Applications and Limitations

CO 2. Define Correlation and Regression and understand the types of correlation

CO 3. Calculate Partial Correlation Coefficient and Multiple Correlation coefficients and Obtain Linear Multiple Regression equations

CO 4. Understand the concept of Probability Distributions and Derive Binomial and Poisson Distributions

CO 5. Use Chi-Square test, F-test, ANOVA, t-test and Z-test for testing hypothesis

Unit-I	Introduction	18 Hours
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Statistics – Definition – Pros and Cons of Statistics - Application of Statistics in various fields.

Data - Meaning – Kinds – Differences between Primary Data and Secondary Data – Sources of Primary and Secondary Data.

Unit-II	Correlation & Regression Analysis	18 Hours
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Correlation – Definition – Uses – Types – First Order Partial Correlation involving 3 variables – Characteristics, Uses & limitations of Partial Correlation Analysis - Multiple Correlation Analysis involving 2 independent variables – Advantages & Limitations of Multiple Correlation Analysis – Regression – Definition – Uses – Correlation vs. Regression – Multiple Regression Analysis involving 3 variables.

Unit-III	Probability Distributions & Statistical Inference	18 Hours
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Probability Distribution - Meaning - Concept – Normal Distribution – Poisson Distribution – Binomial Distribution. Statistical Inference – Hypothesis – Hypothesis Testing – Procedure – Errors.

Unit-IV	Chi-Square Test	18 Hours
Chi-Square Test – Conditions – Applications – Test of Independence – Test of Goodness of Fit – Test of Homogeneity – Limitations.		
Unit-V	F-Test, ANOVA, t-test and Z-test	18 Hours
F-Test – ANOVA – Assumptions – One-way – Two-way – t-test – Applications – Testing Significance of Mean of a Random Sample – Testing difference between means of two samples (Independent, Dependent) – Testing significance of Correlation Coefficient – Z-test of the Significance of Correlation Coefficient		
<p align="center">Note: Weightage of marks problems 80% theory 20%</p> <p>Books for Study:</p> <ol style="list-style-type: none"> 1. Dr. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, New Delhi. 2. C.R. Kothari, Quantitative Techniques, Vikas Publishing Houses Pvt. Ltd., Noida. 3. Dr. P.K. Mathur et.al., Business Statistics, Himalaya Publishing House Pvt. Ltd., Mumbai. 4. S.P. Rajagopalan, R. Sattanathan, Business Statistics, Vijay Nicole Imprints Pvt. Ltd., New Delhi. 5. J.K. Sharma, Business Statistics, Vikas Publishing Houses Pvt. Ltd., Noida. <p>Books for Reference:</p> <ol style="list-style-type: none"> 1. Morris Hamburg, Statistical Analysis for decision making, Harcourt Trade publishers. 2. Dr. S.P. Gupta and M.P. Gupta, Business Statistics, Sultan Chand & Sons, New Delhi. 3. R.S.N. Pillai and Bhagavathi, Statistics – Theory & Practices, S. Chand & Co., New Delhi. 4. P.R. Vittal, Business Statistics & Operation Research, Margham Publications, Chennai. 5. Davie M.Levine et.al., Business Statistics - A First Course, Pearson Education, New Delhi 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO1004	CORE 4	GLOBAL FINANCIAL SYSTEM	6	4

Instructional Objectives

1. To provide an elaborate understanding of both Indian & Global financial system.
2. To provide knowledge on the financial market and regulatory institutions.
3. To make the students to understand about financial institutions and financial services.

Course Outcomes

- CO 1. Understand the role of financial system in the country.
- CO 2. Discuss the functioning of money market and capital market.
- CO 3. Analyse the role of RBI and SEBI in financial market.
- CO 4. Develop strong understanding of banking and non banking financial institutions.
- CO 5. Describe various financial services in the economy and its importance.
- CO 6. Understand and update the recent development in Indian financial sector.

Unit-I	Introduction to Indian Financial System	18 Hours
Financial System and its Components – Significance and Role of Financial System in Economic Development – Structure of Indian Financial System – Problem of the Financial System in India - Reforms in the Indian Financial Sector – Financial Inclusion.		
Unit-II	Indian Financial Markets and Regulatory Institutions	18 Hours
Financial Markets in India – Classification of Financial Markets – Money Market – Features - Functions and Instruments – Role of RBI and Commercial Banks in Indian Money Market - Capital Market – Features - Functions and Instruments – Primary Market - Secondary Market – Government Securities Market – Foreign Exchange Market – Debt and Derivative Market – SEBI guideline to regulate Capital Market.		
Unit-III	Financial Institutions	18 Hours
Development Finance Institutions (DFIs) – Banking and Non Banking Financial Institutions – Distinction between Banking and Non Banking Financial Institutions – Commercial banks – Co-operative bank – Rural bank – Non-Banking Financial Intermediaries.		
Unit-IV	Financial Services	18 Hours
Financial Service – Concept – Significance – Types of Financial Services – Hire Purchase – Housing Finance - Mutual Funds – Merchant Banking – Leasing – Factoring – Forfaiting -		

Venture Capital - Credit Rating and Depository Services.		
Unit-V	Global Financial Institutions & Financial Markets	18 Hours
International Financial Institutions – IMF, World Bank, Asian Development Bank and BRICS Bank – International Financial Markets – NYSE – NASDAQ – TSE – SSE – HKG – LSE.		
Books for Study: <ol style="list-style-type: none"> 1. Khan MY., Indian Financial System, Tata McGraw Hill Publishing Company 2. Varshney PN & Mittal DK, Indian Financial System, Sultan Chand & Co., New Delhi 3. Bezborah P & Singh R, Indian Financial System, Kalyani Publishers 4. Vasanth Desai, The Indian Financial System, Himalaya Publishing House. 4. Machiraju.R.H, Indian Financial System, Vikas Publishing House. 5..Murthy D K & VenugopalRM, Indian Financial System I.K. International Publishers 		
Books for Reference: <ol style="list-style-type: none"> 1. Pathak, Bharati,The Indian Financial System, Pearson Education Publication, New Delhi. 2. P. Mohan Rao, Financial System & Economic Reforms, Deep & Deep Publication Pvt. Ltd. New Delhi 3. Rajesh Khothari, Financial Service in India, Sage Publications, New Delhi. 4. Clifford Gomez, Financial Market, Institution and Financial Services, Prentice Hall, New Delhi. 5. Dr.Gurusamy.S, Financial Markets & Institutions, Tata McGraw Hill Education Private Ltd, New Delhi 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACOE11	ELECTIVE 1	INTERNATIONAL BUSINESS	6	4

Instructional Objectives

1. Introducing International Business
2. To Familiarise students with WTO and Foreign Exchange Market
3. To Understand the functionality of International Economic Organisations and MNCs

Course Outcomes

- CO 1. Explain the International Business
- CO 2. Understand the Working of World Trade Organisation and Foreign Exchange Market
- CO 3. Comprehend International Banking & International Stock Markets
- CO 4. Realise the complete Globalisation concept
- CO 5. Understand the functionality of Multi-National Corporations

Unit-I Introduction to International Business 18 Hours

Concept of Flattening World – Competitive Dimensions – Concept of International Marketing - Reasons for Going International – Internationalisation Stages and Orientations – Internationalisation Business Decisions – Types of International Business.

Unit-II Balance of Trade & Balance of Payments 18 Hours

Balance of Trade & Balance of Payments – Components of Balance of Payments – Concept of Current Account Balance – Balance of Payments Disequilibrium – Financing of Balance of Payment Deficit – Trade in Services – Global Sourcing.

Unit-III WTO & Foreign Exchange Market 18 Hours

World Trade Organisation (WTO) – Foreign Exchange Market – Determination of Exchange Rates – Exchange Control – Exchange Rate Systems – Exchange Rate Classifications – Exchange Rate and Convertibility of the Rupee – Devaluation – Currency Exchange Risks and Management-Foreign Exchange Management in India.

Unit-IV International Banking & Restrictions in International Trade 18 Hours

International Banking – Eurocurrency Market – Internationalisation of Stock Markets – Restrictions in International Trade – Tariffs – Embargoes – Quotas – Red-Tapism – Dumping – Licensing requirements – Standards & Subsidies .

Unit-V Globalisation & Multinational Corporations 18 Hours

Concept of Globalisation – Economic Indicators of Growth of Globalisation – Phases of Globalisation – Globalisation of Business – Advantages of Globalisation – Implications and Impact of Globalisation.

Multinational Corporations (MNCs) – Concept – Dominance of MNCs – Merits and Demerits of MNCs – Multinationals in India - TNCs.

Books for Study:

1. **Sonia Gupta**, International Business, McGraw Hill Education (India) Pvt. Ltd., New Delhi

2. **Francis Cherunilam**, International Business – Text & Cases PHI Learning Pvt. Ltd., New Delhi.
3. **Kamal Fatehi & Jeongho Choi**, International Business Management Springer Nature, Switzerland.
4. **Gabriel Moens and Peter Gillies**, International Trade and Business: Law, Policy and Ethics, Caveridish Publishing (Australia) Pty Ltd. Sydney.
5. **Subha Rao P**, International Business- Text and Cases, Himalaya Publishing House, Mumbai.

Books for Reference:

1. **Walter Leal Filho, Paulo R. Borges de Brito & Fernanda Frankenberger**, International Business, Trade and Institutional Sustainability, Springer Nature, Switzerland.
2. **Densil A. Williams**, International Business Blunders: Lessons for Future Managers, Emerald Publishing Ltd., Bingley, UK
3. **K. Aswathappa**, International Business, McGraw-Hill Education (India) Pvt. Ltd., New Delhi.
4. **Beth A. Simmons & Richard H. Steinberg**, International Law and International Relations, Cambridge University Press, New York.
5. **Malcolm. N. Shaw**, International Law, Cambridge University Press, New York.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACOE12	ELECTIVE 1	CORPORATE LAWS	6	4

Instructional Objectives

1. To acquaint students with basic concepts related to companies
2. To equip students with knowledge of SEBI Act, 1992 and FEMA Act, 1999
3. To introduce students to the Insolvency and Bankruptcy Code, 2016

Course Outcomes

CO1: Discuss the significance of Corporate laws

CO2: Define Corporate Personality, Corporate Governance, E-Governance and describe the Corporate Governance Code in Companies Act.

CO3: Discuss the prohibitions of certain Agreements, Abuse of Dominant Position and Regulation of Combinations under The Competition Act.

CO4: Enumerate the Powers and Functions of SEBI.

CO5: Describe the provisions related to listing of Securities, Public Offerings and discuss the prohibition of Insider Trading in various regulations of SEBI

CO6: Discuss the provisions related to Regulation and Management of Foreign Exchange, Related Offences, Penalties and Appeals Procedure under FEMA, 1999.

CO7: Elucidate the Corporate Insolvency Resolution Process and Liquidation Process under Insolvency and Bankruptcy Code, 2016.

Unit-I	Corporate Governance	18 Hours
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Corporate Laws – Importance. Corporate Personality – Corporate Governance – Concept – Corporate Governance Practices and Codes: Provisions under The Companies Act. – E-Governance

Unit-II	Competition Act, 2000	18 Hours
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Competition Act, 2000 – Introduction – Objectives – Important Definitions – Prohibition of Anti-Competitive Agreements – Prohibition of Abuse of Dominant position – Regulation of Combinations – Competition Commission of India – Composition – Duties, Powers and Functions – Penalties – Appellate Tribunal – Procedures & Powers – Powers of the Central Government.

Unit-III	The Securities and Exchange Board of India Act, 1992	18 Hours
The Securities and Exchange Board of India Act, 1992 – Introduction – Objectives – Important Definitions – Definitions under Securities Contracts (Regulations) Act, 1956 - Powers and Functions of SEBI – Registration – Penalties – Adjudication – Appellate Tribunal – Appeals – Procedure and Powers of The Securities Appellate Tribunal – Power to make Rules and Regulations – SEBI Issue of Capital and Disclosure Requirements Regulations, 2018 – General conditions for Public Issues and Rights Issues – Conditions for Initial Public Offer – Conditions for Further Public Offer – Pricing - Promoters Contribution – Listing of Securities – Conditions for Listing – Types of Listing – Procedure for Listing Requirements – Benefits of Listing – Defects of listing - The SEBI (Prohibition of Insider Trading) Regulations, 2015		
Unit-IV	The Foreign Exchange Management Act, 1999	18 Hours
The Foreign Exchange Management Act, 1999 – Introduction – Objective – Differences and Similarities between FERA and FEMA - Important Definitions under the Act – Provisions related to Regulation and Management of Foreign Exchange – Authorised Person – Offences – Contraventions & Penalties – Adjudication & Appeals – Appellate Tribunal – Directorate of Enforcement		
Unit-V	Insolvency and Bankruptcy Code, 2016	18 Hours
Insolvency and Bankruptcy Code, 2016 – Introduction – Objectives – Applicability of the Code – Important Definitions – Relationship between Bankruptcy, Insolvency and Liquidation - Corporate Insolvency Resolution Process – Liquidation Process – Fast Track Insolvency Process for Corporate Persons – Voluntary Liquidation – Adjudicating Authority – Offences and Penalties – Insolvency and Bankruptcy Board of India – Insolvency Professional Agencies – Insolvency Professionals – Information Utilities – Powers of Central Government		
Books for Study: <ol style="list-style-type: none"> 1. Taxmann's Corporate Laws, Taxmann, New Delhi 2. J. Jayasankar, Corporate Laws, Margham Publications, Chennai 3. Gulshan, S.S., A Hand book of Corporate Laws, S. Chand & Co, New Delhi. 4. SumitPahwa, Corporate Law Referencer, Oakbridge Publishing Pvt. Ltd., Gurugram. 5. Arun Kumar Singh, Corporate Law & Governance, Regal Publications, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. Bharat Bhushan, N.D. Kapoor, Dr. Rajni Abbi & Rajiv Kapoor, N.D. Kapoor's Elements of Mercantile Law, Sultan Chand & Sons Pvt. Ltd., New Delhi. 2. K. Aswathappa & G. Sudarsana Reddy, Business Regulations, Himalaya Publishing House, Mumbai. 3. Dr. MR Sreenivasan, Business Law (Commercial Law), Margham Publications, Chennai. 		

4. **K.G. Garg, Mukesh Sharma, et.al.**, Business and Corporate Law, Kalyani Publishers, New Delhi..
5. **Dr. S. Sankaran**, Corporate And Economic Laws, Margham Publications, Chennai.

E- Resources:

1. The Institute of Chartered Accountants of India's Study Material for Competition Act, 2002: <https://resource.cdn.icai.org/47565bosfinal-p6d-cp2.pdf>
2. The Institute of Chartered Accountants of India's Study Material for The Foreign Exchange Management Act, 1999: <https://resource.cdn.icai.org/47681bosfinal-p6d-cp6.pdf>
3. The Institute of Chartered Accountants of India's Study Material for The Insolvency and Bankruptcy Code, 2016: <https://resource.cdn.icai.org/47588bosfinal-p6d-cp4.pdf>
4. The Institute of Cost Accountants of India's Study Notes for Corporate Laws: <https://icmai.in/upload/Students/Syllabus2016/Final/Paper-13-Revised-Aug.pdf>
5. The Competition Act, 2002 Bare Act at India Code - Digital Repository: https://indiacode.nic.in/handle/123456789/2010?view_type=browse
6. The Securities and Exchange Board of India Act, 1992 Bare Act at India Code - Digital Repository: https://indiacode.nic.in/handle/123456789/1890?view_type=search&sam_handle=123456789/1362
7. The Securities and Exchange Board of India Act, 1992 Bare Act at SEBI's Website: <https://www.sebi.gov.in/legal/acts/jan-1992/securities-and-exchange-board-of-india-act-1992-as-amended-by-the-finance-no-2-act-2019-3.html>
8. Securities Contracts (Regulation) Act, 1956 at SEBI's Website: <https://www.sebi.gov.in/acts/contractact.pdf>
9. The Foreign Exchange Management Act, 1999 Bare Act at India Code - Digital Repository: https://indiacode.nic.in/handle/123456789/1988?view_type=search&sam_handle=123456789/1362
10. The Insolvency and Bankruptcy Code, 2016 at India Code - Digital Repository: https://indiacode.nic.in/handle/123456789/2154?view_type=browse&sam_handle=123456789/1362

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO2001	CORE 5	STRATEGIC HUMAN RESOURCE MANAGEMENT	5	5

Instructional Objectives

1. Realising the significance of strategic management in human resources.
2. Familiarising with Human Resource Information System, Human Resource Audit and Human Resource Accounting.
3. Understanding Electronic HRM and Learning the Application of Human Resource Management in Virtual Office Set-up.

Course Outcomes

- CO 1. Describe clearly the concepts like HRM and SHRM.
- CO2. Realise the significance of Empowerment for Employees in an Organisational Setup.
- CO3. Conceive the complete modus operandi of Workers/Employees Participation in Management.
- CO4. Familiarise with the Information System exist for Human Resources.
- CO5. Do the Human Resource Audit in a Working Environment and assist the Organisation in Accounting of Human Resources.
- CO6. Envisage the e-environment of human resources as well as the functioning of HRM in a Virtual Environment.
- CO7. Visualise the significance of knowledge management, talent management and stress management in an organisational setup.

Unit-I	HRM & SHRM	15 Hours
Human Resource Management (HRM) – Concept – Objectives – Scope – Functions – Personnel Management vs. Human Resource Management. Strategic Human Resource Management (SHRM) – Concept – Benefits – Role of HRM in Strategic Management – The Best Practice Approach vs. The Best-Fit Approach.		
Unit-II	Employee Empowerment & WPM	15 Hours
Employee Empowerment – Concept – Conditions Necessary for Employee Empowerment – Forms of Employee Empowerment – Barriers of Employee Empowerment. Workers Participation in Management (WPM) – Concept – Objectives – Forms – Making WPM Effective.		
Unit-III	HRIS, HR Audit & HRA	15 Hours
Human Resource Information System (HRIS) – Concept – Need – Advantages and Limitations – Application of HRIS – Designing of HRIS – Installation of HRIS. Human Resource Audit (HR Audit) – Concept – Features – Objectives – Need & Importance – Scope Benefits – Indicators of HR Audit – Approaches to HR Audit. HR Accounting – Concept – Objectives – Advantages and Limitations – Approaches of Valuation of Human Assets – Cost Control in Human Resources.		

Unit-IV	E-HRM & HRM in VOs	15 Hours
<p>Application of Information Technology to HR – Dimensions of E-HRM – E-Recruitment – E-Selection – E-Performance Management – E-Training & Development – E-Compensation Management – Employee Profiling.</p> <p>Virtual Organisations (VOs) – Concept – Features – Types – Advantages and Limitations – HRM in Virtual Organisations.</p>		
Unit-V	Knowledge Management, Talent Management & Stress Management	15 Hours
<p>Knowledge Management – Concept – Importance – Role of HRM in Knowledge Management.</p> <p>Talent Management – Concept – Strategies in Talent Management.</p> <p>Stress – Concept – Features – Causes – Consequences – Stress Coping Strategies.</p>		
<p>Books for Study:</p> <ol style="list-style-type: none"> 1. Michael Armstrong, Strategic Human Resource Management – A Guide to Action, Kogan Page Limited, London. 2. S.S.Khanka, Human Resource Management – Text and Cases, S.Chand & Co. Pvt. Ltd., New Delhi. 3. H K. Sundar & J. Srinivasan, Human Resource Development, Margham Publications, Chennai. 4. J. Jayasankar, Human Resource Management, Margham Publications, Chennai. 5. William J. Rothwell & H.C. Kazanas, Planning & Managing Human Resources, HRD Press, Amherst, Massachusetts. 		
<p>Books for Reference:</p> <ol style="list-style-type: none"> 1. K. Sundar & J. Srinivasan, Essentials of Human Resource Management, Vijay Nicole Imprints Pvt. Ltd., Chennai. 2. Mello Jeffrey A, Strategic Human Resource Management, Thomson, India. 3. Michael & Baron Angela, Handbook of Strategic HRM, Armstrong, Jaico Publishing House, New Delhi. 4. E Mohan Thite, Routledge, HRM – Digital Approaches, Directions and Applications, New York 5. Agarwala T, Strategic Human Resource Management, Oxford University Press, New Delhi. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO2002	CORE 6	ADVANCED FINANCIAL MANAGEMENT	6	5

Instructional Objectives

1. To develop in-depth understanding of the concept of financial management.
2. To make the students understand fund management, cost of capital and capital structure.
3. To Familiarise with working capital management, dividend policy and capital budgeting techniques.

Course Outcome

CO1. Understand the foundations of financial management, risk return framework and role of a finance manager.

CO2. Examines the long-term Sources of Funds.

CO3. Describe the cost of capital and determinants of cost of capital.

CO4. Estimate various capital structure theories and factors affecting capital structure decisions in a firm.

CO5. Understand the details of working capital management and effectively manage cash, receivables and inventories.

CO6. Critically examine various theories of dividend and factors affecting dividend policy.

CO7. Analyze and evaluate capital projects under different situations using appropriate capital budgeting techniques.

Unit-I Introduction

18 Hours

Financial Management – Definition – Scope – Objectives – Significance - Profit Maximization Vs Wealth Maximization – Finance Function - Role of Financial Manager – Methods and Tools of Financial Management- Risk return trade off in financial decisions.

Unit-II Fund Management

18 Hours

Long term sources – Shares and Debentures – Convertible securities and term loans – Working capital financing – Sources and approaches - Bank credit – Basic principles and methods of assessment – Other sources of short-term finance – Operating environment of working capital.

Unit-III Cost of capital and Capital Structure Decision

18 Hours

Concepts of cost of capital – Cost of equity, cost of debenture, cost of preference share capital, cost of retained earning – Weighted average cost of capital – Determinants of cost of capital - Capital structure theories – Net income, Net operating income, MM and Traditional Theories – Factors influencing of capital structure - Leverage Meaning – Definition-Operating Leverage, Financial Leverage, Combined Leverage.

Unit-IV Working Capital Management and Dividend Policy

18 Hours

Working capital cycle – Factors influencing working capital - Forecasting of working capital requirements - Management of inventory, cash and accounts receivable – Payables management – Credit and collection policies - Dividend policies – Factors affecting dividend decisions – Dividend theories – Gordon, Walter and MM theories.

Unit-V	Capital Budgeting Techniques	18 Hours
Capital budgeting techniques- Payback period - Discounted Payback Period (DPB) - Net Present value (NPV) - Equivalent Annual NPV - ARR - Internal rate of return (IRR) - Incremental IRR - Modified IRR and Profitability index -Average Rate of Return.		
Note: Weightage of Marks - Theory 40% Problem 60%		
Books for Study: <ol style="list-style-type: none"> 1. I.M. Pandey, Financial Management, Vikas Publishing House, New Delhi. 2. M.Y. Khan and P.K. Jain, Financial Management, Tata McGraw Hill Publishing Company Limited. New Delhi. 3. S.N. Maheswari, Fundamentals of Financial Management, Sultan Chand & Sons, New Delhi. 4. Dr. A. Murthy, Financial Management, Margham Publications, Chennai. 5. P.V.Ratnam, Financial Management Theory, Problems and Solutions, Kitab Mahal, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. Kothari, R, Financial Management: A Contemporary Approach, Sage Publications India Pvt. Ltd. New Delhi 2. Sharma, S.K. and Sareen, Rachan, Fundamentals of Financial management, Sultan Chand & Sons (P) Ltd. New Delhi 3. Singh, Surender. and Kaur, Rajeev, Fundamentals of Financial Management, Scholar Tech Press, New Delhi 4. Rustagi, R.P. Fundamentals of Financial Management, Taxmann, New Delhi 5. Prasanna Chandra, Financial Management, Theory and Practice, Tata McGraw Hill Publishing Company, New Delhi. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO2003	CORE 7	QUANTITATIVE TECHNIQUES	6	4

Instructional Objectives

1. To educate students about the Quantitative techniques.
2. To understand and solve LPP including Transportation and Assignment Problems.
3. To Apply Game theory, Sequencing and Network Analysis Techniques in Business Decision making.

Course Outcomes

- CO 1. Describe role of Quantitative techniques in business and classify them.
CO2. Formulate LPP and solve it using Graphical, Simplex and Big 'M' methods.
CO3. Solve Transportation and Assignment problems
CO4. Apply concepts and theories of Game Theory in framing Competitive Strategies.
CO5. Utilise Sequencing & Network Analysis to reduce time in Business Decision making

Unit-I	Introduction	18 Hours
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Quantitative Techniques: Meaning – Characteristics - Classification – Techniques– Role of QT in Business and Industry – Limitations.

Unit-II	LPP	18 Hours
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Linear Programming Problem: Meaning – Concept – Steps - Components – Characteristics – Linear Programming Problems: Graphical Method - Simplex Method – Big 'M' Method.

Unit-III	Transportation & Assignment Problems	18 Hours
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Transportation Problem: Meaning – Balanced and Unbalanced Transportation Problems: North West Corner Rule – Least Cost Entry Method – Vogel's Approximation Method
Assignment Problem: Definition – Steps involved in solving Assignment Problem by Hungarian Method – Balanced Assignment Problem – Unbalanced Assignment Problem

Unit-IV	Sequencing & Game Theory	18 Hours
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Sequencing – Definition – Terms and Notations – Principal Assumptions – Types: Problems with n Jobs through 2 Machines – Problems with n jobs through 3 Machines.
Theory of Games: Introduction – Problems and Solutions to games: Saddle Point – Dominance Rule – Mixed Strategy – Graphical Method.

Unit-V	Network Analysis	18 Hours
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Concepts – Rules for plotting network diagrams – CPM Computations: EST – EFT – LFT – LST – TF – Finding Critical Path. PERT: Meaning – Steps Involved - Optimistic Time – Pessimistic Time – Most Likely Time – Estimation of Variability of Activity Times.

Weightage of Marks: Theory 20% and Problem 80%

Books for Study:

1. Dr. S.P. Gupta, P.K.Gupta, Manmohan, Business Statistics & Operations Research, Sultan Chand & Sons, New Delhi.

2. **C.R. Kothari**, Quantitative Techniques, Vikas Publishing House Pvt. Ltd., Noida.
3. **Dr. S.K. Khandelwal**, Quantitative Techniques, International Book House Pvt. Ltd, India.
4. **Dr. P.R. Vittal**, Quantitative Techniques, Margham Publications, Chennai
5. **R.B. Khanna**, Quantitative Techniques for Managerial Decisions, Prentice Hall India Learning Private Limited

Books for Reference:

1. **Hamdy A. Taha**, Operations Research: An Introduction, Pearson Education India.
2. **N.D. Vohra**, Quantitative Techniques in Management, McGraw Hill Education.
3. **P.C. Tulsian & Vishal Pandey**, Quantitative Techniques: Theory & Problems, Pearson Education, New Delhi
4. **Dr. U.K. Srivastava**, Quantitative Techniques for Managerial Decisions, New Age International Private Limited
5. **R.S.N. Pillai and Bhagavathi**, Statistics – Theory & Practices, S. Chand & Co., New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACO2004	CORE 8	BUSINESS ENVIRONMENT	5	4

Instructional Objectives

1. To enable the students to have an overview of various factors influencing business and its prosperity.
2. To acquaint the students to economic environment, LPG system and social responsibility
3. To comprehend theoretical foundations of International Business Environment.

Course Outcomes:

CO1 Explain the concepts of Business Environment

CO2 Understand the Economic Environment and LPG system

CO3 Analyse Political and Labour Environment affects the functioning of business

CO4 Describe the Impact of Social and Cultural Environment on Business

CO5 Comprehend the International Environment of Business and International Economic Institutions

Unit-I	Introduction	15 hours
Business Environment – Concept - Nature and Significance - Types of Environment – Internal and External - Micro and Macro - Changing Dimensions of Business Environment - Techniques of Environmental Scanning and Monitoring- Environmental Forecasting – Types – Techniques.		
Unit-II	Economic Environment	15 hours
Economic Environment – Significance – Economic System – Economic Planning - Objectives and achievements – Functions of NITI Aayog – Government Policies – Major Economic Reforms – LPG – NIP.		
Unit-III	Social & Cultural Environment	15 hours
Business & Society – Concept of Society – Types of Social Groups – Impact of Religious and Linguistic Groups on Business – CSR towards various stakeholders of business – Culture – Features – Elements – Impact of Culture on Business.		
Unit-IV	Political & Labour Environment	15 hours
Institutions of Political System – Types of Political Systems – Objectives of State intervention in Business – Privatization & Disinvestment - Impact of Legal environment on Business – Labour Environment – Impact of Legal environment on Business – Labour Welfare & Social Security –		

Trade Union – WPIM.		
Unit-V	Global Environment	15 hours
Globalisation – Features – Essential Conditions for Globalisation – Pros and Cons of Globalisation – Foreign Market Entry Strategies –International investments – Significance of Foreign investment – Types of Foreign investments – FDI – FII – Role & Functions of International Economic Institution – GATT - WTO		
Note: Students should Compulsorily undergo 15 day Institutional Training.		
Books for Study: <ol style="list-style-type: none"> 1. Francis Cherunilam, Business Environment, Himalaya Publications, Mumbai. 2. Sankaran, Business Environment, Margham Publication, Chennai 3. Justin Paul “Business Environment” Text and cases, Tata McGraw Hill, New Delhi. 4. Shaikh, Business Environment, Pearson Education, New Delhi 5.M.Dhanabhakiyam and M Kavitha, Business Environment, Vijay Nicole Publication, Chennai 		
Books for Reference: <ol style="list-style-type: none"> 1. Aswathappa, K. Essentials of Business Environment: Himalaya Publishing house, New Delhi 2.Shajahan, International Business, Mac MilanIndia, New Delhi. 3. P.K.Gosh& G.K. Kapoor, Business Policy and Environment, Sultan Chand and Sons, New Delhi. 4. Bedi, Suresh, Business Environment, Excel Books, New Delhi. 5. Sheikh Saleem, Business Environment, Pearson Education, New Delhi. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACOE21	ELECTIVE 2	CONSUMER BEHAVIOUR	6	4

Instructional Objectives

1. To help the students gain valuable conceptual knowledge of how the behaviour of consumers change and influence their decisions
2. To analyse personal, socio-cultural, and environmental dimensions that influence consumer behaviour on decisions making.
3. To impart knowledge on Consumer Protection Act, 2019

Course Outcomes

CO1. Understand human behaviour and the basic factors that influence the consumers decision process.

CO2. Describe models of consumer behaviour and consumer research process.

CO3. Describe the impact of individual determinants on consumer behaviour and discuss strategies for favorable behaviour.

CO4. Identify and explain the impact of groups determinants on consumer behaviour

CO5. Deliberate environmental influences like social class, culture and sub-culture on consumer behaviour

CO6. Develop understanding of the Consumer Protection Act, 2019

Unit-I	Introduction to Consumer Behaviour	18 Hours
Definition – Nature and Importance of consumer behaviour – Factors influencing consumer behaviour –Consumer behaviour and Market strategy – Models of consumer behaviour – Consumer research process.		

Unit-II	Individual Determinants of Consumer Behaviour	18 Hours
Motivation – Needs – Motives and goals – Dynamic nature of motivation – Arousal of motives – Personality – Nature – Theories – Self concept – Psychographic and life style. Perception – Process – Consumer imagery – Perceived risk. Learning – Principles – Theories – Attitude – Structural model of attitude – Attitude formation and change.		

Unit-III	Group Determinants of Consumer Behaviour	18 Hours
Group – Features – Types – Reference group influence – Types of consumer reference groups – Factors affecting group influence – Application of reference group – Family – Concept – Functions of family – Family decision making – Family life cycle – Opinion leadership and personal influence – Diffusion of Innovation.		

Unit-IV	Environmental Influences on Consumer Behaviour	18 Hours
Social Class – Social Class and Consumer Behaviour – Culture – Characteristics – Factors affecting culture – Role of customs, values and beliefs in consumer behaviour – Sub-culture – Types of sub-culture – Cross-Cultural understanding of Consumer Behaviour – Cross-cultural marketing problems in India – Strategies to overcome cross-cultural problems.		

Unit-V	Consumer Protection Act, 2019	18 Hours
Objectives – Features – Provision of the Act – Rights of consumer – Role of the Central Consumer Protection Authority – Consumer Disputes Redressal Commission – Appellate process – Product liability – Offences and penalties.		
Books for Study: <ol style="list-style-type: none"> 1. S.L. Gupta & Sumitra Pal, Consumer Behaviour an Indian Perspective, Sultan Chand, New Delhi. 2. S. Ramesh Kumar, Consumer Behaviour and Branding, Pearson Education, New Delhi. 3. David L. Loudon and Albert J Della Bitta, Consumer Behaviour, Tata McGraw Hill, New Delhi. 4. Jim Blythe, Consumer Behaviour, Sage Publication, New Delhi. 5. Leon G. Schiffman and Leslie LasarKanuk, Consumer Behaviour, Pearson Education, India 		
Books for Reference: <ol style="list-style-type: none"> 1. Ramanuj Majumdar, Consumer Behaviour, Prentice Hall of India, New Delhi, 2. Berkman & Gilson, Consumer Behaviour: Concepts And Strategies, Kent Publishing Company, New Delhi. 3. Paul, P. J., & Olson, J. C., Consumer Behaviour and Marketing Strategy. McGraw Hill Education. 4. MS Raju, Dominic Xardel, Consumer 146ehavior Concepts – Applications and Cases, Vikas Publishing House PVT Ltd., New Delhi. 5. Solomon, M.R., Consumer Behaviour: Buying, Having, and Being, PHI Learning 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACOEP22	ELECTIVE 2	ADVERTISING & SALES MANAGEMENT	6	4

Instructional Objectives

1. To develop in-depth understanding of modern concepts of advertising.
2. To know the Advertising Media and its copy.
3. To understand Sales Planning & Sales Force Management.

Course Outcomes

CO1: Understand the fundamentals of Advertising.

CO2: Develop an understanding of Advertising Media and Advertising Copy.

CO3: Describe the Role of Advertising Agencies and Regulatory Authority.

CO4: Discuss the concept of Sales Management.

CO5: Analyse Market and Sales Forecasting.

Unit-I	Advertising	18 Hours
Advertising: Meaning, Features, Types, Functions & Setting of Advertising objectives. Advertising Budget. Approaches of Advertising- DAGMAR –Approaches – AIDA.		
Unit-II	Advertising Media and Advertising Copy	18 Hours
Advertising Media: Media Types & Its Evolution, Factors Affecting Media Choice. Advertising Copy: Concepts and Elements. Requisites of A Good and Effective Advertising Copy. Advertising Appeals. Measuring Advertising Effectiveness.		
Unit-III	Advertising Agencies and Regulators	18 Hours
Advertising Agencies: Concept, Role, Types and Selection of Advertising Agencies. Regulating Agencies: Advertising standards Council of India (ASCI), The Advertising Agencies Association of India (AAAI).		
Unit-IV	Sales Management	18 Hours
Sales Management – Objectives – Functions – Setting Sales Objectives – Sales Management Process – Environmental Factors impacting Sales – Ethics in selling.		

Unit-V	Sales Planning & Sales Force Management:	18 Hours
Sales Planning – Market Analysis & Sales Forecasting – Sales Budget – Sales Territory – Sales Quota – Role of IT in Sales Planning - Sales Manager – Duties & Responsibilities – Qualities – Salesman – Recruitment & Selection – Training, Motivation & Compensation – Evaluation of Sales Personnel Performance – Sales & Cost Analysis.		
Books for Study: <ol style="list-style-type: none"> 1. Belch, G. & Belch, M. Advertising and Promotion: An Integrated Marketing Communication Perspective. 2. S.H. Kazmi & Satish Batra, Advertising and Sales Promotion, Excel Books 3. P. Saravanavel & S. Sumathi, Advertising & Salesmanship, Margham Publications, Chennai. 4. Mackay, A. R. The Practice of Advertising. New Delhi, India: Elsevier Ltd. 5. Patel, V. N., & Sharma, S. Brand Management & Consumer Marketing, Oxford Book Company, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. Aakar, D. A., Batra, R. & Mayers, J. G., Advertising Management, Prentice-Hall International. 2. Dr. J. Jayasankar, Sales & Distribution Management, Margham Publications, Chennai 3. Chunawalla, S. A., Advertising, Sales & Promotion Management, Himalaya Publications, New Delhi. 4. Anderson, R. E., Dubinsky, A. J. & Mehta, R. Personal Selling: Building Customer Relationships. New York: Houghton Mifflin Company. 5. Sheth, J. N. Legends in Marketing: Philip Kotler, India: Sage Publishing. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACO01	CORE I	RESEARCH METHODOLOGY	5	5

Instructional Objectives

1. To instill research insights in scholars by kindling their research inquisitiveness
2. To inculcate ethics in Research Process
3. To enable scholars to independently chart out and prepare the Research Report

Course Outcomes

CO 1. Define Research, Research Objective, Hypothesis, Pilot Study, Sample and Sampling, various stages of a Research Process and designing Research Methodology

CO 2. Apply the Moral Principles and Code of Ethics in every stage of Research especially during Data Collection and report the findings of the Research honestly

CO 3. Identify Research Gap, Define research objectives and formulate Research Questions and Hypotheses

CO 4. Discuss various sources of Data & their Collection Methods and identify the best method for the concerned Research

CO 5. Decide the Sampling Size and Sampling Technique to be followed for Research and Design a Questionnaire

CO 6. Organise the data and present the data in the form of Tabulation, Graph, Diagrams and Pictures

CO 7. Interpret the results, Communicate the results and offer Suggestion through drafting a detailed Research Report

Unit-I	Introduction	18 Hours
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Research - Meaning - Scope - Research Methodology – Meaning – Kinds – Research Methods vs Research Methodology - Stakeholders of Social Research – Significance of Research in Social Sciences – Identification of Research Problem – Research Gap - Formulation of Research Questions – Pilot Study – Meaning and Components of Research Design – Review of Literature.

Unit-II	Hypothesis	18 Hours
Hypothesis – Meaning and Role – Structure – Relationship between variables – Types – Strong and Weak – Sampling Theory – Sampling Methods and Techniques – Sampling Size – Basis for determination of Sample Size – Sampling Error .		
Unit-III	Data Collection	18 Hours
Data – Types - Data Collection – Sources – Primary and Secondary – Data Matrix – Unit of Data Collection – Methods and Tools of Data Collection – Interview and Questionnaire and their types – Differences between Interview and Questionnaire – Scaling and Testing Techniques – Reliability and Validity of Instruments – Uses of Information Technology in data Collection (Theory Only)		
Unit-IV	Report Writing	18 Hours
Report Writing – Significance of Report Writing – Different steps in writing Report – Layout of Research Report – Types – Technical Report – Popular Report – Mechanics of writing a Report (Theory Only)		
Unit-V	Research Ethics	18 Hours
Ethics and Research Aims – Moral Justification of Research – Responsibilities of Researcher – Area of Research which raise Ethical Issues – Ethical Issues in the use of Information and Communication Technology – Code of Ethics – Plagiarism – Guidelines to Plagiarism - Open Source & Free Anti-Plagiarism Softwares – Plagiarism Checker – Duplicate Checker – Copy Checker.		
Books for Study: <ol style="list-style-type: none"> 1. Dr. S. Thameemul Ansari, Dr. D. Ravindran, Dr. A. Noor Mohamed, Research Methodology, Charulatha Publications, Chennai. 2. DeepakChawla & Neena Sondhi, Research Methodology, Concepts and Cases, Vikas Publishing House Pvt. Ltd. 3. Ranjit Kumar, Research Methodology – A step by step guide for Beginners, Pearson India. 4. Dr. Amarchand, Research Methods in Commerce, Emerald Publishers, Chennai. 5. Dr. Vijay Upagade and Arvind Shende, Research Methodology, S.Chand, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. C.R. Kothari, Research Methodology, Methods and Techniques, Wiley Eastern Ltd. New Delhi. 2. R.L. Anderson, H.D. Berry., M.Poole, Thesis and Assignment Writing, Wiley Eastern Ltd. New Delhi. 		

3. **H. Bernard Russel**, Social Research Methods (London: Sage)
4. **S.P. Gupta**, **Statistical Methods**, Sultan Chand & Sons, New Delhi.
5. **C.R.Kothari and Gaurav Garg**, Research Methodology – Methods and Techniques, New Age International Publishers.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACO02	CORE II	DATA ANALYSES AND SPSS	5	5

Instructional Objectives

1. To enhance students' knowledge in Data Analyses
2. To enlighten the students about Hypotheses Testing
3. To impart practical knowledge of SPSS for Data Analyses

Course Outcomes

- CO 1. Edit and code the collected data.
- CO 2. Discuss the use of Parametric and Non Parametric Tests
- CO 3. Apply Parametric Tests for Hypothesis Testing
- CO 4. Apply Non Parametric Test for Hypothesis Testing
- CO 5. Discuss the role of Computers and Software Packages in Analysis of Data.
- CO 6. Analyse Data using SPSS for Descriptive Statistics
- CO 7. Carry out t-Test and Bivariate Correlation using SPSS

Unit-I	Introduction	18 Hours
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Definition of Research Data – Meaning of Research Data – Types of Data – Uses of Research Data – Data Editing – Importance of Data Editing – Guidelines for data editing – Data Coding – Pros and Cons of Data Coding – Coding of Qualitative and Quantitative Data (Theory Only)

Unit-II	Data Analysis	18 Hours
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Data Analysis - Meaning – Significance – Considerations in Research Data Analysis - Qualitative Data Analysis – Finding Patterns in Qualitative Data Analysis – Methods used for Data Analysis in Qualitative Research – Quantitative Data Analysis – Methods used for Data Analysis in Quantitative Research. (Theory Only)

Unit-III	Testing of Hypothesis (Parametric Tests)	18 Hours
Meaning of Parametric Test – Uses of Parametric Tests – Advantages of Parametric Tests – Disadvantages of Parametric Tests - Application of Parametric Test – Testing of Hypothesis using Parametric Tests such as T test, ANOVA, Pearson’s Coefficient of Correlation and Z test (Both theory and Problems).		
Unit-IV	Testing of Hypothesis (Non-Parametric Tests)	18 Hours
Meaning of Non-Parametric Tests – Concept of Non-parametric Test – Assumptions of Non-Parametric Tests - Reasons to use Non-Parametric Test – Precautions in using Non-parametric Tests – Testing of Hypothesis using Non-parametric Tests such as Mann-Whitney U Test, Wilcoxon Signed Rank Test and Kruskal Wallis Test (Both Theory and Problems)		
Unit-V	Application of SPSS	18 Hours
Role of Computers in Data Analysis - Introduction to SPSS – Uses of SPSS – Hands on Training of SPSS with specific reference to some popular tests viz., Descriptive Statistics, Single Sample t Test, Percentage Analysis and Bi-Variate Correlation.		
Books for Study: <ol style="list-style-type: none"> 1. Dr. S. Thameemul Ansari, Dr. D. Ravindran, Dr. A. Noor Mohamed, Research Methodology, Charulatha Publications, Chennai. 2. S.C.Gupta, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, India 3. J.K. Sharma, Business Statistics, Pearson Education, India. 4. Deepak Chawla & Neena Sondhi, Research Methodology, Concepts and Cases, Vikas Publishing House Pvt. Ltd. 5. Robert H. Carver, Data Analysis with SPSS, Cengage Learning India Pvt Ltd. 		
Books for Reference: <ol style="list-style-type: none"> 1. S.C.Gupta and V.K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand & Sons, India 2. Karine Charry and Kristof Coussement and Nathalie Demoulin and NicoHeuvincs, Marketing Research with SPSS Statistics, Publisher: Taylor & Francis. 3. Kalyanaraman K., Statistical Methods for Research, Atlantic Publishers & Distributors Pvt Ltd. Atlantic. 4. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, New Delhi. 5. Vijay Gupta, SPSS for Beginners, Author House Publisher 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACO04	CORE IV	MARKETING MANAGEMENT	5	5

Instructional Objectives		
1. To provide insight into the Marketing Concepts and impart theoretical knowledge of Marketing Management 2. To enlighten various tools & techniques used in Marketing 3. To develop Marketing Research skills in the scholars		
Course Outcomes		
CO 1. Comprehend the concept and functions of Marketing and Marketing Management CO 2. Analyze Marketing Environment and Illustrate the process of Marketing Research CO 3. Classify Products, Describe the process of New Product Development, Analyze various stages of Product Life Cycle. CO 4. Analyze the Pricing Methods and factors influencing Pricing Decisions CO 5. Comprehend the role of different Channels of Distribution and Analyze the Promotion Mix and Factors influencing Promotion Mix CO 6. Conduct a Marketing Research Study CO 7. Analyze the pros and cons of e-Marketing, Realize the significance of CRM and identify Ethical Issues in Marketing.		
Unit-I	Introduction	18 Hours
Marketing – Definition - Scope – Functions – Marketing Concepts – Selling vs. Marketing – Marketing Approaches - Marketing Management – Areas of Marketing Management.		
Unit-II	Marketing Environment, Segmentation & Marketing Research	18 Hours
Marketing Environment – Micro and Macro Environment. Market Segmentation – Target Market – Positioning – Introduction to Marketing Mix for Products and Services. Marketing Research – Importance – Process of Marketing Research.		
Unit-III	Product and Pricing Decisions	18 Hours
Product – Concept – Classification – Product Mix - New Product Development Stages - Product Life Cycle – Branding – Packaging – Labelling. Pricing – Objectives – Factors influencing Pricing Decisions – Pricing Methods – Pricing a new product.		
Unit-IV	Distribution and Promotional Decisions	18 Hours
Channels of Distribution – Objectives – Importance - Functions – Intermediaries - Wholesalers – Retailers. Promotion – Role of Promotion in Marketing – Promotion Mix – Factors influencing Promotion Mix – Personal Selling – Sales Promotion – Advertising – Direct Marketing – Public Relations.		
Unit-V	Trends in Marketing	18 Hours
Service Marketing – Differences between Goods and Services – Difficulties in Marketing of Services – Demarketing – Remarketing - e-Marketing - Benefits and Limitations – Viral Marketing - Green Marketing – Customer Relationship Management – Rural Marketing - Ethical Issues in Marketing.		

Books for Study:

1. **Ramaswamy V S and Nandakumari S**, Marketing Management, McMillan, Delhi.
2. **Varshney R L and Gupta S L**, Marketing Management, Sultan Chand & Sons., New Delhi.
3. **Rajan Saxena**, Marketing Management, Tata McGraw Hill, Chennai.
4. **C.B.Gupta**, **Marketing Management – Text & Cases**, Sultan Chand & Sons, New Delhi.
5. **Kavita Sharma and Swati Aggarwal**, Principles of Marketing, Taxmann, New Delhi.

Books for Reference:

1. **Philip Kotler**, Marketing Management, Prentice Hall of India Pvt. Ltd., New Delhi.
2. **Bagozzi R P**, Principles of Marketing Management, Science Research Associates, Chicago.
3. **Naresh K. Malhotra, Satyabhusan Das**, Marketing Research: An Applied Orientation, Pearson India.
4. **Winer and Dhar**, Marketing Management, Pearson India, New Delhi.
5. **Kotler, Kartajaya and Setiawan**, Marketing 4.0: Moving from Traditional to Digital, Wiley, Canada.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACO04	COURE II	CONSUMER BEHAVIOUR	5	5

Instructional Objectives

1. To help the students gain valuable conceptual knowledge of how the behaviour of consumers change and influence their decisions
2. To enable the scholars to conduct Consumer Research independently
3. To impart knowledge on Consumer Protection Act, 2019

Course Outcomes

- CO1. Understand human behaviour and the basic factors that influence the consumers decision process.
- CO2. Describe consumer research process and conduct a Consumer Research.
- CO3. Describe the impact of individual determinants on consumer behaviour and discuss strategies for favorable behaviour.
- CO4. Identify and explain the impact of groups determinants on consumer behaviour
- CO5. Deliberate environmental influences like social class, culture and sub-culture on consumer behaviour
- CO6. Discuss Organisational Buying Behaviour and factors influencing it.
- CO7. Develop understanding of the Consumer Protection Act, 2019

Unit-I	Introduction to Consumer Behaviour	18 Hours
Definition – Nature and Importance of consumer behaviour – Factors influencing consumer		

behaviour –Consumer behaviour and Market strategy – Models of consumer behaviour – Consumer research process – Conducting Quantitative & Qualitative Research.		
Unit-II	Individual Determinants of Consumer Behaviour	18 Hours
Motivation – Needs – Motives and goals – Dynamic nature of motivation – Arousal of motives – Personality – Nature – Theories – Implications - Self concept – Psychographic and life style. Perception – Process – Consumer imagery – Perceived risk. Learning – Principles – Theories – Attitude – Structural model of attitude – Attitude formation and change – Communication – Process – Media Channels – Designing Persuasive Communication – Effects & Appeals – Ethical Issues.		
Unit-III	Group Determinants of Consumer Behaviour	18 Hours
Group – Features – Types – Reference group influence – Types of consumer reference groups – Factors affecting group influence – Application of reference group – Family – Concept – Functions of family – Family decision making – Family life cycle – Opinion leadership and personal influence – Diffusion of Innovation.		
Unit-IV	Environmental Influences on Consumer Behaviour	18 Hours
Social Class – Social Class and Consumer Behaviour – Culture – Characteristics – Factors affecting culture – Role of customs, values and beliefs in consumer behaviour – Sub-culture – Types of sub-culture – Cross-Cultural understanding of Consumer Behaviour – Cross-cultural marketing problems in India – Strategies to overcome cross-cultural problems. Organisational Buying Behaviour – Nature - Factors.		
Unit-V	Consumer Protection Act, 2019	18 Hours
Objectives – Features – Provision of the Act – Rights of consumer – Role of the Central Consumer Protection Authority – Consumer Disputes Redressal Commission – Appellate process – Product liability – Offences and penalties.		
Books for Study: <ol style="list-style-type: none"> 1. S.L. Gupta & Sumitra Pal, Consumer Behaviour an Indian Perspective, Sultan Chand, New Delhi. 2. S. Ramesh Kumar, Consumer Behaviour and Branding, Pearson Education, New Delhi. 3. David L. Loudon and Albert J Della Bitta , Consumer Behaviour, Tata McGraw Hill, New Delhi. 4. Jim Blythe, Consumer Behaviour, Sage Publication, New Delhi. 5. Leon G. Schiffman and Leslie LasarKanuk, Consumer Behaviour, Pearson Education, India Books for Reference: <ol style="list-style-type: none"> 1. Ramanuj Majumdar, Consumer Behaviour, Prentice Hall of India, New Delhi, 		

2. **Berkman & Gilson**, Consumer Behaviour: Concepts And Strategies, Kent Publishing Company, New Delhi.
3. **Paul, P. J., & Olson, J. C.**, Consumer Behaviour and Marketing Strategy. McGraw Hill Education.
4. **MS Raju, Dominic Xardel**, Consumer 156ehavior Concepts – Applications and Cases, Vikas Publishing House PVT Ltd., New Delhi.
5. **Solomon, M.R.**, Consumer Behaviour: Buying, Having, and Being, PHI Learning

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACO04	COURE II	ORGANISATIONAL BEHAVIOUR	5	5

1. To discuss the models & theories of Organisational Behaviour.
2. To describe the various factors influencing individual and group behaviour
3. To comprehend concepts of Organisational Conflict, Organisational Structure, Organisational Culture & Climate

Course Outcomes

- CO1. Define Organisational Behaviour, understand its theories & models.
- CO2. Discuss the importance of Organisational behaviour in managing workforce of an Organisation.
- CO3. Describe the personal factors influencing Organisational Behaviour.
- CO4. Discuss various Motivation theories to explain individual motives influencing a person.
- CO5. Understand Group dynamics & Discuss Stress, its causes and coping strategies.
- CO6. Describe various types of Leadership and tools used by leaders.
- CO7. Understand different types of organizational structures, organizational climate and to know the importance of organizational culture.

Unit-I	Introduction	18 Hours
Organisational Behaviour – Definition – Nature – Need - Scope – Elements – Process – Models – Foundations of Individual Behaviour – Personality – Theories of Personality– Perception – Learning – Attitudes – Values.		
Unit-II	Motivation	18 Hours
Motivation – Theories by Maslow, Herzberg, McGregor, McClelland & Vroom – Motivational tools – Incentives – Job Design – MBO – Motivation and Morale - Organisational Citizenship Behaviour.		
Unit-III	Group Dynamics & Stress Management	18 Hours
Group Dynamics – Group Behaviour – Characteristics and Types of Groups – Group Decision Making – Inter-Group Behaviour – Quality Circles – Work Stress – Causes - Stress		

Management – Coping Strategies of Stress.		
Unit-IV	Leadership	18 Hours
Leadership – Functions – Styles – Theories – Transactional and Transformational Leadership – Emotional Intelligence as a managerial tool – Organisational Conflicts – Sources – Types – Conflict Management		
Unit-V	Organisational Structure & Organisational Change	18 Hours
Organisational Structure – Concept – Design - Organisational Culture and Climate – Power and Politics – Organisational Change – Resistance to Change – Organisational Development – Organisational Effectiveness – Organisational Ethics.		
Books for Study: <ol style="list-style-type: none"> 1. S.S. Khanka, Organisational Behaviour, S.Chand & Co. Ltd., New Delhi. 2. Stephen P. Robbins, Organizational Behavior, Pearson Education, New Delhi. 		
Books for Reference: <ol style="list-style-type: none"> 1. L.M. Prasad, Organisational Behaviour, Sultan Chand and Sons, New Delhi. 2. Margie Parikh and Rajen Gupta, Organisational Behaviour, Tata McGraw Hill Education, New Delhi. 3. K. Aswathapa, Organisational Behaviour, Himalaya Publishing House. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFA1001	CORE 1	FINANCIAL ACCOUNTING -I	7	6

Instructional Objectives		
1. To understand the accounting concepts and conventions. 2. To gain knowledge on preparation of final account and bank reconciliation of statement. 3. To learn the calculation of various methods of depreciation. 4. To acquire the skill for computation of average due date and Insurance claims. 5. To impart the knowledge of single entry system.		
Course Outcome:		
CO1 Understand the accounting concepts and conventions to maintain the business transactions. CO2 Assess the rectification of errors. CO3 Prepare of final accounts and the bank reconciliation statement. CO4 Evaluate the business implications of financial statement information. CO5 Explain the various techniques and methods of depreciation. CO6 Obtain the skill for preparing average due date and account current. CO7 Gain the knowledge on single entry system.		
Unit-I	Introduction	20 Hours
Accounting Concepts and Conventions – Journal – Ledger – Preparation of Trial Balance- Rectification of Errors.		
Unit-II	Final Accounts and BRS	22 Hours
Preparation of Final Accounts – Trading Account – Profit and Loss Account Balance Sheet – Distinction between Capital and Revenue expenditure – Adjustments Entries – Bank Reconciliation Statement (BRS).		
Unit-III	Depreciation Accounting	20 Hours
Meaning of Depreciation – Causes of Depreciation – Methods of Providing Depreciation – Straight Line Method – Diminishing Balance Method – (Excluding Change in the Method of Depreciation) – Annuity Method– Sinking Fund Method – Concept of Depreciation under Companies Act 2013.		
Unit-IV	Average Due date and Insurance Claims	25 Hours
Determination of Average Due Date – Insurance claims – Loss of stock – Average clause.		
Unit-V	Single Entry System	18 Hours
Single Entry – Objectives – Definition – Salient features – Limitations of Single Entry – Ascertainment of Profit – Statement of Affairs Method – Conversion Method – Difference between Statement and Affairs and Balance Sheet.		
Books for Study:		
1. S. Thothadri and S. Nafeesa, Financial Accounting, Mc Graw Hill, Chennai-2018. 2. T.S. Reddy & A. Murthy, Financial Accounting, Margham Publications, Chennai-2018. 3. R.S.M. Pillai, Bagawathi & S.Uma – Advanced Accounting, S.Chand & Co, New Delhi-		

2018.

4. Bhushun Kumar and H.N. Tiwari, Financial Accounting, Taxmann, New Delhi-2018.

5. K.Murugadoss and M.Jaya, Financial Accounting, Vijay Nicole Imprint, Chennai-2018.

Books for Reference:

1. M.C. Shukla, T.S. Grewal, Advanced Accounts, S.Chand & Co. Ltd. New Delhi-2012

2. Dr. Kaustubh Arvind, Financial Accounting, Himalaya Publishing House, Chennai.2018

3. Jain and Narang, Financial Accounting, Kalyani Publisher, New Delhi-2018.

4. R. L. Gupta & V. K. Gupta, Financial Accounting, Sultan Chand & Sons, New Delhi-2010.

5. V.K.Goyal and Ruchi Goyal, Financial Accounting, PHI Learning, New Delhi-2016.

Website Sources:

1. <https://accountingonion.com/>

2. <https://www.journalofaccountancy.com/>

3. <https://www.accountingcoach.com/>

4. <https://due.com/blog/accounting-learnatorium-everything-you-need-to-know-to-be-a-better-accountant/>

5. <https://deardebtor.com/>

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFAAL11	CORE 1	INDIAN ECONOMY	7	6

Instructional Objectives

1. To understand the concept of growth and development, and factors influence the economic development of a nation.
2. To get enlightened planning in India and its impact on economy
3. To assess the agricultural contribution towards GNP and employment.
4. To gain knowledge of the industrial economy and its causes for sickness.
5. To evaluate the new economic policy in the back drop of liberalization, privatization and globalization.

Course Outcome:

CO1 Understand the concept of growth and development, and factors influence the economic development of a nation.

CO2 Get enlightened planning in India and its impact on economy.

CO3 Assess the agricultural contribution towards GNP and employment.

CO4 Gain knowledge of the industrial economy and its causes for sickness.

CO5 Evaluate the new economic policy in the back drop of liberalization and privatization.

Unit-I Growth & Development

23 Hours

Meaning and Characteristics of Underdevelopment – Salient Features of Indian Economy – Factors responsible for development – development as distinct from growth – Obstacles to Economic Development. Economic Growth in India: National Income Determination, GDP, GNP, NDP, NNP, Personal Income, Measures of Economic Development: Human Development

Index, Green GDP, Gross National Happiness Index		
Unit-II	Planning & Monetary Policy	20 Hours
Planning in India– Meaning – Economic Planning – Types of Planning– Major objective of Five year Plans– Twelfth Five Plan- Niti Aayog - Monetary policy tools and money supply in India		
Unit-III	Agricultural Economy	20 Hours
Agriculture – Role in Indian Economy (Contribution to GNP & Employment) – Problems of Low Productivity – Land Reforms – Green Revolution.		
Unit-IV	Industrial Economy	20 Hours
Industry – Importance – Industry policy in India-1948,1956 and 1991,Industrial development in India- Role of Large Scale Industries– Role of Small and Micro Enterprises – Industrial Sickness– Causes and Measures.		
Unit-V	New Economic Policy & External Sector	22 Hours
New Economic Policy and its impact on Indian Economy – Liberalisation – Privatization – Globalization– <u>Balance of Payment ,Balance of Trade, Current Account , Capital Account</u> India’s BOP performance.		
Books for Study: <ol style="list-style-type: none"> 1. Dr.S. Sankaran, Indian Economy, Margham Publications, Chennai-2017. 2. Rudar Datt & Sundaram, Indian Economy, S. Chand & Co, New Delhi-2010. 3. Dhingra.I.C., Indian Economy, Sultan Chand & Sons, New Delhi-2015. 4. M. L. Jhingan, Economics of Development & Planning, Konark Publishers, New Delhi-2012. 5. Ramesh Singh, Indian Economy, McGraw Hill education ltd latest edition 		
Books for Reference: <ol style="list-style-type: none"> 1. Uma Kapila, Indian Economy 2. I.C. Dhingra, Indian Economy, Sultan Chand & Sons, New Delhi 3. K.K. Devett,Indian Economy, Vikas Publishing House, New Delhi 4. Tandon, Indian Economy, Tata McGraw Hill, New Delhi 		
Website Sources: <ol style="list-style-type: none"> 1. https://www.india.gov.in/ 2. https://www.ibef.org/economy.aspx 3. https://dea.gov.in/ 4. https://www.indiabudget.gov.in/economicsurvey/ 5. https://finmin.nic.in/ 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
U8FA2001	CORE 2	FINANCIAL ACCOUNTING - II	4	4

Instructional Objectives

1. To acquire the knowledge on preparation of Branch Accounts.
2. To gain knowledge on preparing Departmental Accounts.
3. To learn the calculation of Hire Purchase System and Instalment System.
4. To familiarize the concept of Partnership Accounting.
5. To obtain the skill on treatment of Goodwill, Retirement and Dissolution of Partnership.

Course Outcomes

- CO1** Acquire the knowledge for preparing various types of branch accounts.
- CO2** Able to transform the accounting knowledge in departmental accounting.
- CO3** Prepare accounts in hire purchase and installment system.
- CO4** Understand of partnership accounting.
- CO5** Assess on treatment of goodwill, retirement and dissolution of a partnership firm.

Unit-I Branch Accounts 12 Hours

Branch Accounts – Objectives of Branch Accounts – Types of Branches – Dependent Branch – Debtor system – Stock and Debtor system – Independent Branch (Foreign Branch Excluded) – Final Account System.

Unit-II Departmental Accounts 12 Hours

Departmental Accounts – Distinction between Department and Branches – Allocation of expenses – Interdepartmental department transfer at Cost or Selling Price. (Simple problems only)

Unit-III Hire Purchase System & Installment System 14 Hours

Hire Purchase System – Accounting treatment – Calculation of Interest – Books of Hire Purchaser and Hire Vendor – Default and Repossession – Installment System Distinction between Hire Purchase System and Installment Purchase System – Accounting treatment – Books of Buyers and Sellers.

Unit-IV Partnership Accounts (Admission) 10 Hours

Partnership– Meaning and Features– Types of Partners – Admission of a Partner – Profit & Loss Appropriation account – Adjustment in Profit Sharing Ratio.

Unit-V Partnership Accounts (Retirement & Dissolution) 12 Hours

Partnership Accounts – Treatment of Goodwill – Adjustment for Goodwill – Retirement and Death of Partners– Dissolutions of Partnership Firm– Insolvency of a Partner and Partnership Firm– Garner Vs. Murray– Gradual Realisation and Piecemeal Distribution. (Simple Problems only)

Books for Study:

1. S. Thothadri and S. Nafeesa, Financial Accounting, Mc Graw Hill, Chennai-2018.
2. T.S. Reddy & A. Murthy, Financial Accounting, Margham Publications, Chennai-2018.
3. R.S.M. Pillai, Bagawathi & S.Uma – Advanced Accounting, S.Chand & Co, New Delhi-2018.
4. Bhushun Kumar and H.N. Tiwari, Financial Accounting, Taxmann, New Delhi-2018.

5. K.Murugadoss and M.Jaya, Financial Accounting, Vijay Nicole Imprint, Chennai-2018.

Books for Reference:

1. M.C. Shukla, T.S. Grewal, Advanced Accounts, S.Chand & Co. Ltd. New Delhi-2012
2. Dr. Kaustubh Arvind, Financial Accounting, Himalaya Publishing House, Chennai.2018
3. Jain and Narang, Financial Accounting, Kalyani Publisher, New Delhi-2018.
4. R. L. Gupta & V. K. Gupta, Financial Accounting, Sultan Chand & Sons, New Delhi-2010.
5. V.K.Goyal and Ruchi Goyal, Financial Accounting, PHI Learning, New Delhi-2016.

Website Sources:

1. <https://accountingonion.com/>
2. <https://www.journalofaccountancy.com/>
3. <https://www.accountingcoach.com/>
4. <https://due.com/blog/accounting-learnatorium-everything-you-need-to-know-to-be-a-better-accountant/>
5. <https://deardebt.com/>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFA2002	CORE 3	FINANCIAL MARKETS	3	3

Instructional Objectives		
1. To know about the importance of Financial System in India. 2. To make the students to understand the method of floating new issues. 3. To familiarize the concept of secondary market. 4. To get a knowledge of online trading. 5. To impart the basic knowledge of the financial derivatives and its kinds.		
Course Outcome:		
CO1 Describe the various financial systems in India. CO2 Gain the knowledge of the procedure on new issue market. CO3 Understand the idea about stock exchange and its role. CO4 Analyze the trading of stock exchange. CO5 Outline the concepts of derivatives & its function.		
Unit-I	Financial System in India	10 Hours
Financial System– Capital Markets – its Importance – Money Market – Development of Financial System in India – Weaknesses of Indian Financial System – Money Market Vs. Capital Market.		
Unit-II	Primary Market	10 Hours
Meaning – SEBI Functions – Stock Exchange – Functions of New Issues Market – Methods of Floating New Issues – Guidelines – Steps – Instruments – Players – Recent trends – Advantages of New Issues.		
Unit-III	Secondary Market	08 Hours
Control of Secondary Market – Recognition and Services of Stock Exchanges – Organisation of Stock Exchanges in India – Listing of Securities – A, B and C Group of Shares – Advantages, Drawbacks, Procedure, Obligations of Listing.		
Unit-IV	Trading	10 Hours
Registration, Procedure, Code of Conduct and Functions of Brokers – Demat Account – Procedure of opening and operating Demat Account - Kinds of Brokers – Method of Trading in Stock Exchange – Online Trading – NSE–NEAT System.		
Unit-V	Financial Derivatives	07 Hours
Meaning – Definition– Kinds of Financial Derivatives – Forwards, Futures, Options and Swaps.		
Books for Study:		
1. E.Gordon K.Natarajan, “Financial Markets and Services” Himalaya Publishing House, Channai. 2019 2. B. Santhanam, “Financial Services” Margham Publication, Chennai. 2016 3. Dr. P. Srirenganayaki, “Financial Services”, Charulatha Publications, Channai. 2016 4. Arun Pattanaik, “Financial Markets and Institutions”, Ritu Publication, Bihar. 2011 5. Dr. Punithavathy Pandian, “Financial Services and Markets” Vikas Publishing House Pvt. Ltd. 2010		

Books for Reference:

1. Shashi K.Gupta, Nisha Aggarwal, Neeti Gupta, “Financial Services”, Kalayani Publication, Chennai. 2017
2. Dr. Vinay Kandpal, Dr. Pankaj Baag, “Financial Institutions and Market, ABS Books Publisher, 2016
3. Dr. Vasant Desai, “Financial Markets and Financial Services”, Himalaya Publishing House, Channai. 2015
4. P.N. Varshney, Dr. K. Mital, “Indian Financial System”, Sultan Chand & Sons, New Delhi. 2015
5. M.Y Khan, “Financial Services” Tata Mcgraw hill, New Delhi. 2014

Website Sources:

1. <https://www.marketwatch.com/>
2. <https://www.nseindia.com/>
3. <http://www.capitalmarket.com/>
4. <https://www.investriq.com/>
5. <https://www.bseindia.com/>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFAAL21	ALLIED 2	BUSINESS LAW	4	3

Instructional Objectives

1. To identify the essentials of contract and competent to contract.
2. To assess the performance of contract that enables how to make a contract and breach the contract.
3. To recognize the concept and rights and duties of indemnity, guarantee, bailment, pledge, pawnor, pawnee, bailor, bailee.
4. To distinguish the agent, personal liability of agent and termination of agent.
5. To understand the sale of goods act and to discriminate sale and agreement to sell.

Course Outcome:

- CO1** Identify the essentials of contract and competent to contract.
- CO2** Assess the performance of contract that enables how to make a contract and breach the contract.
- CO3** Recognize the concept and rights and duties of indemnity, guarantee, bailment, pledge, pawnor, pawnee, bailor, bailee.
- CO4** Distinguish the agent, personal liability of agent and termination of agent.
- CO5** Understand the sale of goods act and to discriminate sale and agreement to sell.

Unit-I	Formation of Contracts	12 Hours
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Essential Elements of Contracts – Types of Contract and Agreement, Rules as to offer, Acceptance and Consideration – Capacity to Contract.

Unit-II	Performance of Contract	12 Hours
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Performance of Contract – Discharge of Contract – Breach of Contract and Remedies – Quasi Contracts.

Unit-III	Indemnity and Guarantee	12 Hours
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Indemnity and Guarantee – Features and Distinctions – Extent of Surety's Liability, Rights and Discharge of Surety – Bailment and Pledge – Features – Difference – Right and Duties of Bailor and Bailee – Right and Duties of Pawnor and Pawnee.

Unit-IV	Contract of Agency	12 Hours
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Definition and Meaning – Creation – Ratification and Requisite – Rights of Principal and Agent – Personal Liability of Agent – Termination of Agency – Irrevocable Agency.

Unit-V	Sale of Goods Act 1930	12 Hours
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Definition of Sale – Sale Vs. Agreement to Sell – Subject Matter – Express and Implied Conditions and Warranties – Caveat Emptor and Exceptions.

Books for Study:

1. J.Jayasankar, Business Laws, Margham Publication, Chennai-2016.
2. N.D.Kapoor, Business Laws, Sultan Chand & Sons, New Delhi-2014.
3. M.C. Shukla, Mercantile Law, S.Chand & Co, New Delhi-2016.
4. R.S.N.Pillai & Bagavathi, Business Laws, S.Chand & Co, New Delhi-2015.
5. Sreanganayaki, Business Laws, Charulatha Publication, Chennai-2018.

Books for Reference:

1. M.C. Kuchal, Business Laws, Vikas Publishing House, New Delhi-2018
2. Dr. Tulsian, Business Laws, McGraw Hill, Chennai-2017.
3. Dr.A.K. Singhal, A Textbook of Business Laws, JBC Press, New Delhi-2017.
4. S. Arora, Business Laws, Taxmann, New Delhi-2019.
5. Dr.G.K. Varshney, Business Laws, Sahithya Bhavan Publication, New Delhi-2019.

Website Sources:

1. <https://www.vantageasia.com/india-business-law-directory/>
2. <https://www.india.gov.in/topics/law-justice>
3. <https://www.indialegallive.com/>
4. <https://indiankanoon.org/>
5. <http://uputd.gov.in/>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAFAAL22	ALLIED 3	GOODS & SERVICES TAX	3	2

Instructional Objectives

1. To know the framework of taxation and GST.
2. To classify SGST and other added tax.
3. To outline the role of central government in GST framework.
4. To explain the knowledge on various slab rates under GST.
5. To make clear the GST network, e-filing procedure and other guidelines.

Course Outcome:

- CO1** Understand the framework of taxation and GST.
CO2 Identify the SGST and other added tax.
CO3 Outline the role of central government in GST framework.
CO4 Comprehend the knowledge on various slab rates under GST.
CO5 Obtain the knowledge of the GST network, e-filing procedure and other guidelines.

Unit-I Framework of Taxation: 10 Hours

Taxation - Definition- Meaning- Objectives -Canons of taxation- Direct Tax & Indirect tax- GST-Classification- Benefits to stakeholders. - Important terms in Goods and Services Tax. Procedure for registration.

Unit-II State Goods and Service Tax (SGST) 10 Hours

VAT-Luxurious tax- Lottery tax- Entry Tax- purchase tax- Stamp duty- Goods and leverage tax- Tax on vehicles- electricity, banking and real-estate.

Unit-III Central Goods and Services tax (CGST), Integrated Goods and service Tax - IGST 10 Hours

Time and Value of supply of goods or services- Central Excise duty- Additional duties of customs- Service tax- Surcharge and all cess.

IGST: Central sale tax and classification- Levy and collection of IGST.

Unit-IV GST Structure 08 Hours

Various slab rate under GS- 0%,5%,12%,18%, 20% plus cess- Custom duty – Credit input

Unit-V Filling & Returns 07 Hours

Maintenance of Accounts and records- E-filing- Harmonized commodity code (HSN Servicing Accounting Code- Implication under GST-HSN and SAC under GST in India.

Books for Study:

1. Text book on Goods and Services Tax Laws, [Prof. Jayakumar Sithanandam](#), White Falcon Publishing, chandigarh, 2019
2. GST The Essentials of Goods and Services Tax, Himalaya Publications, New Delhi, 2017
3. Indirect Taxation, Dr.P.KSinha & Dr.Sachin U Chavan, Everest Publishing House, Pune, 2018
4. Business Taxation (Goods and Services Tax), T.S Reddy and Y.Hari Prasad Reddy, Margham Publication, Chennai-2019
5. Indirect Taxation, Dr.V.Surekha and Prita Davidson, Charulatha Publication, Chennai, 2018.

Books for Reference:

1. **Goods and Services Tax GST, H.C. Mehrotra & V.P. Agarwal , Sahitya Bhawan Publications, Agra, 2019**
2. Goods and Services Tax , CA. Rohini Aggarawal, Dr. Neelam Goel, Sultan Chand, New Delhi, 2019.
3. GST Concepts for all , Bishal Kumar Agarwal & C.S Vias Agarwal, Laxmi Publications Pvt Ltd, New Delhi, 2018
4. Fundamentals of Goods and Services Tax, Vinet Gupta and Dr. N.K Gupta, Bharat Law House Pvt Ltd, New Delhi, 2018
5. GST Made Easy, Arpit Haldia , Taxmann Publication, New Delhi, 2019

Website Sources:

1. <http://www.gstcouncil.gov.in/>
2. <https://cleartax.in/s/gst-council>
3. <https://www.cbic.gov.in/>
4. <https://cbic-gst.gov.in/>
5. <https://tallysolutions.com/>

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACA1001	CORE 1	FINANCIAL ACCOUNTING I	7	6

COURSE OBJECTIVES

1. To develop expertise in financial accounting skills.
2. To Provide Knowledge on the fundamental aspects of Financial Accounting.
3. To expose the students to various aspects of Financial Accounting and its current applications.
4. To learn different methods of providing depreciation

COURSE OUTCOMES (CO'S):

CO-1: Comprehend the basic accounting skills like recording, classifying accounting Data.

CO-2: Prepare final accounts of individuals and Non-trading concerns.

CO-3: Compute depreciation under various methods of providing depreciation.

CO-4: Acquire the skills to prepare statement of affairs from in-complete records.

CO-5: Prepare final accounts from in-complete records.

CO-6: Understand the accounting procedures for admission of a partner.

CO-7: Draft Balance sheet after admission of a Partner.

Unit-I	INTRODUCTION	21 Hours
Definition of Accounting – Attributes of accounting- Advantages and Limitations of accounting- Branches of accounting - Concepts and Conventions –Journal, Ledger and Preparation of Trail Balance - Rectification of Errors		
Unit-II	FINAL ACCOUNTS	21 Hours
Preparation of Final Accounts of a Sole Trading Concern – Adjustments Receipts and Payments Account, Income & Expenditure Account and Balance Sheet of Non-Trading Organizations		
Unit-III	DEPRECIATION	21 Hours
Meaning of Depreciation, Reserves and Provisions - Depreciation, Depletion and Amortization - Objectives of Providing Depreciation - Causes of Depreciation - Methods of Recording Depreciation - Straight Line Method - Diminishing Balance Method - Change in the Method of Depreciation with Retrospective Effect		
Unit-IV	SINGLE ENTRY SYSTEM	21 Hours
Meaning of Single Entry - Objectives - Definition - Salient Features - Limitations of Single Entry - Ascertainment of Profit - Statement of Affairs Method - Conversion Method - Difference between Statement of Affairs and Balance Sheet		
Unit-V	PARTNERSHIP ACCOUNTS	21 Hours
Definition – Partnership Deed –Capital accounts of partners –Admission of a Partner –Profit Sharing Ratio and Sacrificing Ratio –Preparation of New Balances Sheet		

(RATIO OF PROBLEMS AND THEORY = 80% : 20%)

Books for Study:

1. Financial Accounting- R.L. Gupta & V.K. Gupta, Sultan Chand & Sons, New Delhi.
2. Advanced Accountancy- S.P. Jain & K.L. Naranj, Kalyani Publications, New Delhi, Ludhiana.
3. Financial Accounting- K Murugadoss, M Jaya, V Charulatha, D Basker, Vijay Nicole, Chennai.

Books for Reference :

1. Advanced Accounts (Volume I)- M.C.Shukla, T.S.Grewal. S.Chand & Co., Ltd., New Delhi.
2. Financial Accounting - T.S.Reddy & A.Murthy, Margham Publications, Chennai.
3. Advanced Accounting (Financial Accounting) volume I- R.S.N. Pillai, Bagawathi & S.Uma , S.Chand & Co. Ltd., New Delhi.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACAAL11	ALLIED 1	INFORMATION TECHNOLOGY IN BUSINESS	7	6

COURSE OBJECTIVES:

1. To make the students learn basic features of computers.
2. To provide basic knowledge of Information Technology and its Applications.
3. To teach the functioning of various parts of computers.
4. To acquire knowledge of using Internet

COURSE OUTCOMES (CO's):

1. Understand the Basic Application of Computer.
2. Understand the parts of Computer and its functioning.
3. Understand the concept of Computer Hardware & Software
4. Acquire knowledge of Internet and WWW
5. Gain knowledge of the benefits of I.T in Business
6. Create and send e-mail.
7. Acquire the knowledge of use of computers in Office Applications.

UNIT-I	AN OVERVIEW OF COMPUTER	21 Hours
Introduction to Computer – Meaning – Characteristics of Computer – Generations of Computer – Classification of Computers – Application/Uses of Computer in different fields.		
UNIT-II	COMPUTER HARDWARE & SOFTWARE AND OPERATING SYSTEM	21 Hours
Computer Hardware: Meaning – Basic Components of Computer System – Control Units – ALU – Input and Output Devices – Computer Software: Meaning – Types of software – Operating Systems (OS): Meaning – Functions of an Operating System – Classification of Operating Systems.		
UNIT-III	INTERNET AND COMPUTER NETWORKS	21 Hours
Internet: Meaning – Internet Protocols – Internet Addressing – Search Engines - World Wide Web: Meaning – Differences between Internet and WWW – Computer Networks: Introduction – Types of Computer Network – Network Topology		
UNIT-IV	INFORMATION TECHNOLOGY & WEB BROWSERS	21 Hours
Information Technology: Meaning – Uses & its Advantages in Business – Role of I.T in Business – Web Browsing: Meaning – Types of Web Browser Software – E-mail: Meaning – Getting an Email Account – Procedure for Sending and Receiving emails		

UNIT-V	OFFICE APPLICATIONS	21 Hours
Word Processing: Application of Word Processing – Menus and Tool Bars – Opening and Closing of Documents – Text Creation, Formatting Documents and Savings – Printing of Documents – Power Point Presentation: Application of Power Point Presentation – Creating Presentation – Adding, Editing and Deleting Slides – Saving – Slide Views.		
Books for Study: <ol style="list-style-type: none"> 1. Fundamentals of Information Technology: Alexis Leon and Mathews Leon, Vikas Publishing House – 2000. 2. Information Technology Applications for Business: Dr. S. Sudalaimuthu, Himalaya Publications. 3. Computer Fundamentals: Anitha Goel, Pearson Publication 4. PC Software under Windows: Puneet Kumar, Kalyani Publications 5. MS Office 2000: Sanjay Saxsena, Vikas Publishing House, 2000. 		
Books for Reference : <ol style="list-style-type: none"> 1. Introduction to Information Technology: Turban, E, R.K. Rainner Jr., and R. E. Potter, New Delhi: John Wiley – 2000. 2. Introduction to computer: Peter Norton, McGraw Hill 3. Fundamentals of Information technology: D. NVN Chary, Kalyani Publications 4. Information Technology for Management: Henry c. Lucas, McGraw Hill/Irwin 5. Introduction to Information Technology: V. Rajaraman, Prentice Hall of India, 2003 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACA2001	CORE 2	FINANCIAL ACCOUNTING – II	4	4

COURSE OBJECTIVES

1. To understand the preparation of accounting for branch and departments.
2. To understand the treatment of partnership accounting.
3. To Learn Hire Purchase and Installment System.

COURSE OUTCOMES (CO'S):

CO-1: Able to prepare partnership accounts after Retirement or Death of a Partner.

CO-2: Prepare Statement of Piecemeal distribution.

CO-3: Gain knowledge of the concept of hire purchase and Installment system.

CO-4: Acquire the skills to prepare accounts for different kinds of branches.

CO-5: Prepare accounts for various departments and finding profit separately for departments.

Unit-I	RETIREMENT & DEATH OF A PARTNER	12 Hours
Retirement of a Partner- Introduction- Profit sharing ratio- Gaining ratio- Distinction between Sacrificing ratio and Gaining ratio – Treatment of Goodwill on retirement /death of a partner.		

Unit-II	DISSOLUTION OF A FIRM	12 Hours
Meaning –Modes of Dissolution –Insolvency of a Partner –Garner Vs Murray's Principles – Insolvency of all partners –Piecemeal Distribution –Proportionate Capital Method –Maximum loss Method		

Unit-III	BRANCH ACCOUNTING	12 Hours
Meaning –Objectives –Types of Branch –Debtors System –Stock and Debtors System – Wholesale Branch –Independent Branch (Foreign Branches Excluded)		

Unit-IV	DEPARTMENTAL ACCOUNTING	12 Hours
Meaning –Need –Advantages –Difference between Branch and Department Account- Apportionment of Expense- Inter Department Transfer.		

Unit-V	HIRE PURCHASE AND INSTALLMENT SYSTEM	12 Hours
Meaning and Definition - Feature –Distinction –Accounting Treatment –Calculation of Interest and Cash Price-Default and Repossession –Hire Purchase Trading Account –Installment Purchase System –Meaning –Accounting Treatment.		

(RATIO OF PROBLEMS AND THEORY = (80 : 20%))

Books for Study <ol style="list-style-type: none"> 1. Financial Accounting- R.L. Gupta & V.K. Gupta, Sultan Chand & Sons, New Delhi. 2. Advanced Accountancy- S.P. Jain & K.L. Naranj, Kalyani Publications, New Delhi, Ludhiana. 		
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3. Financial Accounting- K Murugadoss, M Jaya, V Charulatha,D Basker, Vijay Nicole,Chennai.
Books for Reference :
1. Advanced Accounts (Volume I)- M.C.Shukla, T.S.Grewal. S.Chand & Co., Ltd., New Delhi.
2. Financial Accounting - T.S.Reddy & A.Murthy, Marghan Publications, Chennai.
3. Advanced Accounting (Financial Accounting) volume I- R.S.N. Pillai, Bagawathi & S.Uma - S. Chand & Co. Ltd., New Delhi

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACA2002	CORE 3	FUNCTIONAL MANAGEMENT	3	3

COURSE OBJECTIVES

1. To introduce the basic concepts of Management functions and principles
2. To learn the scientific decision making and modern trend in the management process
3. To understand the planning process
4. To know practice of staffing, directing and control.
5. To know the procedures of coordination and different forms of business.

COURSE OUTCOMES (CO'S):

CO-1: Understand the basic Principles and Concepts of Management.

CO-2: Develop the skills to Plan and make decisions.

CO-3: Acquire Organising skills.

CO-4: Understand the concept of Staffing and related functions.

CO-5: Comprehend the concept of Controlling and Coordination.

Unit-I	INTRODUCTION TO MANAGEMENT	9 Hours
Management - Meaning And Definitions – Features Of Management – Functions Of Management – Levels Of Management – Principles Of Management - Importance Of Management – Scope Of Management – Principles Of Management – Management Vs. Administration.		
Unit-II	BASICS OF PLANNING	9 Hours
Meaning And Definitions Of Planning – Features Of Planning - Objectives Of Planning – Types Of Planning – Principles Of Planning - Steps In Planning – Planning Premises – Forecasting – Decision Making – Steps In Decision Making.		
Unit-III	ORGANISING	9 Hours
Definition Of Organizing – Features Of Organizing – Principles Of Organizing –		

Departmentation – Authority – Responsibility – Delegation – Centralization – Decentralization – Supervision – Features Of Effective Supervision.		
Unit-IV	STAFFING, DIRECTING AND CONTROL	9 Hours
Meaning And Definition Of Staffing – Functions Of Staffing – Importance Of Staffing – Directing – Features Of Directing– Leadership – Types Of Leadership – Qualities Of A Good Leadership – Control – Features Of Control – Control Process.		
Unit-V	COORDINATION & FORMS OF BUSINESS	9 Hours
Coordination – Features Of Coordination – Principles Of Coordination – Forms Of Business Organization - Sole Trader - Partnership – Limited Liability Partnership (LLP) - Joint Hindu Family (HUF)- One-Person Company (OPC) Joint Stock Companies - Co-Operative Societies – Public Enterprises.		
BOOKS FOR STUDY: <ol style="list-style-type: none"> 1. Principles of management, dr. J jayashankar, margham publication chennai. 2. principles of management, rk sharma & shashi k gupta, kalyani publication chennai. 3. Business management, dr. C.b. gupta, sultan chand & sons. Delhi. 4. Principles of management sundar, k., vijay nicole imprints pvt. Ltd., chennai. 5. Principles & practice of management, prasad, l.m, sultan chand & sons, new delhi. 		
BOOKS FOR REFERENCE : <ol style="list-style-type: none"> 1. Principles of Management Koontz, Weihrich and Aryasri, , Tata McGraw hill, delhi. 2. Principles & Practice of Management, Dr.H.C. Das Gupta, & Sahitya Bhawan, Agra. 3. Management principles and Practices, Lallan Prasad & S.S.Gulshan, & S.Chand & Co, delhi. 4. Principles of Management, Dr.N.Premavathy, Sri Vishnu Publications, Chennai. 5. Business organization, Y.K.Bhushan, Sultan Chand, New Delhi. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACAAL21	ALLIED 2	MANAGERIAL ECONOMICS	5	4

COURSE OBJECTIVES :

1. Use Economic tools to explain the optimal allocation of resources within the firm.
2. To understand analysis of demand and supply
3. To acquaint with production analysis.
4. Use the tools of economic theory to explain optimal production and pricing decisions by the firm in each market structure.
5. To know macro economic factors of business.

COURSE OUTCOMES (CO'S):

CO-1: Understand the nature and scope of Managerial Economics.

CO-2: Acquire knowledge of demand, supply concepts and forecasting techniques.

CO-3: Understand the cost concepts and economies scale.

CO-4: Acquaint with the market structure, price and output determination.

CO-5: Able to describe the concepts of trade cycles, inflation, fiscal & monetary policy etc.,

Unit-I	INTRODUCTION TO MANAGERIAL ECONOMICS	15 Hours
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Economics – Nature of Economics – Scope of Economics – Managerial Economics – Features - Objectives – Scope – Roles and Responsibilities of Managerial Economist

Unit-II	DEMAND AND SUPPLY ANALYSIS	15 Hours
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Demand – Determinants of Demand – Law of Demand – Exceptions – Changes in Demand – Elasticity of Demand – Types – Demand Forecasting – Supply Analysis – Determinants – Law of Supply

Unit-III	PRODUCTION ANALYSIS	15 Hours
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Production – Production Function – Economies And Diseconomies Of Scale – Cost – Types Of Cost – Revenue – Types Of Revenue – Cost Out Put Relationship – Break Even Analysis.

Unit-IV	MARKET STRUCTURE	15 Hours
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Market Structure – Perfect Competition – Imperfect Competition – Monopoly – Monopolistic – Oligopoly – Duopoly

Unit-V	MACRO ECONOMIC FACTORS OF BUSINESS	15 Hours
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National Income – Determinants Of National Income - Inflation – Trade Cycle – Causes – Effects – Monetary Policy – Fiscal Policy.

BOOKS FOR STUDY:

1. Business Economics, K.P.M Sundaram and E.N. Sundaram, Sultan & Chand, New Delhi.

2. Business Economics, S. Sankaran, Margham Publications, Chennai
3. Managerial Economics, R.L. Varsheny and K.L. Maheshwari, Sultan & Chand. New Delhi.
4. Business Economics, H.L. Ahuja, S.Chand, NEW DELHI.
5. Business Economics , T. Aryamala, Vijay Nicole Imprints Pvt Ltd, Chennai.

BOOKS FOR REFERENCE :

1. Managerial Economics, P.L. Mehta, Sultan Chand & Sons - New Delhi.
2. Economics for Business, Peter Mitchelson and Andrew Mann, Thomas Nelson Australia.
3. Business Economics, C.M.Chaudhary, RBSA Publishers, Jaipur .
4. Managerial Economics, Habibour Rahman, Himalaya Publishing House.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACAAP21	ALLIED PRACTICAL 1	COMPUTER APPLICATIONS IN BUSINESS (PRACTICAL)	2	1

COURSE OBJECTIVES (CO'S)

- To impart basic knowledge of MS-Office to the students so that the students can prepare text documents and Excel sheets and PowerPoint for presentation.

COURSE OUTCOMES (CO'S):

CO-1: Develop the skills of Creating, Saving for making documents using MS-Word.

CO-2: Format the Document and Insert the Table using MS- Word

CO-3: Draft an Application for Job using MS- Word

CO-4: Prepare slides and Organisational charts using Ms Power Point.

(A) MS- WORD

	EX NO. 1	2 Hours
Starting MS – WORD, Creating, Saving, Closing & Exiting the document.		
	EX NO. 2	4 Hours
Create a document, save it and edit the document as follows: <ol style="list-style-type: none"> i. Cut, Copy Paste Options ii. Find and Replace Options 		
	EX NO. 3	4 Hours
Create a document, save it and Format the document as follows: <ol style="list-style-type: none"> i. Using Bold, Underline and Italic ii. Change Character Size using the font dialog box iii. Formatting Paragraph: Left Align, Right Align, Centre and Justify 		
	EX NO. 4	2 Hours

Creating Tables in a document, Selecting Rows and Column sort the record by using Auto Format.		
	EX NO. 5	4 Hours...
Using Tab settings enhancing the documents as follows: i. Header and Footer, ii. Page Setup and Print Preview		
	EX NO. 6	2 Hours
Creating an Application for the Job with Bio – Data.		
(B) MS – POWER POINT		
	EX NO. 7	2 Hours
Creating a Presentation – Saving, Opening and Closing a Presentation.		
	EX NO. 8	3 Hours
Adding, Changing, Editing and Running Slides		
	EX NO. 9	4 Hours
Inserting Object/Clipart with Custom Animation and Transition in Slides		
	EX NO. 10	3 Hours
Creating an Organisational Chart using SmartArt Graphic in Power Point		
Books for Study <ol style="list-style-type: none"> 1. PC Software under Windows: Puneet Kumar, Kalyani Publications 2. MS Office 2000: Sanjay Saxsena, Vikas Publishing House, 2000. 3. Computer Fundamentals: Anitha Goel, Pearson Publication 		

DEPARTMENT OF MATHEMATICS

COURSE OUTCOME FOR SEMESTER I & II

Programme: UG Mathematics

Set: 2020

Course Code & Title	Course Outcomes
UASKB101 English for Communication	<ul style="list-style-type: none"> Promote linguistics competence Practicing production and receptive skills Make learners learn how to deal with the people in polite manner by listening and comprehending speeches of national and business leaders Gain pre-reading and scanning the meaning in academic materials Synthesizes the ideas in comprehension
UAMS1001 Algebra and Trigonometry	<ul style="list-style-type: none"> To expose the topics like Theory of Equations, Summation of Series, Matrices Students are exposed to topics like Expansions of trigonometric functions, hyperbolic and inverse hyperbolic functions. It develops logical and systematic computational skills.
Computational Mathematics Lab	<ul style="list-style-type: none"> To solve Mathematical problems using mathematical softwares. This course inherits self-confidence among students.
UAMSAL11 Allied-Numerical Analysis I	<ul style="list-style-type: none"> Tackle the practical situations demands the use of interpolation and extrapolation. To solve Mathematical calculus problems, whenever the classical approach fails.
Allied Practical-Numerical Lab	<ul style="list-style-type: none"> To solve Mathematical problems using mathematical software's. This course inherits self-confidence among students.
UASKB201 Professional English for Physical Sciences	<p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> Construct the structures of basic sentences and learn to use dictionaries and encyclopedia. Develop the skills of effective writing critical reading. Understand active voice, passive voice, idioms and phrases. Focus on the articles in the newspapers and magazines.

	<ul style="list-style-type: none"> • Participate in the conversation and group discussion with confidence.
UAMS2001 Calculus & Geometry	<ul style="list-style-type: none"> • To study functions of two variables, continuity and differentiability of two variables. • To study the geometrical properties of curves including maxima and minima, saddle points etc. • To study the integration of various types. • To study three dimensional Cartesian Co-ordinates system.
UAMSPR21 Practical - Computational Mathematics Lab	<ul style="list-style-type: none"> • To solve Mathematical calculus problems using mathematical software's. • To visualization of three dimensional concepts. • This course inherits self-confidence among students.
UAMSAL21 Allied-Numerical Analysis - II	<ul style="list-style-type: none"> • Tackle the practical situations demands the use of numerical differentiation and integration. • To apply the numerical techniques to solve ordinary differential equations. • To solve Mathematical calculus problems, whenever the classical approach fails.
UAMSAP21 Allied Practical- Numerical Lab	<ul style="list-style-type: none"> • To solve Mathematical calculus problems using mathematical softwares. • To visualization of three dimensional concepts. • This course inherits self-confidence among students.

**UNIT-V HYPERBOLIC AND INVERSE HYPERBOLIC
FUNCTIONS**

15 Hours

Definition – Relations between Hyperbolic functions and Circular functions – Inverse Hyperbolic functions.

Text Book 3: Chapter 4

CONTENT AND TREATMENT AS IN:

1. T.K. Manickavachagom Pillay, T. Natarajan and K. S. Ganapathy, ALGEBRA Vol. – I, II (2007), S. Viswanathan Printers & Publishers Pvt. Ltd, Chennai.
2. P. Kandasamy and K. Thilagavathy, MATHEMATICS FOR B.SC. Vol. – I (2004), S. Chand & Company Ltd, New Delhi.
3. S. Narayanan and T.K. Manickavachagom Pillay, TRIGONOMETRY (2004), S.Viswanathan Printers & Publishers Pvt. Ltd, Chennai.

REFERENCES:

1. S. Arumugam, ALGEBRA (2003), New Gamma Publishing House.
2. P.R. Vittal, MATHEMATICAL FOUNDATIONS, Margham Publication, Chennai.
3. A. Singaravelu, Algebra and Trigonometry, Vol – I & II, Meenakshi Agency, Chennai.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
	CORE PRACTICAL 1	COMPUTATIONAL MATHEMATICS LAB	2	0

List of Exercises

1. Finding the roots of polynomial equations
2. Finding sum of infinite series
3. Verification of Cayley-Hamilton theorem
4. Finding Eigen values
5. Finding Eigen vectors

REFERENCES:

1. Rudra Pratap, MATLAB, Oxford University Press (2013)
2. S. Arumugam, ALGEBRA (2003), New Gamma Publishing House.
3. P.R. Vittal, MATHEMATICAL FOUNDATIONS, Margham Publication, Chennai.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAMSAL11	ALLIED 1	NUMERICAL ANALYSIS I	5	5

Objectives: This course covers the basic method for forming difference table, essence of interpolation techniques, solving algebraic equations and system of linear equations.

UNIT– I FINITE DIFFERENCES AND OPERATORS 15 Hours

First and Higher order differences – Forward and Backward difference – Properties of operators – Differences of a polynomial– Factorial polynomial – Operator E–Relation between Δ , ∇ and E.

Chapter 3: Pages. 70 to 93

UNIT– II INTERPOLATION FOR EQUAL 15 Hours **INTERVALS**

Newton Gregory Forward and Backward interpolation formulae – Guass forward and backward difference formulae – Stirling's formula – Bessel's formula – Problems based on them.

Chapter 4,5: Pages 109-140

UNIT– III INTERPOLATION WITH UNEQUAL INTERVALS 15 Hours

Divided differences – Newton's divided differences formula and Lagrange's formula – Estimating the missing terms. (with one or two missing values)

Chapter 6: Pages. 157 – 175

UNIT– IV INVERSE INTERPOLATION 15 Hours

Lagrange's method and Reversion of series method (Using Newton's forward formula only) – Summation of series – Sum to n terms of the series whose general term is the first difference of a function.

Chapter 6: Pages.176-184; Chapter 3: Pages 98 – 107;

UNIT– V SOLUTIONS OF SMULTANIOUS LINEAR EQUATIONS 15 Hours

Guass Elimination method – Guass Jordan method – Crout's Method – Gauss Seidal Method. (up to three unknowns only)

Chapter 2 : Pages 36 – 54

CONTENT AND TREATMENT AS IN:

P. Kandasamy and K. Thilagavathy, CALCULUS OF FINITE DIFFERENCES AND NUMERICAL ANALYSIS (2003), S. Chand & Co Ltd., New Delhi.

REFERENCES:

1. H.C. Saxena, FINITE DIFFERENCES AND NUMERICAL ANALYSIS (1991), S. Chand & Co Ltd., New Delhi.
2. B.D. Gupta, NUMERICAL ANALYSIS (2001), Konark Pub. Ltd., Delhi.
3. S. Arumugham, NUMERICAL METHODS (2003), New Gamma Publishing, Palamkottai.
4. M.K. Vengataraman, NUMERICAL METHODS FOR SCIENCE AND ENGINEERING (1992), National Publishing Company, Chennai.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
	ALLIED PRACTICAL 1	NUMERICAL LAB	2	0

List of Exercises

1. Computing expressions
2. Symbolic Computation
3. Operations on Vectors
4. Operations on Sets
5. Permutation and Combinations

REFERENCES:

1. Rudra Pratap, MATLAB, Oxford University Press (2013)
2. C. Steven, APPLIED NUMERICAL METHODS WITH MATLAB (2007), Tata McGraw Hill Publications.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UASKB202	SKILL BASED	PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES	4	3

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar
(Outcomes based on guidelines in UGC LOCF – Generic Elective)

NB: All four skills are taught based on texts/passages.

UNIT 1 : COMMUNICATION

- Listening** : Listening to audio text and answering questions
- Listening to Instructions
- Speaking** : Pair work and small group work
- Reading** : Comprehension passages –Differentiate between facts and opinion
- Writing** : Developing a story with pictures.
- Vocabulary** : Register specific - Incorporated into the LSRW tasks

UNIT 2 : DESCRIPTION

- Listening** : Listening to process description - Drawing a flow chart.
- Speaking** : Role play (formal context)
- Reading** : Skimming/Scanning-
Reading passages on products, equipment and gadgets.
- Writing:** Process Description –Compare and Contrast
Paragraph-Sentence Definition and Extended definition-
Free Writing.

Vocabulary : Register specific -Incorporated into the LSRW tasks.

UNIT 3: NEGOTIATION STRATEGIES

Listening : Listening to interviews of specialists / Inventors in fields
(Subject specific)

Speaking : Brainstorming (Mind mapping)
Small group discussions (Subject- Specific)

Reading : Longer Reading text.

Writing : Essay writing (250 words)

Vocabulary : Register specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS

Listening : Listening to lectures.

Speaking : Short talks

Reading : Reading Comprehension passages

Writing : Writing Recommendations
Interpreting Visuals inputs

Vocabulary : Register specific -Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS

Listening : Listening comprehension- Listening for information

Speaking : Making presentations (with PPT- practice).

Reading : Comprehension passages – Note making.
Comprehension: Motivational article on Professional Competence,
Professional Ethics and Life Skills)

Writing : Problem and Solution essay– Creative writing –Summary writing

Vocabulary : Register specific - Incorporated into the LSRW tasks

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAMS2001	CORE 2	CALCULUS AND GEOMETRY	5	5

Objectives: The course introduces students to the fundamental principles, concepts and knowledge in the areas of Differential, Integral Calculus and Analytical Geometry of Three Dimensions. This prepares the students to apply these fundamental concepts and working knowledge to other courses.

UNIT– I DIFFERENTIAL CALCULUS 15 Hours

The n^{th} derivative – Standard results – Fractional expressions – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz's formula for the n^{th} derivative of a product – Partial Differentiation – Function of function rule – Homogeneous functions (Euler's theorem) – Maxima and Minima functions of two and three independent variable.

Text Book 1: Chapter III: Sections 1.1 – 1.6, 2.1

Chapter VIII: Sections 1.2, 1.3, 1.6, Section 4.1.

UNIT– II APPLICATIONS OF DIFFERENTIAL CALCULUS 15 Hours

Curvature, Cartesian formula for the radius of curvature (parametric equation) – The coordinates of the centre of curvature – Radius of curvature when the curve is given in polar coordinates – p-r equation : pedal equation of a curve –Evolutes – Envelopes.

Text Book 1: Chapter X: Sections 2.1, 2.3, 2.4, 2.6, 2.7, 2.5, Sections 1.1, 1.2

UNIT–III INTEGRAL CALCULUS 15 Hours

Integration by Parts – Reduction formula – Bernoulli's formula – Definition of the double integral – Evaluation of the double integral – Double integral in polar coordinates – Triple integrals – Application of multiple integrals – Centre of gravity formula – Moment of inertia – Change of order of integration– Beta and Gamma functions : Definitions – Convergence of $\Gamma(n)$ – Recurrence formula formula of Gamma functions – Properties of Beta functions – Relation between Gamma and Beta functions – Examples.

Text Book 2:Chapter I: Sections 12, 13, 15.1

Chapter V: Sections 2.1-2.2, 3.1, 4, 5.1-5.4

Chapter VII: Sections 2.1-2.3, 3, 4, 5

UNIT– IV GEOMETRY PART – I**15 Hours**

The Plane : Several forms – The equation of the plane passing through the points $(x_1, y_1, z_1), (x_2, y_2, z_2), (x_3, y_3, z_3)$ – Direction cosines of the line which is perpendicular to the plane – Angle between planes – Equation of a plane through the line of intersection of two given planes – Length of perpendicular – Symmetrical form of the equations of a line – Equation of a straight line passing through two given points – The plane and the straight line : The condition for the line to be parallel to the plane – Angle between planes and line – Coplanar lines – The shortest distance between two given lines.

Text Book 3: Chapter II: Sections 4, 5, 6, 7, 9, 10

Chapter III : Sections 2, 4, 5, 6, 7, 8

UNIT– V GEOMETRY PART – II**15 Hours**

Sphere: Equation – The plane section of a sphere is a circle – Equation of a circle on a sphere – Intersection of two sphere is a circle – Tangent plane– Orthogonal Spheres – Cone : Equation of cone – Right circular cone– Cylinder.

Text Book 3: Chapter IV: Sections 3, 5, 6, 7, 8

Chapter V: Sections 2, 2.1, 8

CONTENT AND TREATMENT AS IN:

1. S. Narayanan and T.K. Manickavachagom Pillay, CALCULUS, Volume – I (2017), S. Viswanathan Printers & Publishers, Chennai.
2. S. Narayanan and T.K. Manickavachagom Pillay, CALCULUS, Volume – II (2017), S. Viswanathan Printers & Publishers, Chennai.
3. T.K. Manickavachagom Pillay & others, ANALYTICAL GEOMETRY, Part II – THREE DIMENSIONS, (2009), S. Viswanathan Printers & Publishers, Chennai.

REFERENCES:

1. Shanti Narayan, DIFFERENTIAL CALCULUS,(2001), S. Chand & Co., New Delhi.
2. G.B. Thomas and R.L. Finney, CALCULUS AND ANALYTICAL GEOMETRY, (1998), Addison Wesley (9th Edition).
3. P. Duraipandiyan and Laxmi Duraipandiyan, ANALYTICAL GEOMETRY (TWO AND THREE DIMENSIONS), Asia Publishing Company.
4. P. Kandasamy and K. Thilagavathy, MATHEMATICS FOR B.SC. Vol. I, II, III & IV (2004), S. Chand & Co., Ltd, New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAMSPR21	CORE PRACTICAL 1	COMPUTATIONAL MATHEMATICS LAB	2	2

List of Exercises

1. Successive Differentiation of single variable functions.
2. Finding Maxima and Minima
3. Integration of single variable functions.
4. Finding Radius of curvature.
5. Visualization of three dimensional mathematical objects.

REFERENCES:

1. Rudra Pratap, MATLAB, Oxford University Press (2013)
2. S. Arumugam, ALGEBRA (2003), New Gamma Publishing House.
3. P.R. Vittal, MATHEMATICAL FOUNDATIONS, Margham Publication, Chennai.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAMSAL21	ALLIED 2	NUMERICAL ANALYSIS II	5	5

Objectives: This course will cover advanced methods for numerical differentiation, numerical integration and numerical solution of ordinary differential equations.

UNIT-I	NUMERICAL DIFFERENTIATION	15 Hours
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Newton's forward and backward differences to compute the derivatives – Derivative using divided difference formula – Maxima and Minima using the above formulae.

Chapter 7: Pages 187-204

UNIT– II	NUMERICAL INTEGRATION	15 Hours
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General Quadrature formula – Trapeziodal rule – Simpson's 1/3 rd rule – Simpson's 3/8th rule – Weddle's rule.

Chapter 7: Pages 205-226

UNIT– III DIFFERENCE EQUATIONS 15 Hours

Linear difference equations – Linear homogeneous difference equation with constants coefficient – Particular integrals of the form $a^x, x^m \sin ax, x^m \cos ax$.

Chapter 8: Pages 236-261

UNIT- IV	SOLUTION OF NUMERICAL ALGEBRAIC AND TRANSCENDENTAL EQUATIONS	15 Hours
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Bisection method – Iteration method – Regula Falsi method – Newton Raphson method.

Chapter 1: Pages 1-29.

UNIT- V	NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS	15 Hours
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Taylor Series method – Picard’s method – Euler’s method – Modified Euler’s method –

Runge - Kutta methods.

Chapter 9: Pages 266-300

CONTENT AND TREATMENT AS IN:

P. Kandasamy and K. Thilagavathy, CALCULUS OF FINITE DIFFERENCES AND NUMERICAL ANALYSIS, (2003), S. Chand & Co Ltd., New Delhi.

REFERENCES:

1. H.C. Saxena, FINITE DIFFERENCES AND NUMERICAL ANALYSIS (1991), S. Chand & Co Ltd., New Delhi.
2. B.D. Gupta, NUMERICAL ANALYSIS, (2001), Konark Pub. Ltd., Delhi.
3. Gupta – Malik, CALCULUS OF FINITE DIFFERENCES AND NUMERICAL ANALYSIS, Krishba Prakashan Mandir, Meerut Seventh Edition.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAMSAP21	ALLIED PRACTICAL 1	NUMERICAL LAB	2	2

List of Exercises

1. Numerical Differentiation.
2. Numerical Integration.
3. Double Integration.
4. Numerical Solutions to Ordinary Differential Equations.
5. Testing Consistency of System of Equations.

REFERENCES:

1. Rudra Pratap, MATLAB, Oxford University Press (2013)
2. Brian R. Hunt, Ronald L. Lipsman and Jonathan M. Rosenberg, A GUIDE TO MATLAB (Second Edition) Cambridge University Press.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACCAL11	ALLIED 1	MATHEMATICAL FOUNDATIONS I	5	5

FOR B.Sc. (COMPUTER SCIENCE) & B.C.A.

Objectives: To Explore the Fundamental Concept of Mathematics

UNIT– I SYMBOLIC LOGIC 15 Hours

Proposition, Logical operators, conjunction, disjunction, negation, conditional and bi – conditional operators, converse, inverse, contra positive, logically equivalent, tautology and contradiction, Arguments and validity of argument.

Chapter 1: Sections 1.1 – 1.5

UNIT– II SET THEORY 15 Hours

Set, Set operations, Venn diagram, Properties of sets, number of elements in a set, Cartesian product, relation & functions, Relation: Equivalence relation. Equivalence class, Partially and Totally ordered sets, Functions: Types of Functions, Composition of Functions.

Chapter 2: Sections 2.1 – 2.8

UNIT– III BINARY OPERATORS 15 Hours

Types of Binary operations: Commutative, Associative, Distributive and identity, Boolean algebra: properties, Permutations and combinations.

Chapter 3: Sections 3.1 – 3.3

UNIT– IV DIFFERENTIATION 15 Hours

Simple problem using standard limits, $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{\tan x}{x}$, $\lim_{x \rightarrow 0} e^x$, $\lim_{n \rightarrow 0} (1 + 1/n)^n$, $\lim_{n \rightarrow 0} (1 + 1/n)^{1/n}$, Differentiation, successive differentiation, Leibnitz theorem, partial differentiation Applications of differentiation, Tangent and normal, angle between two curves, Maximum and minimum values [second derivative test], curvature and radius of curvature [Cartesian coordinates], Envelops.

Chapter 4: Sections 4.1 – 4.9

UNIT– V TWO DIMENSIONAL ANALYTICAL GEOMETRY 15 Hours

Straight lines – pair of straight lines – circles – System of Circles – conics [parabola, Ellipse and Hyperbola].

Chapter 5: Sections 5.1 – 5.5

CONTENT AND TREATMENT AS IN:

U. Rizwan, MATHEMATICAL FOUNDATIONS Volume I, Nelliappar Publications, Chennai. 2012

REFERENCES

1. P.R Vittal, MATHEMATICAL FOUNDATIONS, Margham Publication, Chennai.
2. V. Sundaram & others, DISCRETE MATHEMATICAL FOUNDATIONS, A.P. Publication, Sirkali
3. P. Duraipandian, P. Laxmi Duraipandian and Muhilan D, ANALYTICAL GEOMETRY OF 2 AND 3 DIMENSIONS, Emerald Publication 1992 Reprint.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
	ALLIED PRACTICAL 1	STATISTICAL METHODS–ALLIED PRACTICAL	2	0

List of Exercises

1. Measure of Central Tendency.
2. Measure of Dispersion.
3. Correlation Coefficient, Bivariate Correlation Coefficient, Rank Correlation Coefficient and Coefficient of Concurrent deviation.
4. Regression Equations.
5. Curve Fitting by the Method of Least Squares
 - a) $y = ax + b$.
 - b) $y = ax^2 + bx + c$.
 - c) $y = ae^{bx}$.
 - d) $y = ax^b$.

NOTE:

Use of Scientific Calculator shall be permitted for practical examination. Statistical and Mathematical tables are to be provided to the students at the examination hall.

CONTENT AND TREATMENT AS IN:

S. P. Gupta, STATISTICAL METHODS, Sultan Chand & Sons, New Delhi.

REFERENCES:

1. R.V. Hogg and A.T. Craig, (1998), INTRODUCTION TO MATHEMATICAL STATISTICS, Macmillan.
2. A. M. Mood, G. A. Graybil and, D.G. Boes, (1974), INTRODUCTION TO THEORY OF STATISTICS, McGraw Hill.
3. S. S. Wilks, ELEMENTARY STATISTICAL ANALYSIS, Oxford and IBH.
4. S.C. Gupta and V.K.Kapoor, FUNDAMENTAL OF APPLIED STATISTICS, Sultan & sons.

Chapter 5: Sections 5.1 – 5.4

CONTENT AND TREATMENT AS IN:

U. Rizwan, MATHEMATICAL FOUNDATIONS Volume II, Nelliappar Publications, Chennai. 2012

REFERENCES

1. P.R Vittal, MATHEMATICAL FOUNDATIONS, Margham Publication, Chennai.
2. V.Sundaram & others, DISCRETE MATHEMATICAL FOUNDATIONS, A.P. Publication, Sirkali
3. P. Duraipandian, P. Laxmi Duraipandian and Muhilan D, ANALYTICAL GEOMETRY OF 2 AND 3 DIMENSIONS, Emerald Publication 1992 Reprint.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACCAP21	ALLIED PRACTICAL 1	STATISTICAL METHODS –ALLIED PRACTICAL	2	2

List of Exercises

1. Measure of Central Tendency.
2. Measure of Dispersion.
3. Correlation Coefficient, Bivariate Correlation Coefficient, Rank Correlation Coefficient and Coefficient of Concurrent deviation.
4. Regression Equations.
5. Curve Fitting by the Method of Least Squares
 - $y = ax + b$.
 - $y = ax^2 + bx + c$.
 - $y = ae^{bx}$.
 - $y = ax^b$.

NOTE:

Use of Scientific Calculator shall be permitted for practical examination. Statistical and Mathematical tables are to be provided to the students at the examination hall.

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REFERENCES:

1. *R.V. Hogg and A.T. Craig*, (1998), INTRODUCTION TO MATHEMATICAL STATISTICS, Macmillan.
2. *A. M. Mood, G. A. Graybil and, D.G. Boes*, (1974), INTRODUCTION TO THEORY OF STATISTICS, McGraw Hill.
3. *S. S. Wilks*, ELEMENTARY STATISTICAL ANALYSIS, Oxford and IBH.
4. *S.C. Gupta and V.K. Kapoor*, FUNDAMENTAL OF APPLIED STATISTICS, Sultan & sons.

COURSE OUTCOME FOR SEMESTER I & II

Programme: PG Mathematics

Set: 2020

Course Code & Title	Course Outcomes
PAMS1001 Algebraic Structures	<ul style="list-style-type: none"> To give the students a thorough knowledge of the various aspects of Linear Algebra. To train the students in problem-solving as a preparatory to NET/SET.
PAMS1002 Mathematical Analysis	<ul style="list-style-type: none"> To give the students a thorough knowledge of the various aspects of Real line and Metric Spaces which is imperative for any advanced learning in Pure Mathematics. To train the students in problem-solving as a preparatory to NET/SET.
PAMS1003 Ordinary Differential Equations	<ul style="list-style-type: none"> To give an in-depth knowledge of solving differential equations that we encounter frequently in various walks of life. To introduce existence and uniqueness theorems in Differential equations.
PAMS1004 Classical Mechanics	<ul style="list-style-type: none"> To give a detailed knowledge about the mechanical system of particles. To study the applications of Lagrange's equations and Hamilton's equations as well as the theory of Hamilton-Jacobi Theory.
PAMSE101 Advanced Operations Research I	<ul style="list-style-type: none"> To expose the students to the new technique of optimization. To highlight some of the Applications of the optimization techniques.
PAMSE102 Graph Theory	<ul style="list-style-type: none"> To give a rigorous introduction to the basic concepts of Graph Theory. To give applications of Graph Theory in other disciplines
PAMS2001 Advanced Algebra	<ul style="list-style-type: none"> To give foundation in group theory. To train the students in problem-solving as a preparatory to NET/SET.
PAMS2002	<ul style="list-style-type: none"> To give the students a thorough knowledge of the various

Advanced Real Analysis	<p>aspects of Real Line and Metric spaces in general which are imperative for any advanced learning.</p> <ul style="list-style-type: none"> • To introduce a complete Topological approach in all aspects of Analysis and make them to solve problems.
PAMS2003 Partial Differential Equations	<ul style="list-style-type: none"> • To give an in-depth knowledge of solving partial differential equations that we encounter frequently in various walks of life. • To introduce existence and uniqueness theorems in Differential equations.
PAMS2004 Advanced Numerical Methods	<ul style="list-style-type: none"> • To introduce the derivation of numerical methods with error analysis and give better understanding of the subject. • To help the students to find numerical solution of differential equations.
PAMSE201 Advanced Operations Research II	<ul style="list-style-type: none"> • To enlighten the students in the field of Operations Research • To help the students to find optimum solution in business management problems.
PAMSE202 Algebraic Number Theory	<ul style="list-style-type: none"> • To expose the students to the charm, niceties and nuances in the world of numbers. • To highlight some of the Applications of the Theory of Numbers.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS1001	CORE 1	ALGEBRAIC STRUCTURES	6	5

Objectives: To introduce the concept and to develop working knowledge on class equation, finite abelian groups, linear transformations, real quadratic forms.

UNIT-I ANOTHER COUNTING PRINCIPLE 18 hours

Another counting principle – Sylow’s theorems

Chapter 2: Sections 2.11 and 2.12 (omit Lemma 2.12.5).

UNIT-II DIRECT PRODUCTS 18 hours

Direct products – Finite abelian groups

Chapter 2: Sections 2.13 and 2.14, (Lemma 2.14.2 statement only (without proof)).

UNIT-III LINEAR TRANSFORMATIONS 18 hours

Canonical Forms: Triangular form

Canonical Forms: Nilpotent transformations.

Chapter 6: Sections 6.4 and 6.5.

UNIT-IV CANONICAL FORMS 18 hours

Canonical Forms: A Decomposition of V : Jordan Form

Canonical Forms: Rational Canonical Form – Nilpotent transformations.

Chapter 6: Sections 6.6 and 6.7.

UNIT-V TRACE AND TRANSPOSE 18 hours

Trace and transpose –Hermitian, Unitary, Normal transformation

Chapter 6: Sections 6.8 and 6.10.

CONTENT AND TREATMENT AS IN:

I.N. Herstein, TOPICS IN ALGEBRA (Second Edition), Wiley Eastern Limited, New Delhi.

REFERENCES:

1. M. Artin, ALGEBRA(1991), Prentice Hall of India.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, BASIC ABSTRACT ALGEBRA (Second Edition)(1997), Cambridge University Press.

3. I.S. Luther and I.B.S. Passi, ALGEBRA, Vol I – Groups, Vol II – Rings(1999), Narosa Publishing House, New Delhi.
4. D.S. Malik, J.N. Mordeson and M.K. Sen, FUNDAMENTALS OF ABSTRACT ALGEBRA(1997), McGraw Hill, New York.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS1002	CORE 2	MATHEMATICAL ANALYSIS	6`	5

Objectives: To work comfortably with functions of bounded variation, Riemann–Stieltjes integration, convergence of infinite series, infinite products and uniform convergence and its interplay between various limiting operations.

UNIT–I FUNCTIONS OF BOUNDED VARIATION

18 hours

Introduction – Properties of monotonic functions – Functions of bounded variation – Total Variation – Additive property of total variation – Total variation on (a, x) as a function of x – Functions of bounded variation expressed as the difference of two increasing functions – Continuous functions of bounded variation.

INFINITE SERIES: Absolute and conditional convergence –Dirichlet’s test and Abel’s test – Rearrangement of series – Riemann’s theorem on conditionally convergent series.

Chapter 6: Sections 6.1 to 6.8

Chapter 8: Sections 8.8, 8.15, 8.17, 8.18

UNIT–II THE RIEMANN– STIELTJES INTEGRAL

18 hours

Introduction – Notation – The definition of the Riemann –Stieltjes integral – Linear properties – Integration by parts – Change of variable in a Riemann –Stieltjes integral – Reduction to a Riemann Integral – Euler’s summation formula – Monotonically increasing integrators, Upper and lower integrals – Additive and linearity properties of upper and lower integrals– Riemann’s condition – Comparison theorems.

Chapter 7: Sections 7.1 to 7.14

UNIT–III THE RIEMANN–STIELTJES INTEGRAL

18 hours

Integrators of bounded variation – Sufficient conditions for the existence of Riemann-Stieltjes Integrals– Necessary conditions for the existence of Riemann-Stieltjes integrals – Mean value theorems for Riemann –Stieltjes integrals –The integrals as a function of the interval – Second fundamental theorem of integral calculus – Change of variable in a Riemann integral– Second Mean Value Theorem for Riemann integrals

Chapter 7: Sections 7.15 to 7.22

UNIT-IV INFINITE SERIES AND INFINITE PRODUCTS

18 hours

Double sequences – Double series – Rearrangement theorem for double series – A sufficient condition for equality of iterated series – Multiplication of series –Cesaro summability– Infinite products.

POWER SERIES: Multiplication of power series – The Taylor's series generated by a function– Bernstein's theorem – Abel's limit theorem –Tauber's theorem

Chapter 8: Sections 8.20, 8.21 to 8.26

Chapter 9: Sections 9.14, 9.15, 9.19 9.20, 9.22, 9.23

UNIT-V SEQUENCE OF FUNCTIONS

18 hours

Definition of uniform convergence –Uniform convergence and continuity –The Cauchy condition for uniform convergence– Uniform Convergence of infinite series of functions – Uniform convergence and Reimann–Stieltjes integration – Uniform convergence and Differentiation – Sufficient condition for uniform convergence of a series – Mean convergence.

Chapter 9: Sections 9.3 to 9.6, 9.8, 9.10, 9.11, 9.13

CONTENT AND TREATMENT AS IN:

Tom M. Apostol, MATHEMATICAL ANALYSIS (Second Edition), Addison–Wesley Publishing Company Inc. New York.

REFERENCES:

1. A.L. Gupta and N. R. Gupta, PRINCIPLES OF REAL ANALYSIS (2003), Pearson Education.
2. S. C. Malik and Savita Arora, MATHEMATICAL ANALYSIS, (1991), Wiley Eastern Limited, New Delhi.
3. R. G. Bartle, REAL ANALYSIS, (1976), John Wiley and sons Inc.
4. W. Rudin, PRINCIPLES OF MATHEMATICAL ANALYSIS, (3rd Edition) (1976), McGraw Hill Company, New York.
5. Sanjay Arora and Bansilal, INTRODUCTION TO REAL ANALYSIS(1991), Satya Prakashan, New Delhi.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS1003	CORE 3	ORDINARY DIFFERENTIAL EQUATIONS	6`	4

Objectives: To develop strong background on finding solutions to linear differential equations with constant and variable coefficients and also with singular points, to study existence and uniqueness of the solutions of first order differential equations.

UNIT-I LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS 18 hours

Introduction - Second order homogeneous equations – Initial value problems – Linear dependence and independence –a formula for Wronskian– Non-homogeneous equation of order two-Homogeneous equation of order n – Initial value problems for n^{th} order equations.

Chapter 2 of [1]: Sections 1 to 8.

UNIT-II LINEAR EQUATION WITH VARIABLE COEFFICIENTS 18 hours

Introduction - Initial value Problems for the homogeneous equation– Solution of homogeneous equation – The Wronskian and linear independence - Reduction of the order of a homogeneous equation – The non homogeneous equation - Homogeneous equation with analytic coefficients – The Legendre equation.

Chapter 3 of [1]: Sections 1 to 8

UNIT-III LINEAR EQUATION WITH REGULAR SINGULAR POINTS 18 hours

Introduction – The Euler equation– Second order equations with regular singular points – Exceptional cases – The Bessel equation - The Bessel equation (continued)

Chapter 4 of [1]: Sections 1 to 8 (Omit section 5)

UNIT-IV EXISTENCE AND UNIQUENESS OF SOLUTIONS TO FIRST ORDER EQUATIONS 18 hours

Equation with variable separated – Exact equation –Method of successive approximations – The Lipschitz condition – Convergence of the successive approximations.

Chapter 5 of [1]: Sections 1 to 6

UNIT-V BOUNDARY VALUE PROBLEMS 18 hours

Introduction - Sturm -Liouville problem-Green's functions–Applications of Boundary value problems-Picard's theorem.

Chapter 7 of [2]: Sections 1 to 5

CONTENT AND TREATMENT AS IN:

- [1] E.A. Coddington, AN INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS (2007), Prentice – Hall of India Ltd., New Delhi.
- [2] S.G. Deo, V. Lakshmikantham and V. Raghavendra, TEXT BOOK OF ORDINARY DIFFERENTIAL EQUATIONS(2004), Second Edition, Tata McGraw-Hill, New Delhi

REFERENCES:

- 1. W.T. Reid, ORDINARY DIFFERENTIAL EQUATIONS (1971), John Wiley and Sons,
New York.
- 2. M.D. Raisinghania, ADVANCED DIFFERENTIAL EQUATIONS (2001), S.Chand &
Company Ltd. New Delhi.
- 3. B. Rai, D.P. Choudary and H.I. Freedman, A COURSE IN ORDINARY DIFFERENTIAL EQUATIONS (2002), Narosa Publishing House, New Delhi.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS1004	CORE 3	CLASSICAL MECHANICS	6`	4

Objectives: To study mechanical systems under generalized co-ordinate systems. Virtual work, energy and momentum. To study mechanics developed by Newton, Lagrange, Hamilton Jacobi and theory of relativity due to Einstein.

UNIT-I MECHANICAL SYSTEMS 18 hours

The mechanical systems – Generalized co-ordinates –Constraints – Virtual work – Energy and Momentum.

Chapter 1: Sections 1.1 to 1.5

UNIT-II LAGRANGE'S EQUATIONS AND ITS APPLICATIONS 18 hours

Derivation of Lagrange's equation– Integrals of motion-Reyleigh's Dissipation function

Chapter 2: Sections 2.1, 2.3 (omit 2.2), 3.1

UNIT-III HAMILTON'S EQUATIONS 18 hours

Hamilton's Principle – Hamilton's equation– Other Variational Principle.

Chapter 4: Sections 4.1 to 4.3

UNIT-IV HAMILTON'S – JACOBI THEORY 18 hours

Hamilton's Principle Function –Hamilton–Jacobi Equation –Separability.

Chapter 5: Sections 5.1 to 5.3

UNIT-V CANONICAL TRANSFORMATION 18 hours

Differential forms and Generating functions –Special Transformations – Lagrange and Poisson brackets.

Chapter 6: Sections 6.1, 6.2 and 6.3

CONTENT AND TREATMENT AS IN:

D. T. Greenwood, CLASSICAL DYNAMICS (1985), Prentice Hall of India, New Delhi.

REFERENCES:

1. H. Goldstein, CLASSICAL MECHANICS (Second edition), Narosa Publishing House, New Delhi.

2. N.C. Rane and P.S.C. Joag, CLASSICAL MECHANICS (1991), Tata McGraw Hill.
3. J.L. Synge and B.A. Griffith, PRINCIPLES OF MECHANICS, McGraw Hill Book Co, New York, (1970).

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMSEP11	ELECTIVE 1	ADVANCED OPERATIONS RESEARCH I	6`	4

Objectives: To introduces advanced topics in linear and parametric linear programming.

UNIT – I: THEORY OF SIMPLEX METHOD

18 Hours

Some definitions and notations – fundamental properties of solutions – To determine improved basic feasible solution – basic concepts – computational procedure of simplex method – simple way for simplex computations.

Chapter 5: SMX 1, SMX 2, SMX 3, SMX 6, SMX 10, SMX 11, SMX 20, SMX 21, SMX 22, SMX 23, SMX 25.

UNIT – II: REVISED SIMPLEX METHOD

18 Hours

Standard forms for revised simplex method –Formulation of LPP in standard form – I – notations for standard form-I- To obtain inverse of initial Basic matrix and initial Basic feasible solution - Application of Computational procedure for Standard form I.

Chapter 6: RE – SMX 1, RE – SMX 2, RE – SMX 4, RE – SMX 5, RE – SMX 16.

UNIT – III: DUAL SIMPLEX METHOD.

18 Hours

Computational procedure of Dual simplex method – Advantages of Dual simplex method over simplex method – Difference between simplex method and Dual simplex method

Chapter 8 : D-SMX 1, D-SMX 2, D-SMX 8, D-SMX 10.

UNIT – IV: TRANSPORTATION PROBLEM AND ASSINMENT MODELS.18 Hours

Initial Basic feasible solution to Transportation problem – Methods of initial basic feasible solution – moving towards optimality – Mathematical formulation of Assignment problem - Hungarian method for Assignment problem – Unbalanced Assignment problem.

Chapter 15 : TP – 7, TP – 11, TP – 12, TP – 14, TP – 15, TP – 17, TP – 18 and

Chapter 16 : ASP- 1, ASP- 2, ASP- 3, ASP- 6, ASP- 7, ASP- 18.

UNIT – V: PARAMETRIC LINEAR PROGRAMMING.**18 Hours**

Types of Linear variations – Linear variations in the C vector – Alternative method to determine the critical value of θ - linear variations in b vector – some useful theorems.

Chapter 10 : PARA-1, PARA-2, PARA-3, PARA-5, PARA-7, PARA-12.

CONTENT AND TREATMENT AS IN:

S.D. Sharma, OPERATIONS RESEARCH, Kedar Nath Ram Nath (2010)

REFERENCES:

1. F.S. Hillier and J. Lieberman, INTRODUCTION TO OPERATIONS RESEARCH, (Eighth edition), (2006), Tata McGraw Hill Publishing Company, New Delhi.
2. C. Beightler, D. Phillips, and B. Wilde, FOUNDATIONS OF OPTIMIZATION, (Second edition), (1979), Prentice Hall New York.
3. M.S. Bazaraa, J.J. Jarvis, and H.D. Sharall, (1990), John Wiley and sons, New York.
4. D. Gross and C.M. Harris, FUNDAMENTALS OF QUEUEING THEORY [3rd Edition], (1998), Wiley and Sons, New York.
5. Hamdy A. Taha, OPERATIONS RESEARCH, (Sixth edition), Prentice–Hall of India Private Limited, New Delhi.
6. J.K. Sharma, OPERATIONS RESEARCH (2003) (Second Edition), Macmillian (India), New Delhi.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMSEP12	ELECTIVE 1	GRAPH THEORY	6`	4

Objectives: To study and develop the concepts of Graphs, sub graphs, Trees, connectivity, Euler's theorem, Hamilton Cycles, Matching, coloring of graphs, Independent sets, cliques, vertex coloring and planar graphs.

UNIT–I GRAPHS, SUB GRAPHS AND TREES**18 hours**

Graph and simple graphs –Graph isomorphism – The Incidence and adjacency matrices –Sub graph – Vertex degrees – Paths and connection –Cycles –Trees –Cut edges and bonds –Cut vertices.

Chapter 1: Sections 1.1 to 1.7, **Chapter 2:** Sections 2.1 to 2.3

UNIT–II CONNECTIVITY**18 hours**

Euler's tours and Hamilton Cycles Connectivity – Blocks – Euler tours – Hamilton cycles.

Chapter 3: Section 3.1 to 3.2, **Chapter 4:** Section 4.1 to 4.2

UNIT–III MATCHINGS, EDGE COLORINGS

18 hours

Matching – Matching and coverings in Bipartite graphs – Edge chromatic number –Vizing’s theorem.

Chapter 5: Sections 5.1 – 5.2, **Chapter 6:** Sections 6.1 – 6.2

UNIT–IV INDEPENDENT SETS AND CLIQUES, VERTEX COLORINGS

18 hours

Independent sets– Ramsey’s theorem –Chromatic number – Brooks’ theorem –Chromatic polynomials.

Chapter 7: Sections 7.1 – 7.2, **Chapter 8:** Sections 8.1, 8.2, 8.4

UNIT–V PLANAR GRAPHS

18 hours

Plane and planar graphs –Dual graphs – Euler’s formula –The five color theorem and four color conjecture.

Chapter 9: Sections 9.1 – 9.3, 9.6

CONTENT AND TREATMENT AS IN:

J.A. Bondy and U. S. R.Murty, GRAPH THEORY AND APPLICATIONS (1976), McMillan, London.

REFERENCES:

1. J. Clark and D.A. Holton, A FIRST LOOK AT GRAPH THEORY (1995), Allied publishers, New Delhi.
2. R. Gould Benjamin Cummings, GRAPH THEORY (1989), Menlo Park.
3. A. Gibbons, ALGORITHMIC GRAPH THEORY (1989), Cambridge University Press, Cambridge.
4. R.J. Wilson and J.J. Watkins, GRAPHS: AN INTRODUCTORY APPROACH (1989), John Wiley and Sons, New York.
5. R.J. Wilson, INTRODUCTION TO GRAPH THEORY, (Fourth Edition)(2004), Pearson Education.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS2001	CORE 5	ADVANCED ALGEBRA	5	5

Objectives: To study field extension, roots of Polynomial, Galois Theory, finite fields, division rings to develop computational skill in abstract algebra.

UNIT–I EXTENSION FIELDS 15 hours

Extension fields – Transcendence of e.

Chapter 5: Sections 5.1 and 5.2.

UNIT–II ROOTS OF POLYNOMIALS 15 hours

Roots of polynomials – More about roots.

Chapter 5: Sections 5.3 and 5.5

UNIT–III ELEMENTS OF GALOIS THEORY 15 hours

Elements of Galois theory.

Chapter 5: Sections 5.6.

UNIT–IV FINITE FIELDS 15 hours

Finite Fields –Wedderburn’sTheorem on Finite Division Rings.

Chapter 7: Sections 7.1 and 7.2 [Only theorem 7.2.1.]

UNIT–V A THEOREM OF FROBENIUS 15 hours

A Theorem of Frobenius– Integral Quarternions and the Four-Square theorem.

Chapter 7: Sections 7.3 and 7.4.

CONTENT AND TREATMENT AS IN:

I.N. Herstein, TOPICS IN ALGEBRA, (Second Edition), Wiley Eastern Limited, New Delhi.

REFERENCES:

1. M. Artin, ALGEBRA(1991), Prentice Hall of India.
2. P.B. Bhattacharya, S.K. Jain, and S.R. Nagpaul, BASIC ABSTRACT ALGEBRA (1997) (First Edition) Cambridge University Press.

3. I.S. Luther and I.B.S. Passi, ALGEBRA(1996), Vol. I: Groups; Vol. II: Rings, Narosa Publishing House, New Delhi.
4. D.S. Malik, J.N. Mordeson and M.K. Sen, FUNDAMENTALS OF ABSTRACT ALGEBRA(1997), McGraw Hill, New York.
5. N. Jacobson, BASIC ALGEBRA (1980), Vol.I & II, W.H. Freeman; also published by Hindustan publishing company, New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS2002	CORE 6	ADVANCED REAL ANALYSIS	6	5

Objectives: To introduce measure on the real line, Lebesgue measurability and integrability, Fourier Series and Integrals, in depth study in multivariable calculus.

UNIT-I FOURIER SERIES AND FOURIER INTEGRALS 18 hours

Introduction – Orthogonal system of functions – The theorem on best approximation –The Fourier series of function relative to an orthonormal system – Properties of Fourier Coefficients– The Riesz-Fischer Theorem – The convergence and representation problems for trigonometric series – The Reimann-Lebesgue Lemma – The Dirichlet Integrals – An Integral representation for the partial sums of Fourier series –Reimann’s localization theorem –The Weiestrass approximation theorem.

Chapter 11: Sections 11.1 to 11.11 and 11.15 (Tom M. Apostol)

UNIT-II MULTIVARIABLE DIFFERENTIAL CALCULUS 18 hours

Introduction – The Directional derivative – Directional derivative and continuity – The total derivative – The total derivative expressed in terms of partial derivatives – The chain rule – Matrix form of chain rule – The mean-value theorem for differentiable functions – A sufficient condition for differentiability – A sufficient condition for equality of mixed partial derivatives – Taylor’s theorem for functions of \mathbf{R}^n to \mathbf{R}^1 .

Chapter 12: Sections 12.1 to 12.5 and 12.9 to 12.14 (Tom M. Apostol)

UNIT-III IMPLICIT FUNCTIONS AND EXTREMUM PROBLEMS 18 hours

Introduction – Functions with non-zero Jacobian determinants – The inverse function theorem –The Implicit function Theorem – Extrema of real valued functions of one variable and several variables –Extremum problems with side conditions.

Chapter 13: Sections 13.1 to 13.7 (Tom M. Apostol)

UNIT–IV THE LEBESGUE INTEGRAL

18 hours

Length of open sets and closed sets – Inner and outer measure : Measurable sets – Properties of measurable sets – Measurable functions

Chapter 11: Sections 11.1 to 11.4 (Richard R. Goldberg)

UNIT–V THE LEBESGUE INTEGRAL(Cont.)

18 hours

Definition and existence of the Lebesgue integral for bounded function – Properties of the Lebesgue integral for bounded measurable functions – The Lebesgue integral for unbounded functions – Some fundamental theorems .

Chapter 11: Sections 11.5 to 11.8 (Richard R. Goldberg)

CONTENT AND TREATMENT AS IN:

1. Tom M. Apostol, MATHEMATICAL ANALYSIS (Second Edition), Addison – Wesley Publishing Company Inc. New York, (for units I, II & III).
2. Richard R. Goldberg, METHODS OF REAL ANALYSIS (1975), Oxford & IBH Publishing, New Delhi (for Unit IV & V).

REFERENCES:

1. H. L. Roydon, REAL ANALYSIS (1988), Macmillan Pub. Company, New York.
2. W. Rudin, PRINCIPLES OF MATHEMATICAL ANALYSIS (1979), McGraw Hill Company, New York.
3. Sanjay Arora and Bansi Lal, Satya Prakashan, INTRODUCTION TO REAL ANALYSIS, (1991), New Delhi.
4. J. C. Burkill, THE LEBESGUE INTEGRAL (1951), Cambridge University Press.
5. S. C. Malik and Savita Arora, MATHEMATICAL ANALYSIS (1991), Wiley Eastern Limited, New Delhi.
6. M. E. Munroe, MEASURE AND INTEGRATION (1971), Addison–Wiley.

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SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS2003	CORE 7	PARTIAL DIFFERENTIAL EQUATIONS	6	4

Objectives: The aim of the course is to introduce the various types of partial differential equations and obtaining solution of these equations.

UNIT-I PARTIAL DIFFERENTIAL EQUATIONS OF FIRST ORDER 18 hours

Formation and solution of PDE – Integral surfaces – Cauchy problem order equation – Orthogonal surfaces – First order non-linear – Characteristics – Compatible system –Charpit method-Classification of Second Order PDE – Canonical Forms-Adjoint operators.

Chapter 0: Sections 0.4 to 0.11 (Omit 0.11.1)

Chapter 1: Sections 1.1 to 1.4

UNIT-II ELLIPTIC DIFFERENTIAL EQUATIONS 18 hours

Derivation of Laplace and Poisson equation – BVP – Separation of Variables –Dirichlet's Problem and Neumann problem for a rectangle – Interior Neumann problem for a circle - Solution of Laplace equation in Cylindrical and spherical coordinates – Examples.

Chapter 2: Sections 2.1, 2.2, 2.5 to 2.7, 2.10 to 2.12

UNIT-III PARABOLIC DIFFERENTIAL EQUATIONS 18 hours

Formation and solution of Diffusion equation – Dirac-Delta function– Separation of variables method– Solution of Diffusion equation in Cylindrical and spherical coordinates-Examples.

Chapter 3: Sections3.1 to 3.7

UNIT-IV HYPERBOLIC DIFFERENTIAL EQUATIONS 18 hours

Formation and solution of one-dimensional wave equation –Canonical reduction – IVP – D'Alembert's solution –IVP and BVP for two-dimensional wave equation – Periodic solution of one dimensional wave equation in Cylindrical and spherical coordinates systems- Uniqueness of the solution for wave equation-Duhamel's principle-Examples

Chapter 4: Sections 4.1 to 4.12 (Omit 4.5,4.6 and 4.10)

UNIT-V GREEN'S FUNCTION 18 hours

Green's function for Laplace equation – Methods of images – Eigen function method – Green's function for the wave and diffusion equations.

Chapter 5: Sections 5.1 to 5.6

CONTENT AND TREATMENT AS IN:

K. Sankara Rao, INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS (2019), Third Edition, PHI Learning Private LTD, New Delhi.

REFERENCES:

1. R.C. Mc Owen, PARTIAL DIFFERENTIAL EQUATIONS, Second Edition, (2005), Pearson Education, New Delhi.
2. I.N. Snedden, ELEMENTS OF PARTIAL DIFFERENTIAL EQUATIONS(1983), McGraw Hill, New Delhi.
3. M.D. Raisinghania, ADVANCED DIFFERENTIAL EQUATIONS (2001), S. Chand& Company LTD, New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMS2004	CORE 8	ADVANCED NUMERICAL METHODS	5	4

Objectives: To introduce the derivation of numerical methods with error analysis and give better understanding of the subject.

UNIT–I TRANSCENDENTAL AND POLYNOMIAL EQUATIONS 15 hours

Iteration Methods Based on Second Degree Equation (Muller Method, Chebyshev Method, Multipoint Method) – Rate of Convergence (Definition, Secant Method, Regula-Falsi Method, Chebyshev Method, Problems) – Polynomial equations (Iterative methods : Birge-Vieta Method, Bairstow Method – Direct Method : Graeffe's Root Squaring Method).

Chapter 2: Sections 2.4, 2.5, 2.9

UNIT–II SYSTEM OF LINEAR ALGEBRAIC EQUATIONS 15 hours

Direct Methods (Triangularization Method, Cholesky Method, Partition Method) – Iteration Methods (Jacobi Iteration Method, Gauss-Seidel Iteration Method, Successive Over Relaxation (SOR) Method).

Chapter 3: Sections 3.2, 3.4

UNIT–III INTERPOLATION AND APPROXIMATION 15 hours

Hermite Interpolation – Piecewise and Spline Interpolation – Bivariate Interpolation – Approximation – Least Square Approximation.

Chapter 4: Sections 4.5, 4.6, 4.7, 4.8, 4.9

UNIT-IV DIFFERENTIATION AND INTEGRATION

15 hours

Numerical Differentiation – Partial Differentiation – Numerical Integration – Methods Based on Undetermined Coefficients (Gauss Quadrature Methods, Gauss-Legendre Integration Methods, Gauss-Chebyshev Integration Methods, Gauss-Laguerre Integration Methods, Gauss-Hermite Integration Methods Lobatto Integration Methods, Radau Integration Methods) – Double integration.

Chapter 5: Sections 5.2, 5.5, 5.6, 5.8, 5.11

UNIT-V ORDINARY DIFFERENTIAL EQUATIONS

15 hours

Numerical methods – Single step methods (Local Truncation Error or Discretization Error, Order of a Method, Taylor Series Method, Runge-Kutta Methods, Explicit Runge-Kutta Methods : Second Order Methods, Minimization of Local Truncation Error, Third Order Methods, Fourth Order Methods, Systems of Equations : Taylor Series Method, Runge-Kutta Method of Second Order, Runge-Kuta (classical) Method of Fourth Order, Implicit Runge-Kutta Methods).

Chapter 6: Sections 6.3, 6.4.

CONTENT AND TREATMENT AS IN:

M.K. Jain, S.R.K. Iyengar and R.K. Jain, NUMERICAL METHODS FOR SCIENTIFIC AND ENGINEERING COMPUTATION (2012 – Reprint 2018), Sixth Edition, New Age International Publishers.

REFERENCES:

1. S. D. Corte and de Boor, ELEMENTARY NUMERICAL ANALYSIS – An Algorithmic approach, 3rd Edition, McGraw Hill International Book Company, 1980.
2. James B. Scarborough, NUMERICAL MATHEMATICAL ANALYSIS, Oxford & IBH Publishing Company, New Delhi.
3. F.B. Hildebrand, INTRODUCTION TO NUMERICAL ANALYSIS, McGrawHill, New York, 1956.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMSEP21	ELECTIVE 2	ADVANCED OPERATIONS RESEARCH II	5	4

Objectives: This course aims to introduce decision theory, PERT, CPM, deterministic inventory systems, queues, replacement and maintenance problems.

UNIT – I: INTEGER LINEAR PROGRAMMING.

Types of Integer Linear Programming Problems – Gomory’s all integer programming technique- Gomory’s Cutting Plane (all IPP) algorithm – computational demonstration of Gomory’s algorithm – Branch and Bound Method –Branch and Bound algorithm – computational demonstration of Branch and Bound Method .

Chapter 14: INT-LP-3, INT-LP- 5, INT-LP- 6, INT-LP- 18, INT-LP-19

UNIT – II: PRODUCTION MANAGEMENT (INVENTORY)

Types of inventory models – variables in inventory problem – A list of symbols used – The EOQ model with out shortages –

Model I(a) : The economic lot size system with uniform demand ,

Model I(b) : The economic lot size system with different rate of demand in different cycles.

Chapter 25: INVT-I.1, INVT-I.4, INVT-I.6, INVT-I.9, INVT-I.12,

UNIT – III: REPLACEMENT MODELS.

Replacement problem – Money value –Present Worth Factor(PWF) and discount rate – Replacement policy for items whose maintenance cost increase with time and money value changes with constant rate- Individual Replacement policy – Group Replacement of items that fail completely.

Chapter 27: REP &REL-1, REP &REL-8, REP &REL-11, REP &REL-15, REP &REL-17.

UNIT – IV: QUEUEING THEORY (WAITING LINE MODEL)

Transient and steady state – List of symbols – Traffic intensity –Pure Birth Process –Pure Death Process – Kendal notations for presenting queuing model - Model I: $(M|M|1)(\infty|FCFS)$ - Model II(A): General Erlans queuing model.

Chapter 28: QT-3, QT-4, QT-5, QT-10, QT-14, QT-15, QT-22, QT-36.

UNIT – V: PROJECT MANAGEMENT BY PERT –CPM.

Network diagram representation – Forward pass computation –Backward pass computation – Determination of floats and slack times –Determination of critical path Optimum and minimum duration cost – Project Evaluation and Review Technique (PERT).

Chapter 30: PERT-CPM-2, PERT-CPM-7, PERT-CPM-8, PERT-CPM-9, PERT-CPM-18, PERT-CPM-29.

CONTENT AND TREATMENT AS IN:

S.D. Sharma , OPERATIONS RESEARCH, Kedar Nath Ram Nath (2010)

REFERENCES:

1. F.S. Hillier and J. Lieberman, INTRODUCTION TO OPERATIONS RESEARCH, (Eighth edition)(2006), Tata McGraw Hill Publishing Company, New Delhi.
2. C. Beightler, D. Phillips, and B. Wilde, FOUNDATIONS OF OPTIMIZATION, (Second edition)(1979), Prentice Hall New York.
3. M.S. Bazaraa, J.J. Jarvis, and H.D. Sharall, (1990), John Wiley and sons, New York.
4. D. Gross and C.M. Harris, FUNDAMENTALS OF QUEUING THEORY [3rd Edition], (1998), Wiley and Sons, New York.
5. Hamdy A.Taha, OPERATIONS RESEARCH, (Sixth edition), Prentice–Hall of India Private Limited, New Delhi.
6. J.K. Sharma, OPERATIONS RESEARCH (2003) (Second Edition), Macmillian (India), New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAMSEP22	ELECTIVE 2	ALGEBRAIC NUMBER THEORY	6	4

Objectives: This course aims to provide a study on modules over rings, finite fields, algebraic extensions, number fields and cyclotomic fields, Noetherian rings modules and Dedekind rings.

UNIT–I ALGEBRAIC BACKGROUND 18 hours

Rings and Fields – Factorization of Polynomials –Field Extensions – Symmetric Polynomials –Modules– Free Abelian Groups.

Chapter 1: Sections 1.1 to 1.6.

UNIT–II ALGEBRAIC NUMBERS 18 hours

Conjugates and Discriminants – Algebraic Integers –Integral Bases – Norms and Trace – Rings of Integers.

Chapter 2: Sections 2.1 to 2.6.

UNIT–III QUADRATIC AND CYCLOTOMIC FIELDS 18 hours

Quadratic fields and cyclotomic fields : Factorization into irreducibles : Trivial factorization –Factorization into irreducible – Examples of non unique factorization into irreducibles.

Chapter 3: Sections 3.1 to 3.2.

Chapter 4: Sections 4.2 to 4.4.

UNIT–IV QUADRATIC AND CYCLOTOMIC FIELDS(Cont.) 18 hours

Prime Factorization – Euclidean Domains – Euclidean Quadratic fields –Consequences of unique factorization– The Ramanujan–Nagell Theorem.

Chapter 4: Sections 4.5 to 4.9.

UNIT–V IDEALS 18 hours

Prime Factorization of ideals – The norms of an ideal – Non unique Factorization in Cyclotomic Fields.

Chapter 5: Sections 5.2 to 5.4.

CONTENT AND TREATMENT AS IN:

Steward and D. Tall, ALGEBRAIC NUMBER THEORY AND FERMAT’S THEOREM(2002), (Third Edition), A.K Peters Ltd, Natick, Mass.

REFERENCES:

1. Z.I. Bosevic and I.R. Safarevic, NUMBER THEORY(1966), Academic Press, New York.
2. J.W.S Cassels and A. Frohlich, ALGEBRAIC NUMBER THEORY(1967), Academic Press, New York.
3. P. Ribenbiom, ALGEBRAIC NUMBER (1972), Wiley, New York.
4. P. Samuel, ALGEBRAIC THEORY OF NUMBERS (1970), Houghton Mifflin Company, Boston.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS01	CORE I	ALGEBRA AND ANALYSIS	6	4

UNIT– I :

RESEARCH ETHICS

Ethics and Research Aims – Moral Justifications of Research – Responsibilities of researchers – Area of research which raise ethical issues – Ethical issues in the use of information and communication technology – code of Ethics.

TB 1

RINGS, IDEAL AND MODULES

Rings and ring homomorphisms – Ideals, Quotient rings – Zero divisors, Nilpotent elements, Units – Prime ideals and maximal ideals – Nilradical and Jacobson radical – Operations on ideals – Extension and contraction – Exercise – Modules and module homomorphisms – Submodules and quotient modules – Operations on submodules – Direct sum and product – Finitely generated modules – Exact sequences – Tensor product of modules – Restriction and extension of scalars – Exactness properties of the tensor product – Algebras – Tensor product of algebras – Exercises.

TB 2Chapter 1: (pp. 1 – 10)

TB 2Chapter 2: (pp. 17 – 31).

UNIT–II: RINGS, MODULES OF FRACTIONS AND PRIMARY DECOMPOSITION

Local properties – Extended and contracted ideals in rings of fractions – Exercise – Primary Decomposition – Exercise.

TB 2 Chapter 3: (pp. 36 – 43)

TB 2 Chapter 4: (pp. 50 – 55).

UNIT–III: CHAIN CONDITIONS, NOETHERIAN RINGS AND ARTIN RINGS

Chain conditions – Exercises – Primary Decomposition in Noetherian rings – Exercises – Artin Rings – Exercises.

TB 2 Chapter 6: (pp. 74 – 78)

TB 2 Chapter 7: (pp. 80 – 84)

TB 2 Chapter 8: (pp. 89 – 91).

UNIT– IV : ABSTRACT INTEGRATION AND L^p SPACE

The concept of measurability – simple functions – Elementary properties of measures integration of positive functions – Integration of complex functions – The role played by sets of measure zero – Convex functions and inequality – L^p spaces.

TB 3 Chapter 1: (pp. 5 – 31)

TB 3 Chapter 3: (pp. 61 – 69).

UNIT – V: FOURIER TRANSFORMS AND HOLOMORPHIC FOURIER TRANSFORMS

Formal properties – The Invention Theorem – The Plancheral Theorem – The Banach algebra L^1 – Introduction – Two Theorems of Paley and Wiener Quasi – Analytic classes – The Denjoy – Carleman theorem.

TB 3 Chapter 9: (pp. 178 – 193)

TB 3 Chapter 19: (pp. 371 – 383).

Content and Treatment as in:

TB 1 THE STUDENT’S GUIDE TO RESEARCH ETHICS, Paul Oliver, Mc Graw Hill Open University Press, Second Edition, 2010.

TB 2 INTRODUCTION TO COMMUTATIVE ALGEBRA, *M.F. Atiyah and I.G. Macdonald*, (1969), Addison – Wesley.

TB 3 REAL AND COMPLEX ANALYSIS, (Third Edition), *Walter Rudin*, (1986), McGraw Hill.

References:

1. ABSTRACT ALGEBRA, *R.S. Pierce*, Springer Verlag.
2. REAL ANALYSIS, *R.G. Bartle*, (1976), John Wiley and Sons.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS02	CORE II	TOPOLOGY AND DIFFERENTIAL EQUATIONS	5	5

UNIT – I : FUNDAMENTAL GROUP AND COVERING SPACES

Homotopy – Fundamental group – Covering spaces.

Chapter 3: (pp. 49 – 77)

UNIT – II : SIMPLICIAL COMPLEXES

Geometry of simplicial Complexes – Bary centric subdivisions – simplicial approximation Theorem – Fundamental Group of a simplicial complex.

Chapter 4 : (pp. 78 – 108)

UNIT – III : LINEAR SYSTEMS

Uncoupled Linear system – Diagonalization – Exponential operators – The Fundamental Theorem for linear system – Linear system in \mathbb{R}^2 – Complex Eigen Values – Multiple Eigen Values – Non Homogeneous Linear System.

Chapter 1 : Sections 1.1 to 1.7 and 1.10 (pp. 1 – 39, 60 – 63)

UNIT – IV : NONLINEAR SYSTEMS : LOCAL THEORY

Some preliminary concepts & definitions – The Fundamental Existence – Uniqueness Theorem – Dependence on initial conditions and parameters – The Maximum interval of Existence – The Flow defined by a Differential Equation.

Chapter 2 : Sections 2.1 and 2.5 (pp. 65 – 101)

UNIT – V : NONLINEAR SYSTEMS

Linearization – The Stable Manifold Theorem – Dynamical Systems and Global Existence Theorems – Limits Sets and Attractors.

Chapter 2 : Sections 2.6 and 2.7 (pp. 101 – 118)

Chapter 3 : Sections 3.1 and 3.2 (pp. 181 – 199)

Content and Treatment as in :

1. LECTURE NOTES ON ELEMENTARY TOPOLOGY AND GEOMETRY, *I.M. Singer and J.A. Thorpe*, (1967), Springer Verlag, New York.
2. DIFFERENTIAL EQUATION AND DYNAMICAL SYSTEM, *L. Perko*, (2006), Third Edition, Springer Verlag, New York.

References:

1. INTRODUCTION TO TOPOLOGY AND MODERN ANALYSIS, *G.F. Simmons*, (1963), Mcgraw Hill.
2. COUNTER EXAMPLES IN TOPOLOGY, *L. Sten and J. Subash*, Holt, Rinehart and Winston.
3. ADVANCED DIFFERENTIAL EQUATIONS, *M.D. Raisinghania*, (2001), S. Chand & Co., New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS04	ELECTIVE I	PROBABILITY MODELS AND APPLICATIONS	5	5

UNIT – I : INTRODUCTION TO PROBABILITY THEORY

Introduction – Sample space and Events – Probability defined on events – Conditional probabilities – Independents – Baye's formula.

RANDOM VARIABLES

Random variables – Discrete and Continuous Random variables – Expectation of a random variable – Limit Theorems – Stochastic Process.

UNIT – II : CONDITIONAL PROBABILITY AND CONDITIONAL EXPECTATION

Introduction – The discrete case – The Continuous case – Computing expectations by conditioning – Computing probabilities by conditioning – Some applications.

THE EXPONENTIAL DISTRIBUTION AND THE POISSON PROCESS

Introduction – The Exponential distribution – The Poisson process – Generalizations of the Poisson process.

UNIT – III : RENEWAL THEORY AND ITS APPLICATIONS

Introduction – Distribution of $N(t)$ – Limit theorems and their applications – Renewal Reward process – Regenerative process – Computing the renewal function – Application of patterns.

UNIT – IV: PARAMETRIC FAMILIES OF DISTRIBUTIONS OF DIRECT IMPORTANCE IN RELIABILITY THEORY

A notation of aging – The exponential distribution – The poisson process – The poisson distribution – Parametric families of the life distributions – with monotone failure rate.

UNIT – V: CLASS OF LIFE DISTRIBUTION BASED ON NOTATION OF AGING

Introduction – distribution with IFRA arising from shock models – Preservation of life distribution classes under reliability operations – Partial orderings of life distributions – Reliability bounds – Mean life of series and parallel systems.

Content and treatment as in:

1. INTRODUCTION OF PROBABILITY MODELS, *Sheldon M. Ross*.
2. STATISTICAL THEORY OF RELIABILITY AND LIFE TESTING MODELS, To Begin With *R.E. Barlow and F. Proshan*, (1975).

References:

1. PROBABILITY THEORY AND MATHEMATICAL STATISTICS, *M. Fisz*, (1963), John Wiley and Sons, New York.
2. STOCHASTIC PROCESSES, *Sheldon M. Ross*, (2001).

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS04	ELECTIVE I	BANACH ALGEBRA	5	5

UNIT – I : FINITE DIMENSIONAL SPECTRAL THEORY:

Matrices – Determinants and the spectrum of an operator – The spectral theorem – A survey of the situation.

Chapter 11: (pp. 278 – 297)

UNIT – II : BANACH ALGEBRA:

The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius – The radial and semi – simplicity.

Chapter 12 : (pp. 301 – 311)

UNIT – III : BANACH ALGEBRA:

The Gelfand mapping – Application of the formula $r(x) = \lim_{n \rightarrow \infty} \|x^n\|^{1/n}$ – Involution in Banach algebras – The Gelfand–Neumark theorem.

Chapter 13 : (pp. 318 – 325)

UNIT – IV : COMMUTATIVE BANACH ALGEBRA:

Ideal in $C(X)$ and the Banach stone theorem – The Stone cech compactification (continued) – Commutative C^* – Algebra

Chapter 14 : (pp. 327 – 332)

Content and Treatment as in :

1. TOPOLOGY AND MODERN ANALYSIS, *G.F. Simmons*, (1963), McGraw Hill.

References:

1. FUNCTIONAL ANALYSIS, *W. Rudin*, (1973), Mcgraw Hill, New Delhi.
2. FUNCTIONAL ANALYSIS, *G. Bauhman and L. Narici*, (1966), Academic press, New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS04	ELECTIVE I	FUZZY SETS AND THEIR APPLICATIONS	5	5

UNIT – I : FUZZY SETS

Fuzzy sets – Basic concepts – Characteristics – significance of the paradigm shift – Additional properties of – Cuts.

Chapter 1: Sections 1.3 to 1.5

Chapter 2: Sections 2.1

UNIT – II : FUZZY SETS VERSUS CRISP SETS

Representation of Fuzzy sets – Extension principle of Fuzzy sets – Operation on Fuzzy sets –Types of Operation – Fuzzy complements.

Chapter 2: Sections 2.2 to 2.3

Chapter 3: Sections 3.1 to 3.2

UNIT – III : OPERATIONS ON FUZZY SETS

Fuzzy intersection – t-norms, Fuzzy unions – t-conforms – Combinations of operations – Aggregation operations.

Chapter 3: Sections 3.3 to 3.6

UNIT – IV : FUZZY ARITHMETIC

Fuzzy numbers – Linguistic Variables – Arithmetic operation on intervals – Lattice of Fuzzy numbers

Chapter 4: Sections 4.1 to 4.4

UNIT – V : CONSTRUCTION FUZZY SETS

An overview – Direct methods with one expert – Direct methods with multiple experts –

Indirect method with multiple experts and one expert – Construction from sample data.

Chapter 10: Sections 10.1 to 10.7

Content and Treatment as in:

FUZZY SETS AND FUZZY LOGIC: THEORY AND APPLICATIONS, *G.J. Klir, and Bo Yuan*,
Prentice Hall of India Ltd, New Delhi, 2005.

References:

1. FUZZY SET THEORY AND ITS APPLICATIONS, *H.J. Zimmermann*, Allied Publishers, Chennai, 1996.
2. INTRODUCTION TO THE THEORY OF FUZZY SUBSETS, *A. Kaufman*, Academic Press, New York.
3. FUZZY SETS AND THEIR APPLICATION, *V. Novak*, Adam Hilger, Bristol, 1969.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS04	ELECTIVE I	LIE GROUPS AND ORDINARY DIFFERENTIAL EQUATIONS	5	5

UNIT – I:

Lie Groups of Transformations and Infinitesimal Transformations

UNIT – II:

Point Transformations and Extended Infinitesimal Transformations

UNIT – III:

Lie Algebras

UNIT – IV:

Invariance of Second and Higher Order Ordinary Differential Equations

UNIT – V:

Reduction of Order of ODEs and Contact Symmetries

Content and Treatment as in:

Symmetry and Integration Methods for Differential Equations, George W. Bluman and Stephen C. Anco, Springer – Verlag, New York.

DEPARTMENT OF PHYSICS

COURSE OUTCOME FOR I & II SEMESTER FOR UG PHYSICS

Course Name: Properties of Matter and Acoustics

Code: UAPY1001

Credit: 05

	On the completion of this course the student will be able to understand
CO1	the fundamentals of elasticity of material and their determination
CO2	the principles of viscosity and their determination
CO3	the basic concepts of surface tension and factors affecting it
CO4	the source of generating waves and their properties
CO5	the production methods of ultrasonic waves, their applications and basics concepts in acoustics

Course Name: Allied Physics I

Code: UACHAL11

Credit: 05

	On the completion of this course the student will be able to understand
CO1	the fundamentals of properties of matter like elasticity, viscosity and surface tension
CO2	the basic ideas of heat transfer in liquids and their determination.
CO3	the fundamental concepts of basic electrical instruments and magnetism.
CO4	the basic concepts of sound and acoustics of buildings.
CO5	the principles of polarization, diffraction and laser.

Course Name: Thermal Physics

Code: UAPY2001 Credit: 05

	On the completion of this course the student will be able to understand
CO1	the principles of thermometry and calorimetry alongwith the determination of Specific heat capacity of substance
CO2	the fundamental laws of thermodynamics and Maxwell's thermodynamic relations
CO3	the basic concepts of low temperature physics and their significant role in applied physics
CO4	the thermal conduction of materials and their determining methods
CO5	the principles governing the radiation process and techniques to determine them

	On the completion of this course the student will be able to understand
CO1	the study of cathode rays and positive rays and concepts of vector atom model.
CO2	the basic ideas of particle accelerator, nuclear reactions and concepts of cosmic rays.
CO3	the basics of magnetic effect, chemical effect and transient currents.
CO4	the basic concepts in crystallography and fibre optics.
CO5	the principles of electronic components and digital electronics.

	On the completion of this course the student will be able to carry out
CO1	the experimental determination of Young's modulus and surface tension
CO2	determination of frequency of tuning fork and AC main
CO3	determination of specific heat capacity
CO4	determination of refractive index of given substance and focal length of convex lens
CO5	calibration of low range voltmeter and study of diode characteristics
CO6	the experimental determination of rigidity modulus.
CO7	the determination of coefficient of viscosity
CO8	determination of temperature coefficient of resistance.
CO9	construction of unregulated supply.

	On the completion of this course the student will be able to perform
CO1	the experimental determination of Young's modulus and surface tension
CO2	determination of specific heat capacity and rigidity modulus
CO3	determination of refractive index of a material and coefficient of viscosity
CO4	calibration of low range voltmeter and ammeter
CO5	determination of frequency of AC main.
CO6	determination of wavelength of spectral lines
CO7	construction of logic gates.
CO8	determination of frequency of tuning fork

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAPY1001	CORE 1	PROPERTIES OF MATTER AND ACOUSTICS	5	5

Objective: It is aimed at exposing the undergraduate students to study the physical properties of materials and fundamentals of acoustics

Unit I -Elasticity

Hooke's law – Modulus of Elasticity – Relation between elastic constants – Poisson's Ratio– Expression for Poisson's ratio in terms of elastic constants – **Significance of stress and strain diagram**-Work done in stretching and work done in twisting a wire – Torsional pendulum (with & without masses) – Bending of beams - Expression for bending moment – Cantilever – Expression for depression at the loaded end - oscillations of a Cantilever – **Determination of rigidity modulus by static torsion method (scale and telescope).**

Unit II – Viscosity

Newton's law of viscous flow - streamline and turbulent motion- Reynold's number and **its significance**- Poiseuille's formula for the flow of liquid through a capillary tube – Experimental determination of coefficient of liquid by Poiseuille's method- Terminal velocity and Stokes formula —**Experimental determination by Stoke's method-Friction and lubrication**- Meyer's formula for Viscosity of gas – Effect of temperature and pressure on viscosity.

Unit III - Surface Tension

Definition- Molecular interpretation - Surface energy –Work done on increasing the area of a surface- Pressure difference across curved surface – Excess of pressure in liquid drops and air bubbles – Angle of contact – Experimental determination of surface tension – Jaegar's method - Drop- weight method - Capillary rise method - Variation of surface tension with temperature-**Excess pressure inside a curved surface and its special cases.**

Unit IV - Waves and oscillations

Simple harmonic motion – Free, damped, forced vibrations and resonance – Velocity of Transverse wave in a stretched string– Superposition of waves –**Intensity and loudness of sound-decibel-Laws of vibration of stretched string and its verification -Determination of AC frequency** – Sound waves in gases –Beats – Doppler effect and its special cases- Fourier theorem- Application to Square and Saw-tooth wave.

Unit V – Acoustics and Ultrasonic

Acoustics –Reverberation-Reverberation time and its measurements - Sabine's formula (qualitative Analysis)- Absorption coefficient and its determination – Conditions for good

acoustical design of auditorium – Noise and **music** - **Classification of Noise**. Ultrasonic waves – Piezo-electric effect - Piezoelectric generator –**Industrial and medical** applications of Ultrasonics

Books for study

1. Properties of matter by Murugesan R, S Chand & Co. Pvt. Ltd., New Delhi
2. Properties of matter by Brij Lal & Subramaniam, N Eurasia publishing Co., New Delhi, 1989
3. Text book of sound by Brij Lal & Subramaniam, N Vikas Publishing House, New Delhi, 1982
4. Text book of sound by M N Srinivasan – Himalaya Publications (1991)
5. Science and technology of Ultrasonics by Bladevraj, Narosa (2004)

Books for Reference

1. Elements of Properties of Matter by Mathur D S, Shyamlal Charitable Trust, New Delhi, 1993
2. Fundamentals of General Properties of Matter by Gulati H R, R Chand & Co. New Delhi, 1982
3. Waves & Oscillations by Subrahmanyam N & Brij Lal, Vikas Publishing House Pvt. Ltd., New Delhi, 1994
4. A Textbook of Sound by Khanna D R & Bedi R S, atma Ram & Sons, New Delhi 1985
5. Fundamentals of Physics, 6th Edition by D Halliday, R Resnick and J Walker, Wiley NY 2001.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACHAL11	ALLIED 1	ALLIED PHYSICS I	5	5

Objective: This paper is offered to the students of mathematics, Chemistry and Computer Science as allied Subjects. The logical reasoning behind the description of the physics problem and obtaining the solution to such problems are taught in this paper.

UNIT I - Properties of Matter

Elasticity: Hooke's law-Elastic constants – stress and strain diagram-Poisson's ratio-bending of beam – Bending moment – cantilever Depression at the loaded end of a cantilever – determination of Young's modulus by non-uniform bending.

Torsion: Torsion couple – Potential energy in a twisted wire – Torsional pendulum – Time period – Rigidity Modulus – Determination of rigidity modulus by Torsional oscillation (without masses) .

Viscosity: viscosity of a liquid – Viscous force – Co-efficient of viscosity of a liquid – comparison of viscosities of two liquids by graduated burette method.

Surface Tension: Surface Tension –interfacial tension – determination of surface tension and interfacial tension by the method of drops.

UNIT II – Heat

Specific heat – Callender and Barne's method to determine the specific heat capacity of a liquid – Newton's law of cooling – determination of specific heat of a liquid using Newton's law of cooling – Emissivity and Emissive power- Kirchhoff's laws of radiation-Black body radiation-Wien's displacement law, Rayleigh Jean's law.

UNIT – III – Electricity and Magnetism

Electricity: Potentiometer – Principle – Calibration of low range voltmeter - Measurement of internal resistance of cell – measurement of an unknown resistance- Capacitance of a conductor - Capacitance of spherical and parallel plate capacitor – energy of a charge capacitor - Loss of energy due to sharing of charges

Magnetism :Biot- Savart law – Magnetic flux- Magnetic Induction at a point due to a straight conductor carrying current –Moving coil ballistic galvanometer–Moment and pole strength of a magnet – Deflection magnetometer – Tan-C position – Vibration magnetometer – Theory – period of oscillation.

UNIT IV- Sound and Acoustics of Building

Sound: Laws of vibrations in a stretched strings – Velocity and frequency of vibrations of a stretched string — Sonometer – A.C. Frequency - Steel wire – Brass wire. Ultrasonics – properties- Production by Piezo – electric method – Industrial and Medical Applications of Ultrasonics -Non-Destructive Testing.

Acoustics of buildings: Reverberation – Reverberation time – Sabine’s formula [definition only] – Sound absorption co-efficient of surface – conditions for the perfect acoustics.

UNIT V- Optics and Laser

Diffraction: Theory of transmission grating – Normal Incidence – Determination of Wavelength of monochromatic source and Wavelength of mercury lines using a grating by normal Incidence.

Polarization: Optical activity –specific rotatory power – Polarimeter – Determination of specific rotatory power of a solution using Laurent’s half shade polarimeter.

Laser: Principle and Characteristics of Laser-spontaneous and stimulated emission-construction and working of Nd-YAG Laser

Books for study:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005)
2. Allied Physics - Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics - N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing companies (1986).

Books for Reference:

1. Modern Physics –R. Murugesan S. Chand &Co.(2004)
2. Electronic Principles and applications – A. B. Bhattacharya, New Central Book Agency, Calcutta.
3. Introduction to Solid state Physics – C. Kittel, 5th Edition Wiley Eastern Ltd.
4. Renewable & sustainable energy sources – Agarwal.
5. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999)

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAPY2001	CORE 2	THERMAL PHYSICS	5	5

Objective: *This paper aims to impart the understanding of heat flow, its related Phenomenon and the distribution of particles in the systems*

Unit I -Thermometry and Calorimetry

Different thermometric scales -Platinum resistance thermometer - Callender& Griffith's bridge - Thermistor - Specific heat capacity of solids – Dulong&Petit's law - Specific heat capacity of liquid - method of mixtures - Barton's correction – Newton's law of cooling and verification - Specific heat capacity of gases – Meyer's relation - C_p and C_v by Regnault's method, Callender and Barne's method.

Unit II –Thermodynamics

Zeroth law of thermodynamics-First law of thermodynamics - Heat engines - petrol and diesel engines –Carnot's cycle as refrigerator- second law of thermodynamics - thermodynamic scale of temperature - entropy- change of entropy in reversible and irreversible processes - temperature - entropy diagram - third law of thermodynamics - Maxwell's thermo dynamical relations - derivation - Clausius - Clapeyron equation - Specific heat relation.

Unit III - Low temperature Physics

Joule Kelvin effect – Liquefaction of hydrogen- Liquefaction of helium – Kammerling and Onnes method – Helium I and II- Lambda point - Joule-Thomson effect - porous plug experiment: - liquefaction of gases –Production of low temperature by adiabatic demagnetization - applications of low temperatures –Superconductors – Type I and Type II – Meissner effect –applications of Super conducting magnets.

Unit IV -Conduction

Definition and dimension of thermal conductivity – Definition of Thermal diffusivity Principle of rectilinear flow of Heat along a bar - Steady state - Thermal conductivity of a good conductor- Forbes method- Thermal conductivity of a bad conductor - Lee's disc method- Conduction through compound media-series and parallel - Thermal conductivity of rubber - Wiedemann Franz law – Some practical application of heat conduction.

Unit V -Radiation

Black body radiation –Kirchhoff's law, Stefan -Boltzmann law, Wien's law, Planck's law and Stefan's law - Determination of Stefan's constant - Newton's law of cooling from Stefan's

law – Planck's quantum theory of radiations- solar constant and determination - solar energy- Angstrom pyroheliometer –Temperature of Sun- applications

BOOKS FOR STUDY

1. Heat and Thermodynamics - D.S.Mathur
2. Heat and Thermodynamics - BrijLal and Subramaniam, S Chand & Co 16th Edition
3. Elementary statistics - Gupta and Kumar

BOOKS FOR REFERENCE

1. Heat and Thermodynamics - J. B. Rajam& C. L. Arora
2. Thermodynamics and statistical Physics - Sharma &Sarkar
3. Statistical Mechanics - SathyaPrakash&C.Agarwal
4. Fundamentals of Physics, 6th Edition, by D.Halliday, R.Resnick and J.Walker, Wiley, NY, 2001.
5. Thermal Physics, A.B. Gupta and H. Roy, Books and Allied (P) Ltd., (2002.)
6. Physics, 4th Edition, Vols I, II & II Extended by D.Halliday, R.Resnick and K.S.Krane, Wiley, NY, 1994..
7. CRC Handbook of Physics & Chemistry, 80th Ed., CRS Press, NY, 1999.
8. The Feynman Lectures on Physics, Vols. I, II, and III, by R P. Feynman, R B Leighton and M Sands, Narosa, New Delhi, 1998.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAPYPR21	CORE PRACTICAL 1	PHYSICS PRACTICAL- I	2	2

Objective: It is aimed at exposing the under graduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical and thermal properties of matter.

List of Experiments

1. Young's modulus – non uniform bending – pin and microscope.
2. Young's modulus – non uniform bending – optic lever – Scale and Telescope.
3. Surface tension and interfacial surface tension – by drop weight method.
4. Sonometer – frequency of a tuning fork.
5. Sonometer – Determination of AC frequency Using steel wire (Electromagnet)
6. Specific heat capacity of a liquid – Method of mixtures.
7. Focal length of convex lens.
8. Spectrometer – Hollow prism - μ of a liquid.
9. Potentiometer – Calibration of low range voltmeter.
10. Characteristic of Junction diode
11. Rigidity modulus – Torsional pendulum – without masses.
12. Rigidity modulus and moment of inertia – Torsional pendulum – with identical masses
13. Coefficient of viscosity of a liquid – graduated burette - Radius of capillary tube by mercury pellet method.
14. Specific heat capacity – Joules calorimeter
15. Specific heat capacity of a liquid – Newton's law of cooling.
16. Sonometer – Determination of AC frequency Using brass wire (Bar magnet)
17. Sonometer – Comparison of radii of the given wires.
18. Spectrometer – Refractive index of a glass prism (minimum deviation)
19. Post office box – temperature coefficient of resistance of the coil.
20. Unregulated and Zener regulated power supply. (full wave)

Books for Study

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990)
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II (1996)

Books for Reference

1. S.L Gupta and V.Kumar- Practical Physics- PragatiPrakashan – 250th Edition (2002)

2. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A Textbook of practical Physics, Sultan Chand & Sons

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACHAL21	ALLIED 2	ALLIED PHYSICSII	5	5

Objective: This paper is offered to the students of mathematics, Chemistry and Computer Science as allied Subjects. The logical reasoning behind the description of the physics problem and obtaining the solution to such problems are taught in this paper.

Unit I - Atomic Physics

Discovery of cathode Rays- Properties – Determination of e/m by Thomson's parabola method- Positive Rays – Discovery – Properties – Dempster's mass Spectrograph

Atom model - vector Atom model- electron spin and spatial quantization - quantum numbers - Pauli's exclusion principle – Magnetic Dipole moment-Spin magnetic moment-Stern and Gerlach Experiment.

Unit II - Nuclear Physics

Particle Accelerator- Linear accelerator, cyclotron – Particle detectors – GM counter – Transmutation of elements– The Q value equation for a nuclear reaction – Types of nuclear reaction – Basic concepts of fission and fusion – Nuclear reactor – Harmful effects of nuclear radiation – Preventive and safety measures- Origin of cosmic rays – primary and secondary cosmic rays – cosmic ray shower- Latitude effect –Altitude effect.

Unit III –Effects Of Electric Current And Transient Current

Faraday's laws of electromagnetic induction - vector form – Lenz's law – self and mutual inductance – Determination of coefficient of self inductance – Rayleigh's method – Induction coil-electrical conductivity of an electrolyte-Determination of specific conductivity of an electrolyte- Growth and Decay of current in LR circuit – Growth and Decay of charge in RC circuit.

Unit IV – Crystal Structure and Fiber Optics

Types of Solid materials- Types of lattices - crystal structure - Unit cell - Miller indices – Determination - Bragg's law - Principle and propagation of light within the fiber -

classification of optical fiber - fiber optic communication system block diagram-Fiber Optic Sensors- Active and Passive Sensors.

Unit V – Electronics

Basic Electronics: Junction Diode - LED - Zener diode -LCD- Solar Cell-voltage regulator - Junction transistor - Characteristics of Transistor - common base - common emitter mode

Digital electronics: - Boolean algebra - Demorgan's theorem – verification-AND, OR and NOT Gates ,NAND and NOR gates - Universal building Blocks.

Books for study:

1. Allied Physics by Dr.R.Sabesan and Dr.Mrs.Dhanalakshmi
2. Allied Physics by Mr. Kamalakkannan and Jayraman.
3. Text book of optics by Brij Lal and Subramanian
4. Modern Physics by R. Murugesan S.Chand& Co.

Books for Reference:

1. Physics, 4th Edition, Vols I, II & II Extended by D.Halliday, R.Resnick and K.S.Krane, Wiley, NY, 1994.
2. Digital Principles and Application - Malvino& Leach.
3. Basic Electronics, 6th Edition by B. Grob, McGraw- Hill, NY, 1989.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAPYAP21	ALLIED PRACTICAL 1	ALLIED PHYSICS - PRACTICAL	2	2

Objective: It is aimed at exposing the Allied students to the technique of handling simple measuring instruments and also makes them measure certain mechanical and thermal properties of matter.

List of Experiments

1. Young's Modulus – Non-uniform bending method using Pin and Microscope.
2. Rigidity Modulus – Torsional oscillation method (without symmetric masses)
3. Surface tension and interfacial surface tension – by drop weight method.
4. Determination of Co-efficient of viscosity – Graduated Burette.
5. Specific heat capacity of a liquid – Method of mixtures.
6. Sonometer – Determination of AC frequency Using steel wire (Electromagnet)
7. Newton's Rings – Radius of curvature of the convex lens.
8. Spectrometer- Refractive index of a glass prism (minimum deviation)
9. Potentiometer – calibration of low range voltmeter.
10. Determination of M and B_H using Deflection magnetometer in Tan C position and vibration magnetometer.
11. Young's Modulus – Non-uniform bending method using Scale and Telescope.
12. Rigidity Modulus – Torsional oscillation method (with symmetric masses)
13. Specific heat capacity of a liquid – by Newton's law of cooling
14. Spectrometer Grating – Normal incidence – Wavelength of Sodium lines.
15. Potentiometer – calibration of low range ammeter.
16. Figure of merit –Current Sensitiveness and voltage sensitiveness of a galvanometer.
17. Construction of AND, OR and NOT using NAND gate.
18. Characteristics of Zener diode.
19. Verification of Demorgan's Theorem.
20. Sonometer – Determination of frequency of tuning fork (Screw Gauge is given)

Books for Reference

1. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A Textbook of practical Physics, Sultan Chand & Sons
2. C.C Ouseph, G. Rangarajan, R. Balakrishnan- A Textbook of practical Physics- S. Viswanathan Publisher-PartII (1996)

Books for Study

1. Allied Physics by Dr.R.Sabesan and Dr.Mrs.Dhanalakshmi
2. Allied Physics by Mr. Kamalakkannan and Jayraman.
3. Text book of optics by Brijal and Subramanian
4. Modern Physics by R. Murugesan S.Chand & Co.

COURSE OUTCOME FOR I & II SEMESTERS

Course Name: Mathematical Physics Code: PAPY1001

Credit: 05

	On the completion of this course the student will be able to
CO1	Learn about vectors and operators, Second rank Cartesian tensor
CO2	Get introduced to Special functions like Gamma function, Beta function, Delta function, Dirac delta function, Bessel functions and their recurrence relations
CO3	Learn different ways of solving second order differential equations and familiarized with complex variable, Cauchy's theorem and integral formulae
CO4	Learn the fundamentals and applications of Fourier series, Fourier and Laplace transforms, their inverse transforms, One-dimensional Green's function, Reciprocity theorem, etc
CO5	Learn about special type of matrices that are relevant in physics and then learn about tensors, groups, subgroups and conjugate classes, C _{2v} and C _{3v} , Application to infrared and Raman active vibrations of XY ₃ type molecules

Course Name: Classical Mechanics and Relativity Code: PAPY1002 Credit: 5

	On the completion of this course the student will be able to
CO1	Understand the fundamental approach to apply Lagrange's equations and Hamiltonian in classical mechanics
CO2	Acquire the knowledge of Kinematics and Dynamics of rigid body in detail and ideas regarding Euler's equations of motion
CO3	Understand the fundamental approach to apply Hamiltonian formulation and get familiarized with Poisson brackets and Hamilton -Jacobi equation
CO4	Study the different modes theory of small oscillations in detail along with basis of Free vibrations
CO5	Gain basic ideas of relativity and its application

Course Name: Quantum Mechanics I Code: PAPY1003 Credit: 04

	After successful completion of this paper, the student will be well-versed in
CO1	fundamental principles of quantum mechanics.
CO2	concepts of Linear vector spaces, basis and operators and bra and ket notation
CO3	Schrodinger and Heisenberg formulations of time development and their applications
CO4	Space-time symmetries, Hilbert space and hydrogen atom.
CO5	The concepts of spin and angular momentum, as well as their quantization and addition rules

Course Name: General Physics Experiments I Code: PAPYPR11 Credit: 4

	On the completion of this course the student will be able to
CO1	determine the Young's modulus by elliptical and Hyperbolic fringes
CO2	determine Stefan's constant
CO3	determine the band gap of thermistor and semiconductor
CO4	Calculate Rydberg's Constant- Hydrogen spectrum
CO5	determine viscosity of the given material using Meyer's Oscillation disc
CO6	determine the absolute capacitance and comparison of emf using BG
CO7	determine the FP-etalon
CO8	calculate the charge of an electron using e/m method
CO9	determine the coefficient of linear expansion of material using Air wedge method

Course Name: Electronic Devices and Application Code: PAPYE101 Credit: 4

	On the completion of this course the student will be able to
CO1	understand the fabrication of IC and Logic families
CO2	Learn basics of Photonic devices like LED, Laser diode, photodetectors, IR and UV detectors etc and their working in detail .
CO3	understand the fundamental of 555 timer and its applications
CO4	study the basic operational amplifier characteristics, OPAMP parameters ,applications as inverter, integrator, differentiator etc
CO5	basic ideas of voltage regulator, A/D and D/A Convertors

Course Name: Computational Methods and Programming Code: PAPYE102 Credit: 4

	On the completion of this course the student will be able to
CO1	Solve nonlinear algebraic equations, Bisection and Newton-Raphson methods
CO2	Solve Simultaneous linear equations by different method
CO3	Understand Interpolation, Curve fitting, Cubic line fitting
CO4	apply Trapezoidal rule - Simpson's rule, Euler and Runge-Kutta methods
CO5	Write Programmes to solve the mathematical equation using computational methods

Course Name: Statistical Physics

Code: **PAPY2001**

Credit: 5

	On the completion of this course the student will be able to
CO1	Analyse the concepts of microstate and macrostate of a model system
CO2	Understand the concept of ensembles and their comparison and apply the concept of partition function to obtain macroscopic properties of thermodynamic systems
CO3	Apply Bose Einstein statistic for ideal gas, understand the thermodynamic properties
CO4	Apply Fermi Dirac statistic for Fermions
CO5	Understand the behaviour of molecule at very low temperature

Course Name: Electromagnetic Theory

Code: PAPY2002

Credit: 5

	On the completion of this course the student will be able to
CO1	study the mathematical terms of Laplace equation and electrostatics
CO2	study the dynamic charge distribution in magnetostatics
CO3	understand the Faraday's laws of induction and Maxwell equations
CO4	Gain a clear understanding of Maxwell's equations and electromagnetic boundary conditions
CO5	Grasp the idea of electromagnetic wave propagation through wave guides and transmission lines

Course Name: Quantum Mechanics- II

Code: PAPY2003

Credit: 4

	This course will enable the student to have basic knowledge about
CO1	Approximation methods for time-independent problems like the WKB approximation
CO2	perturbation theory and Interaction of an atom with the electromagnetic field
CO3	Theory of scattering and calculation of scattering cross section, optical theorem ,Born approximation, partial wave analysis etc.
CO4	relativistic Quantum Mechanics using Dirac equation, Dirac matrices, The Klein Gordon equation
CO5	Second quantization of the K.G field and Dirac field quantization and their interpretation

Course Name: Electronic Practical II Code:PAPYPR21 Credit: 4

	On the completion of this course the student will be able to
CO1	Study of the attenuation characteristics and design of the phase shift Oscillator and Wein bridge oscillator using op-amp
CO2	construct the inverting, Non- inverting amplifier – Voltage follower summing, difference, average amplifier – differentiator and integrator using op-amp
CO3	Design of Square wave, Saw-tooth wave and Triangular wave generators, Schmitt Trigger, Monostable multivibrator using op-amp
CO4	design the Astable, monostable multivibrator and Schmitt trigger using Timer-555
CO5	Design the D/A converter - Binary weighted method - R-2R Ladder method using op-amp
CO6	Construct the Half adder, Half subtractor, Full adder and Full subtractor using IC7400
CO7	Construct modulus counters- Using Seven segment with IC 7447
CO8	Study the characteristic of UJT and FET
CO9	construct 4 bit Shift Registers – Ring counter – Twisted Ring counter

Course Name: Advanced Spectroscopy Code:PAPYE201 Credit: 4

	On the completion of this course the student will
CO1	Learn about symmetry operations, C ₂ V and C ₃ V, Application to infrared and Raman active vibrations of XY ₃ type molecules
CO2	gain ability to apply the techniques of infrared spectroscopy to elucidate the structure of molecules
CO3	Be able to apply the principle of Raman spectroscopy and its applications in the different field of science & Technology.
CO4	become familiar with different resonance spectroscopic techniques and its applications
CO5	find solutions to problems related ESR and MOSSBAUER spectroscopic systems.

	On the completion of this course the student will be able to
CO1	Understand basic ideas of Astronomical bodies like Terrestrial , Jovian planets Asteroids and Meteoroids
CO2	Understand the various Astronomical Instruments
CO3	Gain basic ideas about the earth, sun, atmosphere, magnetosphere and eclipses
CO4	study the Classification of Stars
CO5	Understand the nomenclature of galaxies its various types and Cosmological Models

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPY1001	CORE 1	MATHEMATICAL PHYSICS	6	5

Objective: To provide an insight into tensors, complex analysis, transforms techniques, Differential equations and Greens function which form the back bone of all higher physics and to apply these techniques to solve Physics problems

UNIT- I: **Linear Vector Spaces:**

Definition of Vector Space – Subspace – Linear Dependence – Linear Independence – Basis – Dimension of a Vector Space – Linear Operators – Representation of Vectors and Linear Operators in a basis – Inner Product – Orthonormal basis – Schwartz inequality – Gram-Schmidt Orthogonalization Process.

UNIT -II: **Special Functions**

Second order linear differential equations – Wronskian – Sturm-Liouville theorem – Orthogonality of eigen functions – Illustration with Legendre, Laguerre, Bessel and Hermite differential equations – Generating function – Recurrence relation – Rodrigue's formula – Expansion of polynomials.

UNIT -III: **Complex Variables**

Functions of a complex variable – Single and multivalued functions – Analytic functions – Cauchy-Riemann conditions – Singular points – Cauchy's theorem – Cauchy Integral formula – Taylor and Laurent expansions – Zeros and Poles – Cauchy Residue theorem and its applications.

UNIT-IV: Fourier and Laplace transforms

Laplace transforms – Solution of linear differential equations with constant coefficients – Fourier transforms – Fourier Sine and Cosine transforms – Convolution theorem – Parseval's Identity – Relationship between Fourier and Laplace transforms – Application to Heat Equation.

UNIT- V: Group Theory

Definition of Groups – Subgroups – Conjugate Classes – Cyclic Groups-Symmetry Elements-Transformation & Matrix Representation – Point & Space Groups – Representation of a Group – Reducible & Irreducible Representation – Schur's Lemmas – Orthogonality Theorem – Character of a Representation – Character Table C_{2v} & C_{3v} – Groups in Molecular Physics – Application for Classification of Elementary Particles.

BOOKS FOR STUDY:

1. **H.K Dass**, Mathematical Physics, (2011 edition) and Rama Verma, S.Chand publications. India.
2. **Sathya Prakash**, Mathematical Physics, 2014 edition, Sultan Chand & sons Publications. India.
3. P. K. Chattopadhyay, 1990, Mathematical Physics, Wiley Eastern, Madras.
4. **G. Arfken and H. J. Weber**, 2001, *Mathematical Methods for Physicists*, 5th Edition,. Harcourt (India), New Delhi.
5. **E. Kreyszig**, 1999, *Advanced Engineering Mathematics*, 8th Edition, Wiley, New York.
6. **M. D. Greenberg**, 1998, *Advanced Engineering Mathematics*, 2nd Edition, International Ed., Prentice - Hall International, New Jersey.

BOOK FOR REFERENCE:

1. **Tulsi Dass and S. K. Sharma**, 1998, Mathematical Methods in Classical and Quantum Physics, Universities Press(INDIA), Hyderabad.
2. **S. Lipschutz**, 1987, *Linear Algebra*, Schaum's Series, McGraw - Hill, New York
3. **E. Butkov**, 1968, *Mathematical Physics* Addison - Wesley, Reading, Massachusetts.
4. **P. R. Halmos**, 1965, *Finite Dimensional Vector Spaces*, 2nd Edition, Affiliated East-West, New Delhi.
5. **M. Hamermesh**, 1962, *Group Theory and Its application to Physical Problems*, Addison Wesley, Reading.
6. **C. R. Wylie and L.C. Barrett**, 1995, *Advanced Engineering Mathematics*, 6th Edition, International Edition, McGraw-Hill, New York.
7. **W. W. Bell**, 1968, *Special Functions for Scientists and Engineers*, Van Nostrand, London.
8. **M. A. Abramowitz and I. Stegun (Editors)**, 1972, *Handbook of Mathematical Functions* Dover, New York.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPY1002	CORE 2	CLASSICAL MECHANICS	6	5

Objectives: To introduce the classical formulation approaches like Lagrangian and Hamiltonian dynamics and to study their application in mechanical systems and solving of problems. Also To review the fundamental concepts of relativity ad to create an understanding of their applications

UNIT-I: Lagrangian Formulaton

Mechanics of a system of particles – Constraints – **principle of virtual work- D'Alembert's principle-** Lagrangian formulation and simple applications-variation principle and Lagrange's equations

Hamilton's principle – Lagrange's equations from Hamilton's principle; **Symmetry and conservation laws-** Principle of least action-Two-body central force problem –Kepler Problem and Kepler's laws

UNIT-II: Mechanics of Rigid Bodies

Rigid body motion – Kinematics – Euler angles – Infinitesimal rotations –principal axes – Coriolis force - Dynamics - Angular momentum and rotational kinetic energy -Moment of inertia tensor - Euler's equations of motion – Poinot method - Symmetrical top.

UNIT-III: Hamilton's Formulation

Legendre transformation and Hamiltonian equations – Cyclic coordinates- **phase space and Liouville's theorem; Symmetries and conservation laws in Hamiltonian picture-** Canonical transformations- Poisson brackets- Hamilton-Jacobi theory- Action and Angle variables.

UNIT-IV: Small Oscillations

Theory of Small Oscillations – Normal mode analysis – Diatomic molecule – normal mode of a linear tri-atomic molecule- forced oscillations- **Effect of dissipative forces on free and forced oscillations**

UNIT-V: Special theory of Relativity

Principle and postulate of relativity- **Lorentz transformation - Lorentz fitzgerald contraction- time dilation-** transformation of addition of velocities- four vector notation- Variation of mass with velocity and mass energy relation- relativistic invariance of physical laws.

BOOKS FOR STUDY:

1. **H. Goldstein**, 2002, *Classical Mechanics*. 3rd Edition, C. Poole and J. Safko, Pearson Education, Asia, New Delhi.
2. **B.D Gupta and SatyaPrakash**, 1997, *Classical Mechanics* 5th Edition. KedarnathRamath, Meerut and New Delhi.
3. **S. N. Biswas**, 1998, *Classical Mechanics*, Books and Allied Ltd., Kolkata.
4. **Upadhyaya**, 1999, *Classical Mechanics*, Himalaya Publishing Co., New Delhi.
5. **P. V, Panat**, 2005 *Classical Mechanics* 5th Edition alpha Science International.
6. **R. Douglas Gregory**, 2006 *An Undergraduate Text of Classical Mechanics*, Cambridge University Press .

BOOKS FOR REFERENCE:

1. **D. Landau and E. M. Lifshitz**, 1969, *Mechanics*, PergomonPress, Oxford.
2. **K. R. Symon**, 1971, *Mechanics*, Addison Wesley, London.
3. **J. L. Synge and B. A. Griffith**, 1949, *Principles of Classical Mechanics*, McGraw-Hill, New York.
4. **C. R. Mondal**, *Classical Mechanics*, Prentice-Hall of India, New Delhi.
5. **R. Resnick**, 1968, *Introduction to Special Theory of Relativity*, Wiley Eastern, New Delhi.
6. **R. P. Feynman**, 1962, *Quantum Electrodynamics*, Benjamin, Reading, MA.
7. **M. Glazer and J. Wark**, 2001, *Statistical Mechanics*, Oxford University Press, Oxford.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPY1003	CORE 3	QUANTUM MECHANICS I	4	6

Objective: To provide an understanding of fundamental principles of quantum mechanics and to introduce to the basic ideas of Dirac formulation, Time-independent perturbation theory, and approximation methods in Quantum Mechanics.

UNIT-I: Basic formalism of Quantum Mechanics:

Schrodinger equation-Time dependent and independent -Physical interpretation of wave function- admissibility conditions for a wave function-Equation of continuity and conservation of probability-Postulates of Quantum mechanics- particle in a box-square well potential-Rectangular potential Barrier –tunnelling.

UNIT-II: Abstract formulation:

Mathematical properties of linear vector spaces- Dirac's bra and ket notation- Hermitian operators-Properties of Hermitian operator- Coordinate and momentum representations-operator associated with different observables-Expectation values of Dynamical quantities- Generalised uncertainty principle-Position momentum uncertainty - Ehrenfest theorem.

UNIT-III: Quantum Dynamics:

Unitary transformation-Schrodinger picture-Heisenberg picture- Equation of motion in Heisenberg representation- Solution of one dimension harmonic oscillator –significance of zero point energy- General view of symmetries and conservation laws.

UNIT-IV: Symmetries in Quantum Mechanics:

Hilbert space-Spherically symmetry potentials-Three dimensional harmonic oscillator(spherical symmetric case)-Rigid rotator with free axis- Eigen function-Hydrogen atom-spin matrices for electron-commutation relation-symmetric and anti -symmetric wave function of hydrogen molecule.

UNIT-V: Angular Momentum:

Angular momentum operators in position representation-Spin angular momentum- Total angular momentum operators-commutation relations of angular momentum operators-Eigen values and Eigen functions of J^2 and J_z , Addition of angular momenta- Clebsch-Gordan coefficients.

BOOKS FOR STUDY:

1. **P. M. Mathews and K. Venkatesan**, 1976, *A Text book of Quantum Mechanics*, Tata McGraw-Hill, New Delhi.
2. **L. I. Schiff**, 1968, *Quantum Mechanics*, 3rd Edition, International Student Edition, MacGraw-Hill Kogakusha, Tokyo.
3. **V. Devanathan**, 2005, *Quantum Mechanics*, Narosa Publishing House, New Delhi.

BOOKS FOR REFERENCE:

1. **E. Merzbacher**, 1970, *Quantum Mechanics* 2nd edition, John Wiley and Sons, New York.
2. **P. A. M. Dirac**, 1973, *The Principles of Quantum Mechanics*, Oxford University Press, London.
3. **L. D. Landau and E. M. Lifshitz**, 1976, *Quantum Mechanics* Pergomon Press, Oxford.
4. **S. N. Biswas**, 1999, *Quantum Mechanics*, Books And Allied Ltd., Kolkata.
5. **G. Aruldas**, 2002, *Quantum Mechanics*, Prentice Hall of India, New Delhi.
6. **A. Ghatak and S. Lokanathan**, *Quantum Mechanics: Theory and Applications*, 4th Edition, Macmillan India.
7. **J. S. Bell, Gottfried and M. Veltman**, 2001, *The Foundations of Quantum Mechanics*, World Scientific, Singapore.
8. **R. P. Feynman, R. B. Leighton, and M. Sands**, 1998, *The Feynman Lectures on Physics*, Vols. 3, Narosa, New Delhi.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPYPR11	CORE PRACTICAL 1	GENERAL PHYSICS EXPERIMENTS I	5	5

LIST OF EXPERIMENTS

(Any 15 out of the given 25)

1. Cornu's method – Young's modulus by elliptical fringes.
2. Cornu's method – Young's modulus by hyperbolic fringes.
3. Determination of Stefan's constant.
4. Band gap energy – Thermistor.
5. Hydrogen spectrum – Rydberg's constant.
6. Co-efficient of linear expansion-Air wedge method.
7. Permittivity of a liquid using RFO.
8. Viscosity of liquid – Meyer's disc.
9. Solar spectrum – Hartmann's interpolation formula
10. F.P. Etalon using spectrometer.
11. Iron /Copper arc spectrum.
12. Brass /Alloy arc spectrum.
13. B-H Loop using Anchor ring.
14. Specific charge of an electron – Thomson's method /Magnetron method.
15. Electrical resistance of a metal /alloy by four probe method.
16. Edser and Butler fringes – Thickness of air film.
17. Spectrometer – Polarisability of liquids.
18. Spectrometer – Charge of an electron.
19. Determination of strain hardening coefficient.
20. Thickness of the enamel coating on a wire – by diffraction.
21. Lasers - Study of laser beam parameters.
22. Measurement of Numerical aperture (NA) of a telecommunication graded index optic fiber.
23. Fiber attenuation of given optical fiber.
24. Determination of solar constant.
25. Biprism – Wavelength of monochromatic source – Refractive index of a liquid.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPYEP11	ELECTIVE I	ELECTRONIC DEVICES AND APPLICATIONS	6	4

Objective: To provide an exposure to the wide application of integrated circuit logic, Optoelectronics devices, Operational amplifiers, 555timer, Phase Locked Loop and Pulse related communication circuits.

UNIT-I: FABRICATION OF IC AND LOGIC FAMILIES

Fabrication of IC – Monolithic integrated circuit fabrication- IC pressure transducers – Monolithic RMS –Voltage Measuring device – Monolithic voltage regulators – Integrated circuit multipliers – Integrated circuits logic – Schottky TTL – ECL – I^2L – P and NMOS Logic – CMOS logic – Tristate logic circuits.

UNIT II: OPTO ELECTRONIC DEVICES

Basics of Photometry - Light sources and Displays - Light emitting Diodes – Surface emitting LED – Edge emitting LED – Seven segment display – Organic LED (OLED) – LDR – Diode lasers – Photo detectors – CCD – Photo diodes – p-i-n - Photo diode – Photo transistors – IR and UV detectors.

UNIT- III: 555 TIMER AND ITS APPLICATIONS

555 Timer – Description – Monostable operation – Frequency divider – Astable operation – Schmitt trigger – Phase Locked Loops – Basic principles – Analog phase detector – Voltage controlled oscillator – Voltage to frequency conversion – PLL IC 565 – Description – Lock in range – Capture range – Application – Frequency multiplication.

UNIT- IV: OP-AMP APPLICATIONS

Instrumentation amplifier–V to I and I to V converter – Op-amp circuits using diodes– Sample and hold circuits – Log and Antilog amplifiers – Multiplier and Divider– **Differentiator, Integrator-Monolithic Power Amplifier** -Electronic analog computation – RC Active filters.

UNIT- V: VOLTAGE REGULATORS AND A/D, D/A CONVERTERS

Series op-amp regulator - IC voltage regulators - Dual voltage supply – 723 General purpose regulator – Switch regulator – Weighted resistor DAC – R/2R Ladder DAC – A-D Converters – Direct type ADCs and Counter type ADCs – Servo tracking and Successive approximation method - A/D Converters – Dual Slope ADC.

Books for Study:

1. S.M.Sze, 1985, Semiconductor Devices – Physics and Technology, Wiley, New York.
2. Milman and Halkias, Integrated Electronics, Mc-Graw – Hill, New Delhi.
3. R.A.Gaekwad, 1994, Op-Amps and integrated circuits EEE.
4. Taub and Shilling, 1983, Digital Integrated Electronics, McGraw Hill, New Delhi.
5. J.Millman, 1979, Digital and Analog Circuits and Systems, McGraw Hill, London.
6. George Kennedy, 1987, Electronic communication systems 3rd Edition, McGraw Hill, London.
7. D.Roy Choudhury and Shail Jain 1991, Linear Integrated circuits, New Age International(P) Limited, Publishers, New Delhi.

Books for Reference:

1. R.F. Coughlin and F.F.Driscoll, 1996, Op-Amp and linear Integrated circuits, Prentice Hall of India, New Delhi.
2. M.S.Tyagi, Introduction to Semiconductor Devices, Wiley, New York.
3. P.Bhattacharya, 2002, Semiconductor Optoelectronic Devices, 2nd Edition, Prentice Hall of India, New Delhi.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPYEP12	ELECTIVE I	COMPUTATIONAL METHODS AND PROGRAMMING	6	4

Objective: To inculcate a flair for scientific research with moral, ethical and social values and also to expose the students to the foundations of various Computational methods and C programming.

UNIT - 1: SOLUTIONS OF EQUATIONS

Determination of zeros of polynomials - Roots of nonlinear algebraic equations and transcendental equations - Bisection and Newton-Raphson methods - Convergence of solutions.

UNIT - 2: LINEAR SYSTEMS

Solution of simultaneous linear equations - Gaussian elimination - Matrix inversion - Eigenvalues and eigenvectors of matrices - Power and Jacobi Methods.

UNIT - 3: INTERPOLATION AND CURVE FITTING

Interpolation with equally spaced and unevenly spaced points (Newton forward and backward interpolations, Lagrange interpolation) - Curve fitting - Polynomial least squares fitting - Cubic spline fitting.

UNIT- 4: DIFFERENTIATION, INTEGRATION AND SOLUTION OF DIFFERENTIAL EQUATIONS

Numerical differentiation - Numerical integration - Trapezoidal rule - Simpson's rule - Error estimates – Gauss-Legendre, Gauss-Laguerre, Gauss-Hermite and Gauss Chebyshev quadratures - Numerical solution of ordinary differential equations - Euler and Runge-Kutta methods

UNIT - 5 : COMPUTATIONAL TECHNIQUES in MATLAB/SciLab

Introduction, basic usage, variables, scripts, operations -Functions, Flow control , Line Plots, mfiles, graphics, Image surface plots, Vectorization - Solving equations and curve fitting, Linear algebra, Polynomials, Optimization , Differentiation, Integration, Differential Equations - Advanced Methods, File I/O - visualization.

BOOKS FOR STUDY

1. Sastry, Introductory Methods of Numerical Analysis.

2. V. Rajaraman, Computer Oriented Numerical Methods, 3rd Ed. (Prentice-Hall, New Delhi, 1993). 42 D:rainbow\B.A.\Tamil\less 1,2,5,12,17proof.pmd
3. M.K. Jain, S.r.Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 3rd Ed. (New Age International, New Delhi, 1995).
4. F. Scheid, Numerical Analysis, 2nd Edition (Schaum's Series McGraw-Hill, NY, 1998).
5. W.H. Press, S.A. Teukolsky, W.T. Vetterling and B.P. Flannery, Numerical Recipes in FORTRAN, 2nd Edition (Cambridge University Press, 1992); First Indian Edition (Foundation Books, New Delhi, 1993).

BOOKS FOR REFERENCE

1. M.A. Abramowitz and I. Stegun (Editors), , 1996).
2. W.H. Press, S.A. Teukolsky, W.T. Vetterling and B.P. Flannery, Numerical Recipes in C, 2nd Edition, (Cambridge University Press, 1992); First Indian Edition (Foundation Books, New Delhi, 1993).
3. Rajaraman, Fortran Programming.
4. E. Kreyszig, Advanced Engineering Mathematics, 8th Ed. (Wiley, NY, 1999).
5. www.mathworks.in, www.scilab.org

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPY2001	CORE 4	STASTICAL PHYSICS	5	5

Objective: *To review the fundamental concepts of thermodynamics, micro and macro ensembles, Bose-Einstein, Fermi Dirac Statistics, Ising model and Fluctuations and their problems*

UNIT- I: Introduction to Thermodynamics and Statistical Mechanics

Thermodynamic potentials- Maxwell's relations- Chemical potential- Entropy and probability- Micro and macro states-phase space- Liouville's theorem

UNIT-II: Ensembles and Partition function

microcanonical ensemble- ideal gas- Gibbs paradox - canonical ensemble- ideal gas - grand canonical ensembles- ideal gas -Comparison of various ensembles

Canonical and grand canonical partition function- Molecular partition function – Translational partition function-Rotational partition function – Vibrational partition function- Applications

UNIT-III: Bose-Einstein Statistics

Ideal Bose gas – Thermodynamic properties – statistics of ensembles – black body radiation – phonons – Debye's theory of specific heat – BE condensation.

UNIT-IV: Fermi Dirac Statistics

Ideal Fermi gas – Fermi Dirac distribution – thermodynamic properties – electron in metals – electronic heat capacity – Pauli's paramagnetic susceptibility

UNIT- V: Phase Transition and Liquid Helium

First and second order phase transitions, Ising model- mean field theories- exact solution of Ising model in one dimension- Superfluidity, Diffusion equation-

Two fluid model of liquid Helium II, Super fluid phase of ^3He , Random walk and Brownian motion

BOOKS FOR STUDY:

1. B.K. Agarwal and M. Eisner, 1998, Statistical Mechanics, 2nd Edition, New Age International, New Delhi.
2. SathyaPrakash and J.P Agarwal, 1994, Statistical Mechanics, 7th Edition, Kedar Nath and Ram Nath & Co, Meerut.
3. S.K.Sinha Statistical Mechanics, theory and application Tata Macgraw Hill.
4. C. Kittel, 2004, Elementary Statistical Physics, Dover Publications.

BOOKS FOR REFERENCE

1. K. Huang, 1975, Statistical Mechanics, Wiley Eastern Ltd., New Delhi.
2. H.B.Callen, John Wiley Thermodynamics and An Introduction to Thermostat
3. J. K. Bhattacharjee, 1996, Statistical Mechanics: An Introductory Text, Allied Publication, New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPY2002	CORE 5	ELECTROMAGNETIC THEORY	6	5

Objective: To introduce the laws governing the distribution and propagation of electromagnetic fields created by static and dynamic charges of distributions and their interaction with matters.

UNIT-I: ELECTROSTATICS

Poisson's and Laplace equation – Boundary conditions and Uniqueness theorem –**Green Reciprocity theorem** - Laplace equation in three dimension – Solution in Cartesian and spherical polar coordinates – Examples of solutions for boundary value problems.

UNIT-II: MACROSCOPIC MEDIA

Polarization and displacement vectors - Boundary conditions on field vectors - Dielectric sphere in a uniform field –**Electrical susceptibility and Dielectric constant** – Electrostatic energy in the presence of dielectric – **Electric Quadrupole** - Multipole expansion – **Molecular field in a dielectric. The Clausius-Mossotti Relation.**

UNIT- III: MAGNETOSTATICS

Biot-Savart Law - Ampere's law – Magnetic scalar and vector potential and magnetic field of a localised current distribution - Magnetic moment, force and torque on a current distribution in an external field - Magnetostatic energy - Magnetic induction and magnetic field in macroscopic media - Boundary conditions - Uniformly magnetised sphere.

UNIT- IV: MAXWELL EQUATIONS AND ITS APPLICATIONS

Faraday's laws of Induction - Maxwell's displacement current - Maxwell's equations - Vector and scalar potentials - Gauge invariance - Wave equation and plane wave solution- Coulomb and Lorentz gauges - Poynting's theorem - Lorentz force -**Radiation Damping** - **The Abraham-Lorentz Formula** - Radiation from an Oscillating electric dipole – Poynting vector and radiated power – Radiation resistance – Radiation from a linear antenna – Antenna arrays

UNIT- V: WAVE PROPAGATION

Reflection and Refraction of Electromagnetic waves at the interface of non-conducting media – Boundary condition at the surface of discontinuity – Fresnel's Equations – Brewster's Law and Degree of Polarisation - Rectangular wave guide -electric and magnetic fields on the surface and inside rectangular wave guide - TE and TM waves in rectangular wave guide - cut-off frequency and wavelength - Circular waveguides - energy flow and attenuation in wave guides - cavity resonators.

BOOKS FOR STUDY:

1. **D. J. Griffiths**, 2002, *Introduction to Electrodynamics*, 3rd Edition, Prentice-Hall of India, New Delhi.
2. **J. R. Reitz, F. J. Milford and R. W. Christy**, 1986, *Foundations of Electromagnetic Theory*, 3rd edition, Narosa Publication, New Delhi.
3. **J. D. Jackson**, 1975, *Classical Electrodynamics*, Wiley Eastern Ltd. New Delhi.
4. **J. A. Bittencourt**, 1988, *Fundamentals of Plasma Physics*, Pergamon Press, Oxford.
5. Satya Prakash, *Electromagnetic Theory and Electrodynamics* (Kedar Nath Ram Nath, Meerut, 2015)

BOOKS FOR REFERENCE:

1. **W. Panofsky and M. Phillips**, 1962, *Classical Electricity and Magnetism*, Addison Wesley, London.
2. **J. D. Kraus and D. A. Fleisch**, 1999, *Electromagnetics with Applications*, 5th Edition, WCB McGraw-Hill, New York.
3. **B. Chakraborty**, 2002, *Principles of Electrodynamics*, Books and Allied, Kolkata.
4. **R. P. Feynman, R. B. Leighton and M. Sands**, 1998, *The Feynman Lectures on Physics*, Vols. 2, Narosa, New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPY2003	CORE 6	QUANTUM MECHANICS II	6	4

Objective: To introduce the physical concepts and mathematical formalism of scattering theory, time dependent perturbation theory, its applications, Relativistic Quantum Mechanics, Dirac equation and Quantization of Schrodinger's and Dirac field.

UNIT-I: Approximation Methods:

Time-independent perturbation theory - Non- degenerate case –Degenerate case-Variational method and its applications-**Ground state of Helium**-WKB method and its applications-**probability of penetration of a barrier.**

UNIT-II: Time-dependent perturbation theory:

Time dependent perturbation theory-Transition to a continuum of final states – **application of time dependent perturbation theory to semi classical theory of radiation-selection rules**- Fermi Golden Rule- constant and harmonic perturbations-Sudden approximation – adiabatic approximation-.

UNIT-III: Scattering:

Definition of Cross-sections - **Differential scattering & total scattering cross-sections**-Laboratory and center of mass reference systems-scattering amplitude- **Formal treatment of scattering by Green's function method**-Born approximation –**condition for validity of Born approximation**-. Partial wave analysis-Optical theorem.

UNIT-IV: Relativistic Wave equation:

Klein-Gordon-**probability and current density**- Dirac relativistic wave equations-**Properties of Dirac matrices-Spin of the electron**- Plane wave solutions of Dirac equation-interpretation of negative energy states-. Spin and magnetic moment of the electron.

UNIT-V: Dirac equation:

Covariant form of Dirac equation- properties of Gamma matrices-Traces- relativistic invariance of Dirac equation- second quantization of Klein- Gordon field- second quantization of Dirac field - creation and annihilation operators

BOOKS FOR STUDY:

1. **P. M. Mathews** and **K. Venkatesan**, 1976, *A Text book of Quantum Mechanics*, Tata McGraw-Hill, New Delhi.
2. **L. I. Schiff**, 1968, *Quantum Mechanics*, 3rd Edition, International Student Edition, MacGraw-Hill Kogakusha, Tokyo.
3. **E. Merzbacher**, 1970, *Quantum Mechanics*, 2nd edition, John Wiley and Sons, New York.
4. **V. K. Thankappan**, 1985, *Quantum Mechanics*, 2nd Edition, Wiley Eastern Ltd, New Delhi.
5. **J.D. Bjorken** and **S.D. Drell**, 1964, *Relativistic Quantum Mechanics*, MacGraw-Hill New York.
6. **V. Devanathan**, 2005, *Quantum Mechanics*, Narosa Publishing House, New Delhi.
7. S.L. Gupta and I.D. Gupta - Quantum Mechanics.

BOOKS FOR REFERENCE:

1. **P. A. M. Dirac**, 1973, *The Principles of Quantum Mechanics*, Oxford University Press, London.
2. **L. D. Landau** and **E. M. Lifshitz**, 1958 *Quantum Mechanics*, Pergomon Press, London.
3. **S. N. Biswas**, 1999, *Quantum Mechanics*, Books and Allied, Kolkata.
4. **G. Aruldas**, 2002, *Quantum Mechanics*, Prentice-Hall of India, New Delhi.
5. **J. S. Bell**, **Gottfried** and **M. Veltman**, 2001, *The Foundations of Quantum Mechanics*, World Scientific.
6. **V. Devanathan**, 1999, *Angular Momentum Techniques in Quantum Mechanics*, Kluwer Academic Publishers, Dordrecht.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPYPR21	CORE PRACTICAL 2	ELECTRONICS EXPERIMENTS I	5	4

LIST OF EXPERIMENTS

(Any 15 out of the given 20)

1. Characteristics of UJT and Relaxation Oscillator.
2. FET Characteristics and FET amplifier.
3. Op-Amp – Inverting, Non-inverting amplifier – Voltage follower summing, difference, average amplifier – differentiator and integrator,
4. Op-Amp – Study of the attenuation characteristics and design of the phase shift-Oscillator.
5. Op-Amp –Study of the attenuation characteristics and design of the Wien Bridge Oscillator.
6. Op-Amp – Solving simultaneous equations.
7. Op-Amp – Design of square wave, saw tooth wave and Triangular wave generators.
8. Op-Amp – Design of Schmitt Trigger and construction of Monostablemultivibrator.
9. Op-Amp – Design of active filters – second order –Low pass, high pass, band pass and band rejecter.
10. Op-Amp – D/A converter - Binary weighted method - R-2R Ladder method.
11. IC7400 – Half adder, Half subtractor, Full adder, Full subtractor.
12. IC 7490 – modulus counters- Using Seven segment with IC 7447
13. Up-down counters – Design of modulus counters.
14. 4 bit Shift Registers – Ring counter – Twisted Ring counter.
15. IC 7483 – Arithmetic Operations.
16. IC 555 – Astablemultivibrator and Voltage Controlled Oscillator.
17. IC 555 – Monostablemultivibrator, Frequency Divider.
18. IC 555 – Schmitt Trigger and Hysterisis.
19. IC 7400 & IC 7413 - Clock generators.
20. Temperature co-efficient using 555 timers.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPYEP21	ELECTIVE 2	MOLECULAR SPECTROSCOPY	6	4

Objective: To expose to the fundamental principles of various spectroscopic techniques for structural applications.

UNIT-I: MOLECULAR SYMMETRY

Symmetry operations – Symmetry elements – Algebra of Symmetry operations - Multiplication table – Molecular point group – Matrix representation of Symmetry operations – Reducible and Irreducible representations – The Great Orthogonality Theorem - Character table for C_{2v} and C_{3v} point group – Symmetry Species of point group – Complete Character Table for point – Distribution of Fundamentals Among the Symmetry Species – Infrared Activity – Raman Activity

UNIT-II: INFRARED SPECTROSCOPY

Vibrations of diatomic and simple polyatomic molecules - Anharmonicity – Fermi Resonance – Hydrogen Bonding – Normal Modes of Vibration in a crystal – Solid State Effects – Interpretation of Vibrational Spectra – IR Instrumentation techniques – principle, construction and working of FT-IR spectrometer

UNIT-III: RAMAN SPECTROSCOPY

Vibrational and Rotational Raman spectra – Mutual Exclusion principle – Raman spectrometer – Polarization of Raman Scattering light. Structure Determination using IR and Raman spectroscopy – Phase transitions – Resonance Raman Scattering

- **Raman Microscopy**

UNIT-IV: NMR AND NQR SPECTROSCOPY

Quantum theory of NMR – Bloch equations – Design of NMR Spectrometer – Chemical Shift – Application to molecular structure.

Theory of NQR – Nuclear Quadrupole energy levels for axial and non-axial symmetry – Experimental techniques and applications.

UNIT-V: ESR AND MOSSBAUER SPECTROSCOPY

Quantum Theory of ESR – Design of ESR Spectrometer – Hyperfine Structure – Anisotropic systems of g-factors – **Systems in Triplet state**

Mossbauer effect – Recoilless emission and absorption – Mossbauer spectrum – Experimental techniques – Mossbauer spectrometer - **Magnetic Hyperfine interactions** – **Chemical Isomer shift** – **Crystal symmetry and Magnetic structure** – **Surface studies**

BOOKS FOR STUDY:

1. **C. N. Banwell** and **E. M. McCash**, 1994, Fundamentals of Molecular Spectroscopy, 4th Edition TMH, New Delhi.
2. **G. Aruldas**, 2001, Molecular Structure and Spectroscopy, Prentice Hall of India Pvt. Ltd. New Delhi.
3. **D. N. Satyanarayana**, 2004, Vibrational Spectroscopy and Applications, New Age International Publication
4. **Gurdeep Chatwal & Sham Anand**, Spectroscopy (Atomic and Molecular) Himalaya Publishing house

BOOKS FOR REFERENCE:

1. **D. D. Jyaji** and **M. D. Yadav** 1991, Spectroscopy, Amol Publications
2. **Atta ur Rahman**, 1986, Nuclear Magnetic Resonance, Springer Verlag.
3. **D. A. Lang**, Raman Spectroscopy, McGraw-Hill International
4. **Raymond Chang**, 1980, Basic Principles of Spectroscopy McGraw-Hill Kogakusha, Tokyo.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PAPYEP22	ELECTIVE 2	ASTROPHYSICS	6	4

Objective: *To provide an introduction to stellar structure and evolution, and to enhance the knowledge about Nuclear Astro Physics, Stellar objects & Stellar explosions, Gravitational collapse and relativistic astrophysics and formation of Accretion disks*

UNIT-I: Astronomical theory

Birth of Modern Astronomy – Geocentric and Heliocentric theories – Kepler’s laws of planetary motion – Newtonian gravitation – Celestial sphere – Planets – Terrestrial and Jovian planets (Planets individual description is not required in detail) - Asteroids- Meteoroids – Comets.

UNIT- II: Astronomical Instruments

Telescopes – Elements of telescope – Properties of images – Types of Optical telescopes – Refracting and Reflecting telescopes- Radio telescope – Sunlight and Spectroscopy – Electromagnetic spectrum - Spectrograph – Limitations – Photographic photometry – Photoelectric photometry – Spectrophotometry – Detectors and image processing.

UNIT- III: Sun and Earth

Sun – Physical properties – Composition – Core – Nuclear Reactions – Photosphere – Chromosphere – Corona – Sunspots – Sunspot cycle – Solar Wind – Solar flares – Coronal Mass Ejections – Solar Prominences - Auroras – space weather effects – History of the Earth – Temperature of a planet – The atmosphere – Pressure distribution – Temperature distribution – Magnetosphere – Eclipses – Solar and Lunar Eclipses.

UNIT-IV: Classification of Stars

Classification of Stars – The Harvard Classification system – Luminosity of a Star – Hertzsprung-Russel Diagram – Stellar evolution using the HR diagram – Theoretical evolution of stars – White Dwarfs – Neutron stars - Black holes – Event horizon – Basic physics of Black Holes – Neutron stars – Pulsars.

UNIT-V: Galaxies

Galaxy nomenclature – Types of Galaxies – Spiral – Elliptical – irregular galaxies – Milky Way Galaxy and its structure – Rotation and Mass Distribution – Rotation curve and Doppler shift – Star clusters – Galactic clusters – Cosmological Models – Big bang theory – Steady state theory – Hubble’s law – Olber’s paradox – Interstellar extinction – Dark matter.

BOOKS FOR STUDY

1. A. Mujiber Rahman, Concepts of Astrophysics, Scitech Publications, Chennai, 2018.
2. Abell, Morrison and Wolf, Exploration of the Universe, 5th ed., Saunders College Publications, Uk, 1987
3. Textbook of astronomy and astrophysics with elements of cosmology, V.B.Bhatia, Narosa publishing house, 2001.

BOOKS FOR REFERENCE:

1. Carroll and Ostlie, Introduction to Modern Astrophysics, 2nd ed., Pearson International, UK, 2007.
2. William J. Kaufmann, III, Macmillan Publishing company, London.
3. General Relativity, Astrophysics and Cosmology – A.K.Raychaudhuri, S.Banerji and A.Banerjee (Springer-Verla, 1992)
4. General Relativity and Cosmology – S. Banerji and A. Banerjee (Elsevier, 2007)
5. The Structure of the Universe – J.V.Narlikar (OUP, 1978)

COURSE OUTCOME

Degree: M. Phil., Physics

Course Name: Research Methodology

Code: MPHAPY01

Credit: 5

	On the completion of this course you are expected to
CO1	Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling
CO2	Develop skills on qualitative and quantitative research data analysis and presentation. Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis
CO3	Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis
CO4	Have basic awareness of data analysis-and hypothesis testing procedure
CO5	Develop awareness on ethically use, document and integrated sources for logical format of writing thesis, paper and drafting report.

Course Name: Advanced Physics

Code: MPHAPY02

Credit: 5

	On the completion of this course you are expected to understand
CO1	the relativistic quantum mechanical equations, namely, Klein-Gordon equation and Dirac equation, explain the formalism of relativistic quantum field theory.
CO2	exploring the ideas of nuclear and particle physics
CO3	synthesis and analysis of proton exchange membrane
CO4	importance of solid-state physics in the modern society
CO5	Onsager, Debye equation and calculate dielectric relaxation time and to draw the plane diagram using Cole-Cole, Cole-Davidson plots

Course Name: Applied Spectroscopy and Chemical Physics

Code: MPHAPY03

Credit: 5

	On the completion of this course you are expected to
CO1	study and update the basics of spectroscopy
CO2	learn the advancement of spectroscopy and its instrumentation
CO3	make familiar about ultrasonics and its velocity measurement techniques
CO4	get idea of bonds and its formation
CO5	detail studies of spectroscopic instruments

Course Name: Physics of Thin Films and Nano Materials

Code: MPHAPY03

Credit: 5

	On the completion of this course you are expected to
CO1	learn different deposition techniques and preparation of thin films of different composites.
CO2	study different physical properties of semiconducting insulating films
CO3	study optical and magnetic properties
CO4	learn different synthesis process of nanoparticles
CO5	study change in properties of materials at nano scale and applications.

Course Name: Applied Spectroscopy and Computational Physics

Code: MPHAPY03

Credit: 5

	On the completion of this course you are expected to
CO1	study and update the basics of spectroscopy
CO2	learn the advancement of spectroscopy and its instrumentation
CO3	make familiar about ultrasonics and its velocity measurement techniques
CO4	learn the different basis set to study molecular interactions
CO5	explore the DFT method to understand energetic-geometric-charge distribution of molecular structure

Course Name: **NANO LUMINESCENCE**

Code: MPHAPY03

Credit: 5

	On the completion of this course you are expected to
CO1	study the concept and types of luminescence
CO2	learn the concept of radiative and non radiative transitions
CO3	be familiar with different synthetic techniques of nano luminescence materials
CO4	learn the different characterization techniques
CO5	Gain the knowledge of Current Progress in Solid-State Lighting

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAPY01	CORE 1	RESEARCH METHODOLOGY	5	5

UNIT – I: RESEARCH METHODOLOGY

Meaning of research – Objectives of research – motivation of research – Types, approaches and significance – Methods versus methodology – Research in scientific methods – Research process – Criteria for good research – Problem encountered by research in India – Funding agencies.

UNIT – II: RESEARCH DESIGN

Research Problem: Selecting the problem – Necessity of defining the problem – Techniques involved in defining the problem – Research design – Needs and feature of good design – Different research design – Basic principles of experimental design.

UNIT – III: DATA COLLECTION AND DOCUMENTATION

Data collection methods – Data types – Processing and presentation of data – Techniques of ordering data – Meaning of primary and secondary data – The uses of computers in research – The library and internet – Uses of search engines – virtual libraries - common software for documentation and presentation.

UNIT – IV: DATA AND ERROR ANALYSIS

Statistical analysis of data – standard deviation – Correlation – Comparison of sets of data – Chi squared analysis for data – Characteristics of probability distribution – Binomial, Poisson and normal distribution – Principle of least square fittings – Curve fitting – Measurement of errors – Types and sources of errors – Determination and control errors.

UNIT – V: RESEARCH COMMUNICATION

Meaning of research report – Logical format for writing thesis and paper – Essential of scientific report: abstract, introduction, review of literature, materials and methods and discussion – Write up steps in drafting report – Effective illustrations: tables and figures – Reference styles : Harvard and Vancouver systems.

BOOKS FOR STUDY AND REFERENCE:

1. Research Methodology, Methods and techniques – C.R. Kothari – Wishwa Prakasam Publications, II Edition.
2. Research: An introduction – Robert Ross – Harper and Row Publications.
3. Research Methodology – P. Saravanavel – Kitlab Mahal, Sixth Edition.

4. A Hand book of Methodology of Research – Rajammal P.A.Devadass - Vidyalaya Press.
5. Introduction to Computers- N.Subramanian
6. Statistical methods – G.W. Snedecor and W.Cocharan – Oxford and IBH, New Delhi.
7. Statistical Methods – S.P.Gupta
8. How to write and publish a scientific paper – R.A.Day- Cambridge University Press.
9. Thesis and Assignment writing – Anderson – Wiley Eastern Ltd.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAPY02	CORE 2	ADVANCED PHYSICS	5	5

UNIT I: QUANTUM MECHANICS

Second quantization of Schrödinger and Klein-Gordon fields – Creation and annihilation operators – Commutation relations – Second quantization of Dirac field – Covariant and anti-commutation relations for Dirac field.

UNIT II: NUCLEAR AND PARTICLE PHYSICS

Compound nucleus and statistical theory – Experimental evidence – Statistical assumption – Average cross section – Angular distribution – Transmission coefficients – Level density – Decay of the statistical compound nucleus – Emission of charged particles. Symmetries and conservation laws – Gell Mann Nishijima formula – CPT invariance – Quark model.

UNIT III: NON-LINEAR AND MOLECULAR MECHANICS

Basics of nonlinearity – Linear and nonlinear oscillators – Autonomous and non-autonomous system – Dynamical systems.

The energy calculations – Energy minimization – Force field parameterization – Conformation analysis – Solvation-Montecarlo methods – Molecular dynamics – Free energy calculation.

UNIT IV: SOLID STATE PHYSICS-I

Band structure theory – Band structure for some semiconductors – Semiconductor transport theory – Basics of continuity equation – Theory of generation and recombination – Theory of PN junction – PN junction solar cells – Ionic conductivity – Normal and super ionic conductors – Application of super ionic solids: Battery, Fuel cells, Electrochromic display.

UNIT V: SOLID STATE PHYSICS-II

Basic concepts of dielectrics: Static fields – Time dependent fields – Static dielectric constant: Dipolar interaction – dipolar molecules in gases and dilute solutions – Onsager equation – Debye equations – Dielectric relaxation and loss – Distribution of relaxation time – Complex plane diagrams – Cole-Cole, Cole-Davidson plots.

Books for study and reference:

1. Advanced Quantum Mechanics – B.S. Rajput – Pragathi Praksan
2. Physics of the Nucleus – M.A. Preston – Addison-Wesley
3. Elementary Particles – D. Griffiths.
4. Nonlinear dynamics – M. Lakshmanan and S. Rajasekar – Springer International
5. Computational Chemistry – Guy H. Grant and W. Graham Richards – OxfordUniversity Press
6. Semiconductor Devices – S.M. Sze
7. Electronic Properties of materials – Rolf E. Hummel – Springer
8. Super ionic Solids – S. Chandra – North Holland Publishing Company Ltd.
9. Theory of Dielectrics – H. Frohlich – OxfordUniversity Press.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAPY04	ELECTIVE I	APPLIED SPECTROSCOPY & COMPUTATIONAL PHYSICS	5	5

UNIT -1

Infrared and Raman Spectroscopy principle-Far Infrared spectroscopy-Fourier Transform Techniques-FTIR and FT Raman Instrumentation. Sampling Methods for Infrared Absorption and Transmission Spectra-Raman Sampling Method –Origin of Group Frequencies and Factors affecting them.

UNIT-2

Concept of Nuclear Magnetic Resonance Spectroscopy- FTNMR Spectrometer-sampling techniques. Chemical Shift and splitting pattern – Structure determination of simple molecules. Shift reagents – Nuclear Over Hauser effect. Principle of ESR – Instrumentation and Spectral analysis – ESR studies of solids and bio-molecules.

UNIT –3

Infrared – experimental technique – application of IR spectra in the study of H – Bonding – determination of equilibrium constant –Nash method – thermodynamic properties – dipole moment derivatives – enhancement of intensity in H – bonding system – N.M.R experimental technique – Chemical shift – application to H – bonding studies.

UNIT – 4

Trial wave function-LCAO basic set approach-The secular equation-Huckel Theory-fundamental principle-application to Allyl system-Hartree-product wave functions-The Hartree Hamiltonian-Electron spin and Anti symmetry-Slater determinants – The Hartree-Fock self consistent field method.

UNIT – 5

The Hohenberg-Kohn Existence and Variational theorem-Kohn-Sham self consistent field methodology- Exchange correlation functional-local density approximation-density gradient and kinetic energy density corrections-adiabatic connection methods-semi empirical DFT-Advantages and Disadvantages of DFT compared to MO Theory-General performance overview of DFT-Energetic-Geometries-charge distributions.

Books for Study:

1. Molecular Spectra and structure-G.Herzberg-(Vol-I&II)-Third Edition-1996-D.Van Nostrand Company Inc.
2. Introduction to IR and Raman Spectroscopy-B.NoimanColthup :H.Lawrence Daly: E.StephenWiber by- Academic Press.
3. High Resolution NMR – Popple et.al – Prentice Hall
4. Spectroscopy by Straughen and Walker, Chapman and Hall Company.
5. Computational Physics, by J. M. Thijssen (Cambridge University Press, 2001), 2.
6. ComputationalPhysics, by N. J. Giordano and H. Nakanishi (Pearson Prentice hall, 2006),
7. Christopher J. Cramer, *Essentials of Computational Chemistry: Theories and Models*, 2nd Ed. Wiley & Sons, New York.
- 8.Daan Frenkel & Berend Smit, *Understanding Molecular Simulaiton*, AP, NY, 2002

Books for reference:

1. Computational Physics: Problem Solving with Computers (2007) Landau, P´aez, & Bordeianu
2. R.M. Dreizler and E.K.U. Gross, Density Functional Theory, (Springer, Berlin, 1990)
3. R.G. Parr and Q. Yang, Density Functional Theory of Atoms and Molecules, (Oxford Science Publications 1989)

4. Hydrogen Bond – G.C.Pimental – Freeman, Sanfrancisco.
5. Hydrogen Bonding – S.N.Vinogradov – Nastrand Reinhold.
6. NMR – Andrew and Roberts.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAPY04	ELECTIVE I	APPLIED SPECTROSCOPY & CHEMICAL PHYSICS	5	5

UNIT -1

Infrared and Raman Spectroscopy principle-Far Infrared spectroscopy-Fourier Transform Techniques-FTIR and FT Raman Instrumentation.Sampling Methods for Infrared Absorption and Transmission Spectra-Raman Sampling Method –Origin of Group Frequencies and Factors affecting them.

UNIT-2

Concept of Nuclear Magnetic Resonance Spectroscopy-FTNMR Spectrometer-sampling techniques.Chemical Shift and splitting pattern – Structure determination of simple molecules. Shift reagents – Nuclear Over Hauser effect. Principle of ESR – Instrumentation and Spectral analysis – ESR studies of solids and bio-molecules.

UNIT –3

Production of Ultrasonic waves – Low and High frequency waves – Longitudinal and transverse modes – Piezoelectric and magnetostriction transducers. Measurement of Ultrasonic velocity and absorption – Progression wave method – Optical method – acoustic interferometer – Pulse technique – impedance method.

UNIT – 4

H – Bonding – models of hydrogen bonding (Electrostatic model, quantum mechanical models) – Non bonded interaction – Potential energy curves and symmetrical Hydrogen bonds – Proton transfer and ion pair formation – thermodynamics of H – bonding – equilibrium constant.

UNIT – 5

Infrared – experimental technique – application of IR spectra in the study of H – Bonding – determination of equilibrium constant –Nash method – thermodynamic properties – dipole moment derivatives – enhancement of intensity in H – bonding system – N.M.R experimental technique – Chemical shift – application to H – bonding studies.

Books for Study:

1. Molecular Spectra and structure-G.Herzberg-(Vol-I&II)-Third Edition-1996-D.Van Nostrand Company Inc.
2. Introduction to IR and Raman Spectroscopy-B.NoimanColthup :H.Lawrence Daly: E.StephenWiber by- Academic Press.
3. High Resolution NMR – Popple et.al – Prentice Hall
4. Spectroscopy by Straughen and Walker, Chapmen and Hall Company.
5. Fundamentals of Ultrasonics – Jack Blitz –Butterworths – London.
6. Introduction to Chemical Ultrasonics – M.J.Blandamer – Academic Press, London
7. Ultrasonics – Bemsomcarlin – McGrawHill
8. Hydrogen Bond – G.C.Pimental – Freeman, Sanfrancisco.
9. Hydrogen Bonding – S.N.Vinogradov – Nastrand Reinhold.
10. NMR – Andrew and Roberts.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAPY04	ELECTIVE I	PHYSICS OF THIN FILMS AND NANO-MATERIALS	5	5

UNIT - I: Nucleation, Growth and Preparation Techniques of Thin Films

Nucleation, growth, kinetics and thermodynamics of materials – Four stages of film growth incorporation of defects during growth – Physical vapor deposition, Chemical vapor deposition – Plasma / Ion beam deposition – Sputtering Process – Methods of sputtering – RF sputtering – DC planar magnetron sputtering – Solution growth process – Substrate cleaning – Annealing – Agglomeration and Oxidation.

UNIT - II: Transport properties of Metal, Semiconducting and Insulating Films

Sources of resistivity in metallic conductors – sheet resistance – Hall effect and magneto resistance – Semiconducting films: Theoretical considerations - Experimental results – Photoconduction – Insulating films: Dielectric properties – dielectric losses – Ohmic contacts Metal – Insulator and Metal – Metal contacts – DC and AC conduction mechanism.

UNIT – III: Optical and Magnetic properties of thin films

Thin films optics – Theory – Reflection, transmission, absorption and transition – Optical constants of thin films – Experimental techniques – Thickness and temperature effect of optical constants – Application of optical films – interference filters – Antireflection coating – Magnetic properties of thin films – Super conducting films.

UNIT IV: Synthesis and Processing of Nanomaterials

Synthesis of metallic and semiconductor nanoparticles: Bottom up: Cluster beam evaporation, Ion beams deposition, chemical vapour deposition (CVD) sol-gel techniques Top down: Ball Milling, Photo, e- beam, X-ray lithography.

UNIT V – Properties and Applications of Nanomaterials

Determination of particle size – Increase in width of XRD peaks of nanoparticles – Shift in photoluminescence peaks – quantum size effect – Electron confinement in infinitely deep square well – Idea of Quantum dots and Quantum wires – magnetic behaviour of nanoparticles- dilute magnetic semiconductor – Carbon nanotubes – Different type of nanotubes – Applications of carbon nanotubes.

Books for study

1. Hand book of Thin films Technology: L. I. Maissel and R. Glang.
2. Thin film Phenomena: K. L. Chopra.
3. Thin Film Fundamentals: A. Goswami, New age International, 1996.
4. Nano particles and Nano structured films: Preparation characterization and application Ed. J.H. Fendler, John Wiley & Sons, 1998.
5. Physics of Nano structures: K.P. Jain, Narosa, 1997.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAPY04	ELECTIVE I	NANO LUMINESCENCE	5	5

UNIT – I

BASICS OF LUMINESCENCE

History of Luminescence - Classification of Luminescence, Phosphor properties - Phosphors Applications, Important Applications of Phosphors – Lamp Phosphors, Tri-colour lamps, Phosphors for Special Lamps, Phosphors for CRTs, FEDs, LEDs.

UNIT - II

BASIC MECHANISM OF PHOTOLUMINESCENCE

Excitation and Emission Spectra

Radiative transition, Non-radiative transition, Multiphonon Relaxation, Cross-Relaxations, Up-Conversion.

Features of Rare Earth Ions with Respect to Luminescence

Discrete f-f Transition, Broad Energy Bands, f-d transition, CT bands.

Rare Earths Energy levels and transitions

Electronic Transitions, Stark Splitting, Multiphonon Process and Crystal Field splitting Energy Transfer.

UNIT – III

Synthesis of Luminescence Materials

Sample preparation Methods and Calculations, Wet Chemical Method, Solid-state reaction, Combustion Synthesis, Sol-Gel synthesis, Microwave assisted synthesis.

UNIT – IV

Methods of Measurements (Instrumentations)

X-ray Diffractometer, Spectrofluorophotometer – Optical System of Spectrofluorophotometer, Procedures for Measurement of the Excitation and Emission Spectra, UV – DRS (Diffuse Reflectance Spectra) - FTIR Spectrometer, SEM (Scanning Electron Microscopy) – Specifications of Scanning Electron Microscope, Physical Basis of Operation, Instrumentation, TEM (Transmission Electron Microscopy) – Specifications of Transmission Electron Microscope – EDX (Energy Dispersive X-ray Analysis) - Photoluminescence Life time measurement –CIE a software based measurement of colour.

UNIT – V

Current Progress in Solid-State Lighting (SSL)

Strategies for Solid-State Lighting – Blue LED with Phosphor (s), UV LED plus Three or more Phosphors - Past, Present and Future Scenario of SSL.

Books for Study

Phosphors for Solid-State Lighting – Springer Series in Materials Science – Volume 174 – Zhiming M. Wang, Fayetteville, AR, USA, Jurgen Parisi, Oldenburg, Germany – Kartik N. Shinde. H.C. Swart .Kyeongsoon Park. ISBN 978-3-642-343 12-4 (eBook).

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACH1001	CORE 1	GENERAL CHEMISTRY I	5	5

OBJECTIVE:

75 Hours

Basic concepts regarding atomic structure, periodic properties, bonding concepts, quantum chemistry, solids, liquids, gases, hydrocarbons, nomenclature, reactions, principles of volumetric analysis derivation of equations, related problems, and applications wherever necessary are to be taught for I-Semester.

COURSE OUTCOME:

1. Make predictions about atomic structure and chemical properties of the elements based on their position in the periodic table
2. Identify the physical and chemical properties of common organic functional groups
3. Explain the physical properties of solids, liquids, gases and solutions
4. Classify the types of organic reactions and methods to determine organic reaction mechanism
5. Apply qualitative analysis to detect the functional groups experimentally

UNIT – 1

15 Hours

- 1.1 Quantum chemistry- wave nature of electron — Schrodinger wave equation [No derivation] – Significance of wave functions, ψ and ψ^2 – probability distribution of electrons (definition) – radial probability distribution curves (diagram). Quantum numbers – Planck's theory – Photoelectric effect-Compton effect- de Broglie's relationship – Heisenberg's uncertainty principle - Pauli's exclusion principle – Hund's rule– Aufbau's Principle.
- 1.2 Periodicity of properties – Definition and periodicity of the following properties – Atomic and ionic radii – factors affecting atomic and ionic radii. Diagonal relationship with examples – Summary of horizontal, vertical and diagonal relationships in the periodic table. Electronic configurations of elements – Stability of half – filled and completely filled orbitals.
- 1.3 Ionization potential – factors affecting ionization potential – Electron affinity-factors affecting electron affinity – Electronegativity – factors affecting electronegativity – Pauling scale – Mulliken electro negativity scale – Alfred and Rochow scale.

UNIT – II

15 Hours

- 2.1 Classification of organic compounds – Nomenclature of organic compounds – Functional groups – Homologous series – IUPAC recommendations for naming simple aliphatic – Alicyclic and aromatic compounds – Polyfunctional compounds – Heterocyclic compounds.
- 2.2 Basic concepts of bonding in organic chemistry – Hybridisation – geometry of molecules – Methane, Ethane, Ethylene, Acetylene and Benzene – Factors affecting covalent bond. Electron displacement affects – inductive –mesomeric – electromeric – resonance – hyperconjugation and steric effects.
- 2.3 Types of organic reactions – Cleavage of bonds - Homolytic and Heterolytic fission of carbon-carbon bond – Methods for determining reaction mechanism – Reaction intermediates – Structure and stability of Carbocations, Carbanions and Free radicals- 1,2 and 1,4 additions with mechanism .

UNIT – III

15 Hours

- 3.1 Gaseous state – Kinetic gas equation – derivation – Gas laws from the kinetic gas equation – Maxwell's distribution of molecular velocities [no derivation] – Effect of temperature on velocity distribution kinds of velocities – mean, RMS and most probable velocities.
- 3.2 Collision Diameter, Collision frequency, mean free path – transport properties- viscosity – thermal conductivity – diffusion – equipartition of energy – heat capacity on molecular basis- Boyle temperature – coefficient of compressibility and thermal expansion.
- 3.3 Real gases – Compressibility factor- van-der-Waal's equation (No derivation), Virial equation of state – significance of critical constant of a gas. Liquefaction of gases – Joule Thomson Effect – its coefficient and derivation. Inversion Temperature

UNIT – IV

15 Hours

- 4.1 Principles of Inorganic analysis – Reactions involved in the separation and identification of cations and anions in the analysis – Spot test reagents-Aluminon, Cupferon, DMG, Thiourea, Magneson, Alizarin and Nessler's reagent.
- 4.2 Semimicro techniques – Principles of acid-base equilibria – common ion effect – Solubility product and their applications in qualitative analysis.
- 4.3 Errors in Chemical Analysis – Accuracy, Precision, Types of error – Absolute -Relative error. Methods of eliminating errors. Methods of expressing Precision: Mean, Median,

Deviation, Average deviation and coefficient of variation. Significant figures and its application with respect to the glasswares used. Normal error curve and its importance

UNIT – V

15 Hours

- 5.1 Solid State – Laws of crystallography- Elements of symmetry - Crystal systems - Unit cell - Crystal lattices – crystal systems – unit cell – space lattice – Bravais’s lattices – Miller’s indices.
- 5.2 Simple cube, Body centered cube and face centered cube - structure of NaCl, CsCl, diamond and graphite. Electrical and Magnetic properties of metals. Band theory of metals, conductors, semiconductors and insulators and n & p type semiconductors
- 5.3 Liquid state – density – diffusion – Viscosity – vapour pressure-evaporation. Surface tension – effect of temperature on surface tension – parachor – definition and applications only – Coefficient of viscosity – effect of temperature – effect of pressure - Liquid crystals – classification and molecular arrangements

Text Books:

- ❖ Text book of Organic Chemistry by Arun Bahl & B.S. Bahl - S.Chand.
- ❖ Text book of Inorganic Chemistry by P.L. Soni – S. Chand.
- ❖ Principles of Physical Chemistry by Puri, Sharma – Vishal Publication.
- ❖ Advanced Organic Chemistry by Morrison & Boyd.
- ❖ Text book of Inorganic Chemistry by R.D. Madan

Reference Book

- ❖ Advance Organic Chemistry by I.L. Finar.
- ❖ Advance Inorganic Chemistry by J. D. Lee.
- ❖ Physical Chemistry by S.Glasstone.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
	CORE PRACTICAL 1	PRACTICAL I- INORGANIC QUALITATIVE ANALYSIS & COMPLEX PREPARATION	2	0

OBJECTIVE:

Analysis of Inorganic salt containing one anion and one cation. Semi-micro method using the conventional scheme to be adopted.

COURSE OUTCOMES:

1. Define chemistry as the study of the composition, structure, properties and reaction matter
2. Identify the methods and the instruments that can be used to study chemistry
3. Identify the methods and apparatus that can be used to find out ions in the solution
4. Analyse presence of anion and cation in the simple inorganic salt
5. Prepare the inorganic compounds using required chemicals

Inorganic qualitative analysis - I

Cations to be studied

Lead, Copper, Bismuth, Cadmium, Iron, Aluminium Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

Anions to be studied

Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

Preparation of Inorganic Compounds - I

1. Tetrammine copper II sulphate
2. Tris (thiourea) copper I chloride
3. Potassium trioxalato ferrate (II)

REFERENCE:

1. Basic Principles of Practical Chemistry.
V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu. S. Chand & Sons publications.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAPYAL11/ UABIAL11	ALLIED I	ALLIED CHEMISTRY I	5	5

(for I year B.Sc. Physics & Bio-Chemistry)

75 Hours

Objective: To learn the concepts of organic inorganic and physical chemistry.

Course outcome:

1. Gain the knowledge of extraction of metals from ores in metallurgical processes.
2. Analyse various periodic properties of elements.
3. Understand the concepts of inductive effect and resonance effect.
4. Acquire knowledge about optical isomerism and geometrical isomerism.
5. Describe the first order rate reaction and hydrolysis of ester.
6. Gain the knowledge of geometry of small molecules.
7. Differentiate between Homogeneous and heterogeneous catalysis.

UNIT – I

15 Hours

- 1.1 Extraction of Metal– types of ores – Ore Dressing– Types of Ore Dressing Gravity separation, Froth Floatation and Magnetic separation.-Calcination -Roasting
- 1.2 Reduction to free metal-Smelting-Refining of Metals – Types of Refining – Liquation, Electrolytic and Zone Refining. Extraction of copper and nickel.
- 1.3 Periodic properties – variation of atomic radii, ionic radii, ionization potential, electron affinity and electro negativity – factor influencing in the periodic table.

UNIT – II

15 Hours

- 2.1 Aromaticity – Conditions – Huckel's rule – aromaticity of benzene.
- 2.2 Cyclo-alkanes preparation properties of Cyclohexane – Bayers strain theory. Polarization – Inductive effect, mesomeric effect and steric effect - [Acidity and Basicity of organic compounds.
- 2.3 Stereo isomerism – Types, Causes of optical activity of Lactic acid and tartaric acid – Racemisation – Resolution – Geometrical isomerism – maleic and fumaric acid.

UNIT – III

15 Hours

- 3.1 Chemical Kinetics – Distinction between Order and Molecularity – derivation of First order rate equation – half life period of first order reaction – determination of rate constant of hydrolysis of ester.
- 3.2 Catalysis – catalyst – auto catalyst – enzyme catalyst – Promoters – catalytic poisoning – Active center – Distinction between homogeneous and heterogeneous catalysts – Industrial application of catalysts.
- 3.3 Photochemistry – Grothus Drapers law, Stark Einsteine's law – quantum yield – phosphorescence – fluorescence – chemiluminescence – photosensitization – Photosynthesis.

UNIT – IV

15 Hours

- 4.1 VSEPR Theory – Shapes of simple Molecules BF_3 , PCl_5 SF_6 and XeF_6 .
- 4.2 Naphthalene – Preparations, Properties and uses of Naphthalene – Structure of Naphthalene.
- 4.3 Phase Rule: Phase, Component, Degree of freedom, Phase Rule – Definition. One component system – Water system. Osmosis - Osmotic pressure – reverse osmosis – desalination of sea water.

UNIT – V

15 Hours

- 5.1 Nuclear Chemistry – Definition of Half life period – Group displacement law – Radioactive series. Nuclear Fission and Fusion – Applications of nuclear Chemistry in Medicine, agriculture and industries – ^{14}C dating.
- 5.2 Crude Oil – Petroleum – Petroleum Refining - Cracking – Applications of Cracking. Fuels – Calorific value of fuels – Non-conventional fuels – need of Solar energy – Applications – Bio-fuels.
- 5.3 Elements of symmetry – unit cell – crystal lattice – types of cubic lattice – one example for each.

Text Book:

- Allied Chemistry by Dr. S. Sundaram
- Allied Chemistry by R. Gopalan

Reference Book

- Advance Organic Chemistry by Bahl and ArunBahl. 19th Edition., 2005 - Sulthan Chand company, New Delhi.
- Principles of Inorganic Chemistry by B.R. Puri and L.R. Sharma. ShobanLalNagin Chand and Co. New Delhi 2000.
- Principles of Physical Chemistry by B.R. Puri, L.R. Sharma and S. Pathania. ShobanLalNagin Chand and Co. New Delhi 2001.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
	ALLIED PRACTICAL 1	Allied Chemistry Practical I	5	5

(for I year B.Sc. Physics & Bio-Chemistry)

Objective: to learn the techniques of Volumetric Analysis **30 Hours**

Course Outcome:

1. Acquire skill to determine the amount of substance present in the given solution volumetrically.
2. Able to prepare standard solutions of prescribed normality.

VOLUMETRIC ANALYSIS 1

1. Estimation of Sodium Hydroxide using std. Sodium Carbonate.
2. Estimation of hydrochloric acid using std. Sulphuric acid.
3. Estimation of Borax using std. Sodium carbonate.
4. Estimation of FeSO₄ using Std. Mohr Salt Solution.
5. Estimation of Oxalic acid using Std. KMnO₄ Solution.
6. Estimation of CuSO₄ using Std. K₂Cr₂O₇.

Reference Book:

1. Inorganic Quantitative Analysis by Vogel.

Practical Book:

2. Practical Book by Thomas.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACH2001	CORE 2	GENERAL CHEMISTRY II	5	5

OBJECTIVES:

75 Hours

Basic concepts regarding ionic bond, covalent bond, cyclo alkanes, dienes, thermochemistry, thermodynamics, derivation of equations, related problems, s-block elements, group study, polymerisation, mechanism and applications.

COURSE OUTCOMES:

1. Explain the behaviour of and interactions between, matter, and energy at the atomic and molecular levels
2. Determine ionic and covalent character of ions and molecules
3. Write the preparation, properties, acidity and uses of alkynes and cycloalkanes
4. Understand the principles of thermodynamics and types of systems and surroundings
5. Explain the properties of alkali metals and alkaline earth metals
6. Determine the bond dissociation energy, variation of heat of reaction with temperature using Kirchoff's equation

UNIT – I

15 Hours

- 1.1 Ionic bond – Electronic theory of valence – Conditions for the formation of ionic bond – General properties - Radius ratio rule and its limitations – Energetics of formation of NaCl from Na and Cl – Hydration energy and lattice energy and their applications – Born - Haber cycle. Fajan's rules – Characteristics of electrovalent compounds.
- 1.2 Valence bond theory – Conditions for the formation of covalent bond – General properties – Polarity of bonds – Orbital overlap - Bond lengths and bond energies – hybridization – sigma and pi bonds-Octet rule.
- 1.3 VSEPR theory geometries of BO_3^{3-} , NH_4^+ , ClF_3 , PCl_5 , IF_7 , and XeF_6 molecules – partial ionic character of covalent bond – percentage of ionic character.

UNIT – II

15 Hours

- 2.1 Molecular orbital concept of bonding (Linear combination of atomic orbitals (LCAO)). Sigma and pi-bonds, multiple bonding. Orbital designations: gerade, ungerade, (few examples) HOMO, LUMO. Orbital mixing: MO diagrams of H_2 , Li_2 , Be_2 , B_2 , C_2 , N_2 , O_2 , and their ions wherever possible; Heteronuclear molecular orbitals: CO, NO, NO^+ .

2.2 Bond properties: bond orders, bond lengths (Qualitative account and types). Metallic Bond: Qualitative idea of valence bond-Weak Chemical Forces: Hydrogen bonding-Non-Covalent forces:-Receptor-Guest interactions, Halogen bonds.

2.3 Alkanes – Methods of preparation of alkanes – Physical and chemical properties of alkanes – Mechanism of free radical substitution in alkanes - Cycloalkanes – Baeyer Strain theory -preparation using Wurtz's reaction – Dieckmann's ring closure and reduction of aromatic hydrocarbons – Substitution and ring opening reactions.

UNIT – III

15 Hours

3.1 Alkenes – Preparation and Properties of alkenes – Electrophilic and Free radical addition-Addition reactions of alkenes with hydrogen and halogens - Mechanism – Markownikoff's rule and Mechanism – hydrogen bromide [peroxide effect] and Mechanism – sulphuric acid – water .

3.2 Mechanism – hydroboration – ozonolysis – hydroxylation with KMnO_4 – allylic substitution by NBS - Epoxidation and Mechanism – Oxidation – reduction – Self-addition-Free radical addition – polymerization of dienes – Synthesis of dienes – 1,3 butadiene

3.3 Alkynes – Acidity of alkynes – Addition of hydrogen – Hydroboration – Hydrohalogenation – Addition of hypohalous acid - Hydration – addition of water with HgSO_4 catalyst – Addition of alcohols and carboxylic acids. Formation of acetylides – alkylation of alkynes with mechanism – oxidation with KMnO_4 – ozonolysis – Formation of benzene – Oxidative coupling – Isomerization.

UNIT – IV

15 Hours

4.1 Alkali metals – Li, Na, K, Rb and Cs – Occurrence – Comparative study of elements – oxides, halides, hydroxides and carbonates – Exceptional property of Lithium – Diagonal relationship of Li with Mg.

4.2 Alkaline earth metals – Be, Mg, Ca, Sr and Ba – Occurrence – comparative study of the elements with respect to oxides, hydroxides, halides, sulphates and carbonates - Exceptional property of Beryllium – Diagonal relationship of Be with Al – Comparison of alkaline earth metals with alkali metals – Magnesium resemblance with zinc.

- 4.3 Metallurgy- Occurance of metals in ore- Methods of Dressing of Ore – Gravity Separation, Magnetic Concentration, Froth Floating Process , Calcination , Roasting in Reverberator and Blast Furnace. Smelting, Purification process and Zone refining with examples.

UNIT – V

15 Hours

- 5.1 Thermodynamics – Definition and explanation of terms – System, boundary, surroundings – Homogeneous and heterogeneous system – Isolated ,Closed and Open system – Intensive and extensive properties –Independent and Dependent state variables - Thermodynamic functions – State and path functions-Enthalpy and internal energy- Exact and inexact differentials.
- 5.2 Thermodynamic processes – types of processes – cyclic – reversible – irreversible – isothermal – adiabatic- Definitions of Laws of Thermodynamics -concept of heat and work –Work done in isothermal and adiabatic process- Cyclic rule.
- 5.3 Thermochemistry – Heat of reaction – Exothermic and endothermic reaction – Calculation of ΔH from ΔE and vice versa – Thermochemical equations – bond dissociation energy – Calculation from thermochemical data - variation of heat of a reaction with temperature – Kirchoff's equation and its significance.

Text Book:

- ❖ Text book of Organic Chemistry by Arun,Bahl& B.S. Bahl- S.Chand.
- ❖ Text book of Inorganic Chemistry by P.L. Soni – S. Chand.
- ❖ Principles of Physical Chemistry by Puri, Sharma – Vishal Publication.
- ❖ Advanced Organic Chemistry by Morrison & Boyd.
- ❖ Text book of Inorganic Chemistry by R.D. Madan

Reference Book

1. Advance Organic Chemistry by I.L. Finar.
2. Advance Inorganic Chemistry by J.D. Lee.
3. Physical Chemistry by S.Glasstone.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACHPR21	CORE PRACTICAL 1	PRACTICAL I - INORGANIC QUALITATIVE ANALYSIS & COMPLEX PREPARATION	2	2

Objective:

Analysis of mixture containing two cations and two anions of which one will be an Interfering ion. Semi-micro methods using the conventional scheme to be adopted.

COURSE OUTCOME:

1. Identify the methods and apparatus that can be used to find out ions in the solution
2. Analyse presence of anions and cations in the mixture of inorganic salt qualitatively
3. Understand to eliminate interfering anionic radicals
4. Apply qualitative analysis to detect and separate as groups of metal ions

Inorganic qualitative analysis - II

Cations to be studied

Lead, Copper, Bismuth, Cadmium, Iron, Aluminium Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

Anions to be studied

Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

Preparation of Inorganic Compounds -II

1. Chloropentammine cobalt (III) chloride
2. Ferrous ammonium sulphate
3. Microcosmic salt

ACID RADICALS	20 Marks
BASIC RADICALS	20 Marks
PREPARATION	20 Marks
VIVA VOCE	05 Marks
RECORD	10 Marks
TOTAL	75 Marks

REFERENCE BOOKS:

1. Basic Principles of Practical Chemistry.
V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu. S. Chand & Sons publications.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAPYAL21/ UABIAL21	ALLIED 2	ALLIED CHEMISTRY II	5	5

(for I year B.Sc. Physics & Bio-Chemistry)

75 Hour

Objective: To learn concepts of organic, inorganic and physical chemistry.

Course Outcome

1. Gain the knowledge of industrial applications such as paints, matchstick and Fertilizers.
2. Gain knowledge about the biomolecules such as carbohydrates, amino acid, RNA and DNA.
3. Acquire knowledge about electrochemistry and its prevention.
4. Understand the action of drugs such as antibiotics, antiseptics, anesthetics.
5. Gain the knowledge of extraction techniques such as chromatography and their types.
6. Classify the various types of sugars and elucidate their structures.
7. Determine the equivalent conductance of electrolytes and perform conductometric titrations.

UNIT – I

15 Hours

- 1.1 Nomenclature of coordination compounds – Werner Theory of Coordination Compound – Chelation – Functions and structure of Haemoglobin and Chlorophyll.
- 1.2 Fertilizers and manures – Bio-fertilizers – Organic Manures and their importance – Role of NPK in plants – preparation and uses of Urea, Ammonium nitrate, potassium nitrate and super phosphate of lime.
- 1.3 Composition of Match sticks and match box – Industrial making of safety matches. Preparation and uses of chloroform, DDT, Gamhexane and Freon.

UNIT – II**15 Hours**

- 2.1 Classification – Structure of glucose – Properties and uses of starch – uses of Cellulose Nitrate – Cellulose acetate.
- 2.2 Classification of Amino Acids – preparation and properties of Glycine – Classification of Protein based on physical properties and biological functions. Primary and Secondary structures of protein [Elementary Treatment only] composition of RNA and DNA and their biological role.
- 2.3 Substitution reaction – Nitration, halogenation, sulphonation and Friedel crafts alkylation of benzene.

UNIT – III**15 Hours**

- 3.1 Specific and equivalent conductance – their determination – effect of dilution.
- 3.2 Kohlrausch's law – Determination of equivalent conductance of weak electrolyte– Conduct metric Titrations - HCl Vs NaOH and CH_3COOH Vs NaOH. Electrochemical corrosion and its prevention.
- 3.3 p^{H} and its determination by indicator method – Buffer solutions – Buffer action – importance of buffer in the living system – Derivation of Henderson equation.

UNIT – IV**15 Hours**

- 4.1 Paints – Pigments – Components of Paint – Requisites of a good paint. Colour and Dyes – Classification based on constitution and application.
- 4.2 Biological activities and deficiency, diseases of Vitamin A, B, C, D, E and K – Hormones – Functions of insulin and adrenalin.
- 4.3 Chromatography – Principles and application of Column, paper and thin layer chromatography.

UNIT – V**15 Hours**

- 5.1 Drugs - Sulpha Drugs – Uses and Mode of action of Sulpha Drugs – Antibiotics – Uses of Penicillin, Chloramphenicol, Streptomycin. Drug abuse and their implication.
- 5.2 General and Local Anaesthetics – Antiseptics – Example and their application. Definition and one example each for analgesics antipyretics, tranquilizers and sedatives - causes for diabetes, cancer and AIDS.
- 5.3 Colloids - Types and classification of colloidal system, Lyophilic and Lyophobic Sols – Dialysis, Electro-dialysis, Ultrafiltration. Emulsion – types – preparation.

References:

- Advance Organic Chemistry by Bahl and ArunBahl. 19th Edition., 2005 - Sulthan and Chand company, New Delhi.
- Principles of Inorganic Chemistry by B.R. Puri and L.R. Sharma. ShobanLalNagin Chand and Co. New Delhi 2000.
- Principles of Physical Chemistry by B.R. Puri, L.R. Sharma and S. Pathania. ShobanLalNagin Chand and Co. New Delhi 2001.
- P.L. Soni – “Text book of inorganic Chemistry. S. Chand & Co., New Delhi 1999.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UAPYAP21/ UABIAP21	ALLIED PRACTICAL 1	ALLIED CHEMISTRY PRACTICAL	5	5

30 Hours

Objective: To learn the techniques in Organic Analysis

Course Outcome:

1. Understand the techniques involve in analysis organic compounds.
2. Gain knowledge of functional group analysis such as aldehyde, ketone, phenol and carboxylic acid.
3. Acquire skill to analyse the presence of saturation, unsaturation and special elements such as nitrogen, sulphur, halogens in an organic compound.

ORGANIC ANALYSIS:

Reactions of aldehyde [aromatic], carbohydrate, carboxylic acid [mono and dicarboxylic], phenol, aromatic primary amine, amide and diamide. Systematic analysis of organic compounds containing one functional group and characterisation by confirmatory tests.

Reference Book:

1. Advance Practical Chemistry by R. Mukhopadhyay.

Practical Book:

1. Practical Book by Thomas.

Marks 75

1. Short procedure	05 Marks
2. Volumetric Titration	30 Marks
3. Organic Analysis	25 Marks
4. Viva-voce	05 Marks
5. Record	10 Marks
Total	75 Marks

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACH1001	CORE 1	INORGANIC CHEMISTRY I	6	5

OBJECTIVES: To make students acquainted with basics of crystallography, structure and bonding involved in Inorganic Chemistry and their basics.

COURSE OUTCOMES:

1. Solid State –Student becomes aware of solid state chemistry including the properties associated with it like electrical, magnetic and optical.
2. Becomes a bridged with knowledge of inorganic polymers including their properties, structure, type and applications.
3. Enlightened about metal clusters, types and bonding –Boron hydrides and Carboranes are also studied.
4. Factor affecting the stability of complexes Spectrometric/Polarographic and Potentiometric methods are included.
5. Stereochemical aspects are studied including ORD and CD.A knowledge of crown ethers/porphyrins/Schiff's bases is obtained.

UNIT I: THEORIES OF COORDINATION CHEMISTRY 18 Hours

1.1 Crystal field theory (CFT) – d orbital splitting in octahedral, tetrahedral and square planar complexes, Ligand field stabilization energy (LFSE), Spectrochemical series.

1.2 Spectral and magnetic characteristics of transition metal complexes, Jahn – Teller distortion, Limitations of CFT.

UNIT II: COORDINATION CHEMISTRY M.O. THEORY 18 Hours

2.1 Molecular orbital theory – evidence for Metal- Ligand orbital overlap, energy level diagrams; Nephelauxetic effect. Term states of d ions – term symbols, spin orbit coupling (LS coupling or RS coupling), d-d transition

2.2 Selection rules for transition, Orgel and Tanabe-Sugano diagrams. Charge transfer spectra – features and comparison with d-d spectra.

UNIT – III METAL CLUSTERS & BORON HYDRIDES 18 Hours

3.1 Metal clusters: Carbonyl clusters and halide clusters – upto tri-nuclear metal clusters, quadruple bond; naked clusters.

3.2 Boron hydrides: Polyhedral boranes, carboranes, metallocarboranes – preparation, properties and structure.

UNIT – IV COORDINATION CHEMISTRY

18 Hours

4.1 Stability of complexes – factors affecting the stability of complexes, thermodynamic aspects of complex formation, determination of stability constants – spectrophotometric, polarographic and potentiometric methods. SHAB approach – Pearson's principle,

4.2 Classification of Acids and Bases as Hard or Soft, Acid- Base Strength and Hardness and Softness, Symbiosis, Theoretical Basis of Hardness and Softness, Applications in metallurgy.

UNIT – V STEREOCHEMISTRY OF COORDINATION COMPOUNDS 18 Hours

5.1 Stereochemical aspects– Stereoisomerism in inorganic complexes, isomerism arising out of ligand conformation and absolute configuration of the complex, chirality and the nomenclature of the chiral complexes

5.2 Optical rotatory dispersion (ORD) and Circular Dichroism (CD). Macrocyclic ligands – Crown ethers, Porphyrins, Corrins, Cryptands and Schiff's bases.

Reference Book:

1. J.E. Huheey, Inorganic Chemistry – Principles, Structure and Reactivity, Harper Collins, New York, IV Edition (1993)
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry – A Comprehensive Text, John Wiley and Sons, V Edition (1988)
3. K.F. Purcell and J.C. Kotz, Inorganic Chemistry – WB Saunders Co., USA (1977)
4. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York (1974)
5. J.E. Huheey, Inorganic Chemistry, Harper Collins NY IV Edition, (1993)
6. G.S. Manku, Inorganic Chemistry (1984)
7. D.F. Shriver, Pw. Atkins and C.H. Langford, Inorganic Chemistry, OUP (1990)

Recommended Books

1. N.N. Greenwood and Earnshaw, Chemistry of the Elements, Pergamon Press, New York (1984)
2. E.L. Muetterties, Polyhedral Boranes, Academic Press, New York (1975)
3. N.H. Ray, Inorganic Polymers, Academic Press, (1978)
4. S.F.A. Kettle, Coordination Chemistry, EIBS (1973)
5. K. Burger, Coordination Chemistry, Butter Worths (1973)
6. F. Basolo and R.G. Pearson, Mechanism of Inorganic Reaction, Wiley NY (1967)
7. R. Sarkar, General and Inorganic chemistry, (Parts I and II), New Book Agency, Calcutta.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACH1002	CORE 2	ORGANIC CHEMISTRY - I	5	5

OBJECTIVE:

To learn the concepts of stereochemistry, and execute conformational analysis and their application in the determination of reaction mechanism. To understand the mechanism of nucleophilic and electrophilic substitution reactions and synthesise simple molecules.

COURSE OUTCOMES:

1. Identify and classify the chiral molecules and interconvert their different projections.
2. Analyse the different conformations of cyclohexyl and decalin systems.
3. Carry out the nucleophilic substitution reactions in aliphatic compounds.
4. Synthesis simple starting materials by electrophilic and nucleophilic substitution reactions.
5. Determine the mechanism of reactions by kinetic and non kinetic methods.

UNIT I – STEREOCHEMISTRY

18 Hours

1.1 Optical activity and chirality, Classification of chiral molecules as asymmetric and dissymmetric. A brief Study of dissymmetry of allenes, biphenyls, spirocompounds, ansa compounds, trans cyclooctene and cyclononene, absolute configuration –R, S notation of biphenyls and allenes. Fischer projection. Inter conversion of Sawhorse, Newman and Fischer projections. Molecules with more than one asymmetric center (restricted to five carbons). e.g. Erythro and threo compounds. Asymmetric synthesis. Cram's rule.

1.2 Geometrical isomerism, E, Z - nomenclature of olefins, geometrical isomerism of oximes, Geometrical and optical isomerism (if shown) of disubstituted cyclopropane, cyclobutane and cyclopentane. Stereo specific and stereo selective reactions, Identification of enantiotopic, homotopic, diastereotopic hydrogens and Prochiral compounds in carbon compounds.

UNIT II – CONFORMATIONAL ANALYSIS

18 Hours

2.1 Conformation of some simple 1, 2 – disubstituted ethane derivatives. Conformational analysis of disubstituted cyclohexane. Conformation of substituted cyclohexanol, cyclohexanone and cyclohexane carboxylic acid derivatives.

2.2 Conformation of fused ring decalins and stereochemistry of cis and trans decalin and 9 – methyl decalin.

UNIT III – ALIPHATIC NUCLEOPHILIC SUBSTITUTION REACTION

18 Hours

3.1 S_N1 , S_N2 and S_Ni mechanisms – Ion pairs in S_N1 mechanism- Neighbouring group mechanism – reactivity, structural and solvent effects – substitution in norbornyl and bridgehead systems – substitution at carbon doubly bonded to oxygen and nitrogen – alkylation and acylation of amines, halogen exchange, Von-Braun reaction, alkylation and acylation of active methylene carbon compounds, hydrolysis of esters, Williamson reaction, transesterification, Claisen and Dieckmann condensation.

3.2 Nucleophilic substitution at allylic carbon, allylic rearrangements, S_N1 , S_N2 , S_Ni , ambident nucleophile, and ambident substrates

3.3 S_E1 , S_E2 and S_Ei mechanism, double bond shift – Reactivity. Migration of double bond, keto-enol interconversion, HVZ reaction, Stark-Enamine reaction, halogenation of aldehydes and ketones and decarboxylation of aliphatic acids.

UNIT IV – AROMATIC ELECTROPHILIC SUBSTITUTION REACTIONS

18 Hours

4.1 The arenium ion mechanism. Orientation and reactivity (ortho, meta and para directing groups). Typical reactions – nitration, halogenation, alkylation, acylation and diazonium coupling, Formylation, Reimer – Tieman reaction, Vilsmeier – Haack, Gattermann, Gattermann – Koch, Kolbe reaction.

4.2 Synthesis of di and tri substituted benzene (symmetrical tribromo benzene, 2-amino 5-methylphenol, 3-nitro 4-bromobenzoic acid, 3, 4-dibromonitrobenzene, 1,2,3 – trimethylbenzene, 2,4,6, trimethylbenzaldehyde) starting from benzene or any monosubstituted benzene.

4.3 Electrophilic substitution reactions of furan, pyrrole, thiophene and pyridine-N-oxide. Orientation and reactivity in benzofuran, indole, benzothiophene, quinoline and isoquinoline

UNIT V AROMATIC NUCLEOPHILIC SUBSTITUTIONS & DETERMINATION OF REACTION MECHANISM

18 Hours

5.1 Methods for the generation of benzyne intermediate and reactions of arynes intermediate. Nucleophilic substitution involving diazonium ions. Aromatic Nucleophilic substitution of activated halides. Ziegler alkylation. Chichibabin reaction. Nucleophilic substitution reactions of furan, pyrrole, thiophene and pyridine.

5.2 Kinetic and non-kinetic methods of determining organic reaction mechanism. Hammett and Taft equations – Simple Problems.

RECOMMENDED BOOKS

1. Organic Synthesis by R.O.C. Norman, Chapman and Hall, NY, (1980)
2. Physical Organic Chemistry by Niel Isaacs, ELBS Publications (1987)
3. Organic Reaction Mechanism by S.M. Mukherji and S.P. Singh, MacMillan India Ltd., Chennai (1990)
4. Organic Chemistry IV Edition by Stanley Pines
5. Structures and Mechanism by E.S. Gould
6. Advanced Organic Chemistry, Part A and B, by Francis A. Carey and Richard J. Sundberg, 3rd Edition (1990), Plenum Press.
7. Aromatic Nucleophilic Substitution by J. Miller
8. Advanced Organic Chemistry III Edition by J. Miller
9. Reactive Molecules, C. Wentrup, John Wiley and Sons, New York (1984)
10. Advanced organic reaction mechanism and structure by J. March, Tata McGraw Hill.
11. Stereochemistry, Conformation analysis and Mechanism by P.S. Kalsi, 2nd Edition (1993), Wiley Eastern Limited, Chennai.
12. Stereochemistry of carbon compounds by Ernest Eliel.
13. Heterocyclic chemistry by Joule & Mills – 5th edition.

Reference Books:

1. Organic Chemistry, Marc London
2. Organic Chemistry, Mc Murray
3. Organic Chemistry, Graham Solomons
4. Carbenes, Nitrenes and Arynes by T.L. Gilchrist and C.W. Rees, Thomas Nelson and Sons Ltd., London.
5. Stereochemistry and Mechanism through solved problems by P.S. Kalsi. Wiley Eastern Ltd., (1994)
6. Basic principles of Organic Stereochemistry by P. Ramesh – Madurai Kamaraj University.
7. Organic Reaction Mechanism by R.K. Bansal.
8. A Guide book to mechanism in organic chemistry by Longman.
9. Structure and mechanism in organic chemistry by C.K. Ingold, cornell University press.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACH1003	CORE 3	PHYSICAL CHEMISTRY I	6	4

OBJECTIVE:

To learn the chemical potential and its significance. To study the effect of temperature on reaction rate. To study the elements of group theory and the applications of group theory.

COURSE OUTCOMES:

1. Gain knowledge and understand the concept of partial molar properties, fugacity and their determination.
2. Illustrate the thermodynamics of real systems and the concept of activity and activity coefficient.
3. Describe the collision theory, ARRT theories of chemical kinetics, Bjerrum -Bronsted equation and linear free energy relationships.
4. Acquire knowledge about the symmetry operations, point groups, representations and character tables.
5. Analyze the hybrid orbitals of non-linear molecules and electronic spectra of ethylene and formaldehyde.

UNIT I – THERMODYNAMICS-I

18 Hours

1.1 Partial molar properties-Partial molar free energy (Chemical potential) – Chemical potential and Gibb's Duhem equation. Chemical potential of mixture of gases - Partial molar volume - Partial molar enthalpy and partial molar entropy – Significance of partial molar properties – Determination of partial molar quantities - Variation of chemical potential with temperature and pressure.

1.2 Concept and definition of fugacity –Methods of determination of fugacity of real gases - variation of fugacity with temperature and pressure – Determination of fugacity in gas mixtures- –Lewis – Randall rule.

UNIT II –THERMODYNAMICS-II

18 Hours

2.1 Thermodynamics of real gases- Thermodynamics of ideal and non-ideal binary solutions - Vapour pressure curves of non ideal solution with positive and negative deviations.

2.2 Excess functions – Excess chemical potential, excess Gibb's free energy, excess entropy , excess enthalpy and volume - Determination of excess enthalpy and excess volume.

2.3 The concept of activity and activity coefficients in liquid solutions and its significance–determination of standard free energies – choice of standard states – gases, liquid solvent and

solute - Determination of activity and activity coefficients for non electrolytes by vapour pressure measurements.

UNIT III –CHEMICAL KINETICS

18 Hours

3.1 Effect of temperature on reaction rates – collision theory of reaction rate –Test of collision theory – effectiveness of collisions – Steric factor – Weakness of collision theory and its causes.

3.2 Absolute reaction rate theory (ARRT) - Statistical mechanical derivation of reaction rate – thermodynamic formulation of reaction rate - Eyring equation - ARRT theory to simple unimolecular and bimolecular processes- Significance of enthalpy of activation and entropy of activation

3.3 Potential energy surfaces – kinetic isotopic effects - Reactions in solutions – effect of dielectric constant and ionic strength on reactions in solutions – Bjerrum – Bronsted equation – Linear free energy relationships – Hammett and Taft equations.

UNIT IV– ELEMENTS OF GROUP THEORY

18 Hours

4.1 Symmetry elements and symmetry operations – Groups – rules for forming a group, cyclic group - abelian group- sub group - Finite and infinite groups- group multiplication table – similarity transformation and classes

4.2 Identifications of symmetry operations and determination of point groups – Matrix representations - reducible and irreducible representations – Great Orthogonality theorem (GOT) – Properties of Irreducible representations– construction of character table for C_{2v} and C_{3v} point groups.

UNIT V – APPLICATIONS OF GROUP THEORY

18 Hours

5.1 Direct product representation and its applications- The standard Reduction formula - hybrid orbitals in non linear molecules (CH_4 , BF_3 , SF_6 and NH_3) - Determination of representations of vibrational mode analysis in non linear molecules (H_2O , CH_4 , BF_3 , and NH_3).

5.2 Symmetry selection rules of infra-red and Raman spectra – application of group theory to the electronic spectra of ethylene and formaldehyde - Symmetry Adapted Linear Combination (SALC) procedure- Symmetry factors of secular determinant and its applications to butadiene.

TEXT BOOKS

1. S.Glasstone, Thermodynamics For Chemists, Affiliated East West Press, New Delhi, 1950.
2. J.Rajaram and J.C.Kuriacose, Thermodynamics For Students Of Chemistry, LalNaginChand, New Delhi, 1986.
3. G.K.Vemulapalli, Physical Chemistry, Prenticall-Hall, 2000.
4. Thomas Engel and Philp Reid, Physical Chemistry, Pearson Education, 2006.

5. J.Rajaram and J.C.Kuriacose, Kinetics And Mechanism Of Chemical Transformations. Macmillan India Ltd, 1993.
6. K.J.Laidler, Chemical Kinetics, Harpet And Row, New York, 1987.
7. K.L.Kapoor, A text Book Of Physical Chemistry Macmillan India Ltd, 2001.
8. V.Ramakrishnan and M.S.Gopinathan, Group Theory In Chemistry, Vishal Publications, 1998.
9. K.V.Raman, Group Theory and It's Applications To Chemistry, TataMcgraw Hill Publishing, Co, 1990.
10. Bhattacharya: Group Theory And It's Applications.
11. Veerareddy, Symmetry and Spectroscopy of Molecules. New age International Publishers. 2016

SUGGESTED REFERENCE BOOKS

1. W.J.Moore Chemistry, Orient Longman, London. 1972.
2. K.G.Denbiegh, Thermodyanamics Of Steady State, Methien And Co.Ltd, London, 1951.
3. L.K. Nash, Elements Of Chemical Thermodyanamics, Addison Wesley, 1962.
4. G.M.Barrow, Physical Chemistry, Mcgraw Hill, 1988.
5. R.G.Frost and Pearson, Kinetics And Mechanism, Wisely, New York, 1961.
6. C.Capellos and B.H.J.Bielski, Kinetics Systems, Wisely Interscience, New York, 1972.
7. Amdur and G.G.Hammes, Chemical Kinetics, Principles And Selected Topics, McgrawHill, New York, 1968.
8. G.M.Harris, Chemical Kinetics, D.C.Health And Co., 1966.
9. F.A.Cotton, Chemical applications of Group Theory, John Wiley And Sonsinc., New York, 1971.
10. N.Thinkham, Group Theory and Quantum Mechanics, McGraw Hill Book Company, New York, 1964.
11. Strietweiser, Molecular Orbital Theory For Organic Chemists John Wiley And Sons, New York, 1961.
12. D.S.Schonland, Molecular Symmetry, Vannorstrand, London, 1965.
13. Alan Vincent, Molecular Symmetry and Symmetry And Group Theory-Programme Introduction To Chemical Application, Wiley, New York, 1977.
14. Sandony, Electronic Spectra And Quantum Chemistry, Prentice Hall, 1964.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACHPR11	CORE PRACTICAL 1	ORGANIC PRACTICAL I	6	4

Objective: To learn the techniques in the preparation of simple organic molecules. To extract a few natural products and analyse organic compounds by spectral and chromatographic methods.

COURSE OUTCOMES:

1. Prepare the organic compounds by single stage preparations.
2. Extract the natural products from common natural sources.
3. Identify the groups in an organic molecule by IR and UV VIS spectrometers.
4. Analyse the purity of organic compounds by chromatographic techniques.

1) Any Six preparations from the following

- (i) Preparation of o-benzyl benzoic acid
- (ii) p-Nitrobenzoic acid from p-nitrotoluene
- (iii) Anthraquinone from anthracene
- (iv) Benzhydrol from Benzophenone
- (v) m-Nitroaniline from m-dinitrobenzene
- (vi) 1,2,3,4 – Tetrahydrocarbazole from cyclohexanone
- (vii) p-chlorotoluene from p-toluidine
- (viii) 2,3 – Dimethylindole from phenyl hydrazine and 2 – butanone
- (ix) Methyl orange from sulphanilic acid
- (x) Diphenyl methane from benzyl chloride

2) A) Extraction.

- (i) Caffeine from Tea Dust,
- (ii) Lactic Acid from Milk
- (iii) Citric Acid from Lemon
- (iv) Rose acid from Rose

(OR)

B) Instrumental Analysis. (Any one of the following)

- i) Identification of Chromophores using FTIR/ UV Spectroscopy
- ii) Analysing simple organic substances using Gas Chromatography.
- iii) Analysing the purity of the prepared organic compounds given in the section-1 using TLC and Column Chromatography.

Preparation	25 Marks
Recrystallisation	10 Marks
Extraction or Inst. Analy	20 Marks
Practical Viva	10 Marks
Record	10 Marks
Total	75Marks

REFERENCE:

1. Practical Organic Chemistry by Vogel.

RECOMMENDED BOOKS

1. Practical Organic Chemistry by Gnanaprakasam.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACHEP11	ELECTIVE PRACTICAL 1	COLORIMETRY & KINETIC STUDIES	6	4

Objective: To learn Inorganic Complex preparation and Colorimetric techniques and to study the experiments in chemical equilibrium and chemical kinetics.

COURSE OUTCOME:

- Acquires the practical knowledge of preparation of Various Inorganic complexes.
- Analyse the colorimetric analysis of Iron, Nickel, Manganese and Copper.
- Acquires the practical knowledge of determining relative acidity and thermodynamic parameters using kinetic studies.
- Analyse the kinetic of inversion of sucrose by polarimetry technique.
- Describes the second order and Zero order reaction by kinetic methods.

I) Preparation of the following:

- Potassium tris (oxalato) aluminate (III) trihydrate
- Tris (thiourea) copper (I) chloride
- Potassium tris (oxalato) chromate (III) trihydrate
- Sodium bis (thiosulphato) cuprate (I)
- Tris (thiourea) copper (I) sulphate
- Sodium hexanitrocobaltate (II)
- Chloropentammine cobalt (III) chloride
- Bis (acetylacetonato) copper (II)
- Hexammine nickel (II) chloride
- Bis (thiocyanato) pyridine manganese (II)

II) Colourimetric analysis of Iron, Nickel, Manganese and Copper

- Using 1,10 Phenanthroline - Suggestion
- Flame Photometry – Suggestion

III) **Kinetics Studies**

- Determination of the relative acidity of two different acids by studying the kinetics of hydrolysis of ester in presence of acid.
- Determination of the temperature coefficient and Activation energy of hydrolysis of Ethyl Acetate.
- Determination of the relative strengths of the two given acids by studying the kinetics of inversion of sucrose in presence of acid using Polarimeter.
- Study of the kinetics of persulphate oxidation.

5. Study of the kinetics of Iodination of Acetone.
6. Freundlich Adsorption isotherm of adsorption of oxalic acid on charcoal

Total: 75 Marks

1. Practical	55 Marks
2. Viva-Voce	10 Marks
3. Record	10 Marks

RECOMMENDED BOOK:

1. Qualitative Inorganic Analysis by V.V. Ramanujam
2. Practical Inorganic Chemistry by Vogel.
3. Physical Practical Experiments by Palit.
4. Advance Practical Chemistry by R. Mukhopadhyay& P. Chatterjee.
5. Advanced Practical Physical Chemistry by J.B Yadav
6. Practical Physical Chemistry by B. Viswanathan& P.S. Raghavan

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACHEP12	ELECTIVE PRACTICAL 2	APPLIED CATALYSIS	6	4

OBJECTIVES: To make students acquainted with basics of catalysis, and its biological importance.

COURSE OUTCOMES:

- 1) Analyse the theories of unimolecular, bimolecular reaction kinetics and their significance.
- 2) Illustrates the Gibbs free energy of activation and theories of homogenous catalysis.
- 3) Describe the theories and kinetics of heterogenous catalysis.
- 4) Explains the laws of photochemistry, actinometry and photochemical applications.
- 5) Gains knowledge about enzyme catalysis and its different theories.

UNIT – I REACTION RATES

18 Hours

1.1 Collision theory of reaction rate – molecular beams – collision cross sections – effectiveness of collisions – Steric factor – Limitations of collision theory. Significance of enthalpy of activation and entropy of activation

1.2 Absolute reaction rate theory (ARRT), activated complex theory to simple unimolecular and bimolecular processes - Eyring equation Comparison of ARRT theory and collision theory.

1.3 Theories of unimolecular reactions – Perrins theory – Lindermann's theory – Formulation of Lindermann's theory – criticism on Lindermann's theory – Hinshelwoods theory – Slater treatment.

UNIT – II HOMOGENEOUS CATALYSIS

18 Hours

2.1 Theory of Homogeneous catalysis – Function of catalyst in terms of Gibbs Free Energy of activation .Concepts of acidity – Bronsted – Lewis acids - Concept of base – Bronsted – Lewis bases - Acid – Base catalysis.

2.2 Types of Acid – Base catalysis –Kinetics of Acid – Base catalysis – Effect of pH on reaction rate – Catalytic coefficient - Hammett and Bronsted Equation – Acidity Function – Advantage and disadvantages of homogeneous catalysts.

UNIT – III HETEROGENEOUS CATALYSIS

18 Hours

3.1 Theory of Heterogeneous catalysis – Quantitative treatment of adsorption – Kinetics of Heterogeneous reactions – influence of pressure on reaction rate – Retarded reactions.

3.2 Effect of temperature on Heterogeneous reactions -Absolute rate theory in Heterogeneous gas reactions - Metal and metal oxide catalyst – Metal oxide supported catalyst, polymer supported catalyst. Solid acid and base catalyst

UNIT – IV PHOTO CATALYSIS

18 Hours

4.1 Light absorption- laws of photochemistry- quantum yield – Standardization of light sources – Determination of quantum yield – Actinometry – chemical actinometry

4.2 Photo sensitization – Photo electro chemical cell – Photo isomerization - Photo assisted electrolysis of water - photo chemical applications - Environmental Pollution control and dye degradation using photo catalysis

UNIT – V ENZYME CATALYSIS

18 Hours

5.1 Enzyme catalysis – Enzymatic reactions of biological importance - Advantages of enzyme catalysis - Reaction specificity – Theory of Enzyme catalysis – Lock and key theory - Mechanism of enzyme catalysis – Coenzyme - Factors influencing enzyme action – temperature, pH, Enzyme activators – enzyme inhibitors - enzyme concentration and substrate concentration.

5.2 Michaelis – Menton Equation – V_{max} and half V_{max} – turnover number - and Lineweaver – Burk method– Eadie –Hofstee method.

Text Books:

1. K.J. Laidler, Chemical Kinetics, IIIrd edn., Harper and Row publisher, New York, 1987.
2. B.Viswanathan, Catalysis: Principles and application, Narosa Publ., New Delhi 2004.
3. V. Ramamurthy, Photochemistry in organized and constrained media, VCH Edn. New York, 1991.
4. Roghatgi Mukherjee Fundamentals of Photo chemistry

Reference Books:

1. V. Murugesan, Recent trends in catalysis, Narosa Publ., New Delhi, 2004.
2. K. Kalyanasundara, Photochemistry in microheterogenous systems, Academic Press, New York, 1987.
3. Samuel H. Maron, Principles of Physical Chemistry, Mac Millan, Publ., New York 1972.
4. E. Conn and K. Stump, Outlines of Biochemistry, John Wiley and Sons, 1987.
5. FriedlichLiebau, Structural Chemistry of Silicates, Springer – Verlag, Berlin, 1985.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACH2001	CORE 4	INORGANIC CHEMISTRY II	5	5

OBJECTIVES:

To make the students acquaint themselves with Nuclear Chemistry now-how, Stellar and cosmic phenomenon and also about coordination and bonding in transition metals and other compounds

COURSE OUTCOME:

1. The students became aware of theory of coordination including Crystal Field Theory and its limitation .
2. The Molecular orbital theory of complexes is known with a knowledge of term states and coupling.
3. Electron transfer reaction is known including Marcus theory and their effect of leaving/entering groups. Trans effect is learned.
4. The origin of nuclear forces in the universe and background of radiation and detection was imparted.
5. Different types of nuclear reaction Q-value of α , β , γ , δ and ϵ process related to nucleus of an atom is studied. Medical application of nuclear chemistry is also learned.

UNIT – I SOLID STATE

18 Hours

1.1 Structure of solids – Comparison of X-ray and Neutron Diffraction. Structure of Cadmium Iodide, Nickel Arsenide, Rutile, Fluorite & antiferite, Wurtzite structures, Spinels and Inverse Spinels.

1.2 Defects in solids (Frenkel, Schottky). Non-stoichiometric compounds. Electrical, Magnetic and Optical properties of solids- Band theory of semi-conductors, Organic Semiconductors (basic example),

1.3 Solid state lasers. Types of magnetic behaviour – dia, para, ferro, antiferro and ferrimagnetism. Hysteresis. Magnetic Susceptibility and measurements – Guoy and Faraday methods.

UNIT – II STRUCTURE AND BONDING

18 Hours

2.1 Polyacids: Isopolyacids and heteropolyacids of Vanadium, Chromium, Molybdenum and Tungsten – properties and structure.

2.2 Inorganic polymers: General properties, Phosphorous based polymers – polyphosphazenes ;Sulphur based polymers – Sulphur Nitrides – synthesis, structure and applications.

2.3 Silicates: Types, structure, properties and applications; Molecular sieves. Inorganic phosphors, Ferrites, Garnets.

UNIT III: COORDINATION CHEMISTRY REACTION MECHANISM 18 Hours

3.1 Electron transfer reactions – outer and inner sphere mechanisms, atom transfer reactions, precursor and successor complexes, Marcus theory, bridging ligands, complementary and non-complementary electron transfer reactions.

3.2 Substitution reactions in square planar complexes –mechanism of substitution, Trans effect, Cis effect, effect of Entering and Leaving ligands and the effect of metal ions on the rate of Substitution, theory and applications of Trans effect.

UNIT IV: NUCLEAR CHEMISTRY – I 18 Hours

4.1 Nuclear properties – Nuclear spin and Moments, origin of nuclear forces, Quark Theory for sub-atomic particles. Salient features of the Liquid Drop and Shell models of the nucleus.

4.2 Modes of radioactive decay: Orbital electron capture; nuclear isomerism, internal conversion Isomeric Transition, detection and determination of activity by cloud chamber, Nuclear emulsion, Bubble chamber, G.M. counter Scintillation and Cherenkov counters.

4.3 Compound Nucleus theory, high energy nuclear reactions, nuclear fission and fusion reactions as energy sources: direct reactions:

UNIT V: NUCLEAR CHEMISTRY – II 18 Hours

5.1 Nuclear Reaction types, reaction, cross section, Q-value, threshold energy,Stellar energy: synthesis of elements, Hydrogen burning, Carbon burning. Photonuclear and Thermo nuclear reactions. Szilard Chalmers reaction. The e, s, r, p and x processes.

5.2 Nuclear reactors: fast breeder reactors, particle accelerators, cyclotron and synchrotron.

5.3 Radio analytical methods: Isotope dilution analysis, Radiometric titrations, Radio immuno assay, Neutron activation analysis.

REFERENCE BOOKS:

1. J.E. Huheey, Inorganic Chemistry – Principles, Structure and Reactivity, Harper Collins, New York, IV Edition (1993)
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry – A Comprehensive Text, John Wiley and Sons, V Edition (1988)
3. K.F. Purcell and J.C. Kotz, Inorganic Chemistry – WB Saunders Co., USA (1977)
4. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York (1974)

5. J.E. Huheey, Inorganic Chemistry, Harper Collins NY IV Edition, (1993)
6. G.S. Manku, Inorganic Chemistry (1984)
7. D.F. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, OUP (1990)
8. N.N. Greenwood and Earnshaw, Chemistry of the Elements, Pergamon Press, New York (1984)
9. E.L. Muetterties, Polyhedral Boranes, Academic Press, New York (1975)
10. N.H. Ray, Inorganic Polymers, Academic Press, (1978)
11. S.F.A. Kettle, Coordination Chemistry, EIBS (1973)

RECOMMEND BOOKS:

1. K. Burger, Coordination Chemistry, Butterworths (1973)
2. F. Basolo and R.G. Pearson, Mechanism of Inorganic Reaction, Wiley NY (1967)
3. R. Sarkar, General and Inorganic chemistry, (Parts I and II), New Book Agency, Calcutta.
4. H.J. Arnikar, Nuclear Chemistry, Wiley Eastern Co., II Edition, 1987.
5. S. Glasstone, Source Book on Atomic Energy, Van Nostrand Co., 1969
6. G. Frieslander, J.W. Kennedy and J.M. Miller, Nuclear and Radiochemistry, John Wiley and Sons, 1964.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACH2002	CORE 5	ORGANIC CHEMISTRY II	6	5

OBJECTIVE: To learn the various types of reactions, rearrangements and their synthetic utility.

COURSE OUTCOMES:

1. Carry out the electrophilic and nucleophilic addition over multiple bonded organic molecules.
2. Execute the elimination reactions and establish the stereochemistry of products.
3. Synthesis simple molecules by rearrangement reactions.
4. Interconvert organic molecules by oxidation and reduction reactions.
5. Establish and propose the mechanism of organic reactions.

UNIT I – ADDITION TO CARBON – CARBON AND CARBON –HETERO MULTIPLE BONDS

18 Hours

1.1 Electrophilic, nucleophilic, and Free radical addition mechanisms – addition of halogen and nitrosyl chloride to olefins. Hydration of olefins and alkynes, hydroxylations, Hydroboration, Diels-Alder reaction.

1.2 Aldol condensation, knovenagal condensation, Ene synthesis, Michael addition, 1, 3 – dipolar additions – Simmon and Simmon Smith reaction. Mannich reaction, Stobbe condensation, Darzen, perkin, Wittig, Reformatsky and Benzoin reactions. Stereochemical aspects to be studied wherever applicable.

UNIT II – ELIMINATION REACTIONS

18 Hours

2.1 E₁, E₂ and E₁CB mechanism – E₁, E₂ and E₁CB spectrum –comparison between E₁,E₂ and E₁cb reactions, PyrolyticEi- elimination, Orientation of the double bond – Hoffman and Saytzeff rules – Competition between elimination and substitution.

2.2 Typical eliminations reactions. Dehydration of alcohols, dehydrohalogenation and dehalogenation, Peterson elimination. Stereochemistry of E₂ eliminations in cyclohexane systems. Mechanism of pyrolytic eliminations. Chugaev and Cope eliminations.

UNIT III – MOLECULAR REARRANGEMENTS

18 Hours

3.1 A detailed study with suitable examples of the mechanism of the following rearrangements: Pinacol – Pinacolone (examples other than tetramethylethyleneglycol) – Wittig-Wagner – Meerwein, Demjanov, dienone – phenol rearrangement.

3.2 Favorski, Baeyer – Villiger, Wolf, Stevens (in cyclic systems) and Von Richter rearrangements. Lossen, Curtius, Hoffmann, Bechmann, Claisen and Ortho claisen rearrangements.

UNIT IV – OXIDATION

18 Hours

4.1 Mechanism – study of the following oxidation reactions – oxidation of alcohols – use of DMSO in combination with DCC or acetic anhydride in oxidising alcohols – oxidation of methylene to carbonyl, oxidation of aryl methanes – allylic oxidation of olefins.

4.2 Formation of C=C, C-C bonds by dehydrogenation, dehydrogenation by quinones, oxidations with SeO_2 , $\text{Hg}(\text{OAc})_2$ and $\text{Pb}(\text{OAc})_4$, DESS- MARTIN reagents. Formation of C-C bond in phenol coupling –acetylene coupling-allylic oxidation-oxidation of alcohol, glycols, halides and amines to aldehydes and ketones- Ozonolysis-oxidation of Olefinic double bonds and unsaturated carbonyl compounds Epoxidation-enantioselective hydroxylation of olefenes-oxidative cleavage of C-C bond.

UNIT V – REDUCTION, CARBENES AND NITRENES

18 Hours

5.1 Reduction :Enantioselective hydrogenation of olefenes. Selectivity in reduction 4-t-butylcyclohexanone using selective hydride reducing agents- Selectrides – Synthetic importance of Clemmenson and Wolf-Kishner reductions – Modification of Wolff-Kishner reduction

5.2 Birch reduction, MPV reduction. Catalytic hydrogenation, Sommelet reaction. Reduction with LiAlH_4 , NaBH_4 , tritertiarybutoxyaluminium hydride, sodium Cyanoborohydride, trialkyltinhydride,Hydrogen transfer from diimides and hydrazines.Carbenes and nitrenes : Methods of generation, structure, addition reactions with alkenes –insertion reactions.

RECOMMENDED BOOKS

1. Principles of organic synthesis R.O.C. Norman, Chapman and Hall, London. 1980.
2. Structure and Mechanism by E.S. Gould
3. Advanced Organic Chemistry – Part B by Francis A. Carey and Richard J, Sundberg, 3rd Edition 1990.
4. Organic Reaction Mechanism by S.M. Mukherji and S.P. Singh, MacMillan India Ltd., Chennai – 1990.
5. Organic synthesis by Michael Smith.
6. Carbenes, Nitrenes and Arynes by T.L. Gilchrist and C.W. Rees, Thomas Nelson and Sons Ltd., London.
7. Molecular Rearrangements Vol-I and Vol-II by Paul de Mayo.
8. Advanced Organic Chemistry III Edition by J. March.

REFERENCE BOOKS

1. Stereochemistry and Mechanism through solved problems by P.S. Kalsi, Wiley Eastern Ltd., 1994.
2. Some Modern Methods of Organic Synthesis by W Carruthers, III Edition, Cambridge University Press, 1993.
3. Modern Synthetic Reactions by H.O. House, The Benjamin Cummings Publishing Company, London, 1972
4. Advanced organic chemistry, Mc Murray, Thomas Pvt. Ltd.,
5. Organic reaction mechanisms: Parmer and Chawla, S. Chand and Co.,

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACH2003	ELECTIVE I	PHYSICAL CHEMISTRY II	6	4

OBJECTIVE:

To study the different types of molecular spectroscopy, and kinetics of complex reactions. To study the fundamental principles of Quantum Chemistry, Schrodinger wave equation and its applications.

COURSE OUTCOMES:

The students will be able to

1. Explain the principles of vibrational, rotational spectroscopy of poly and diatomic molecules, Raman spectroscopy and rule of mutual exclusion principle.
2. Distinguish physisorption and chemisorptions and understands the Langmuir, BET and Gibb's adsorption isotherms.
3. Describe the kinetics of complex, chain reactions and studies the kinetics of fast reactions.
4. Analyse the classical, quantum theories, operators and Schrodinger equations for different systems.
5. Understands the application of quantum chemistry to hydrogen, hydrogen like atoms and angular, radial distributions.

UNIT I – SPECTROSCOPY

18 Hours

1.1 Electromagnetic radiation – regions of EMR and spectroscopy - Interaction of matter with radiation – Rotational Spectroscopy – Classification of molecules - Diatomic molecules as rigid rotator – Energy level and selection rule - Diatomic non rigid rotator- Energy levels – selection rule – Problems in rotational spectroscopy - Rotational spectroscopy of polyatomic molecules.

1.2 Vibrational spectroscopy – Molecular vibrations – Simple harmonic oscillator - Anharmonic Oscillator - vibrational spectra of poly atomic molecules – vibrational frequencies – group frequencies – overtones – Combinational bands – difference bands – 1.3 Fermi resonance. Raman Spectra- elastic and inelastic scattering – pure rotational Raman spectra – Rule of exclusion.

UNIT II – SURFACE CHEMISTRY

18 Hours

2.1 Adsorption - Types of Adsorption – Physisorption and chemisorption – Factors affecting adsorption – Adsorption isotherms – Heat of adsorption

2.2 Freundlich Adsorption isotherm – Langmuir Adsorption Isotherms – limitations of Langmuir theory - BET adsorption isotherms- Derivation of BET Equation - surface area determinations - Gibbs adsorption isotherm.

2.3 Mechanism of surface reactions- Adsorption theory of Heterogeneous catalysis - mechanism of heterogeneous catalytic reactions-the adsorption coefficient and its significance.

UNIT III – CHEMICAL KINETICS

18 Hours

3.1 Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reactions, chain reactions, general treatment of chain reactions- Linear chain and branching chain reaction- explosion limits - Upper and lower explosion limits-chain length-Rice Herzfeld mechanism for the decomposition of acetaldehyde- Rate expressions and scheme of reactions following half order, first order and one and half order .

3.2 Study of fast reactions- relaxation methods-temperature and pressure jump methods-stopped flow and flash photolysis method.

UNIT IV – INTRODUCTION TO QUANTUM CHEMISTRY

18 Hours

4.1 Classical theory – Principle and postulates - Inadequacy of classical theory – Planck's quantum theory – photoelectric effect- Bohr's theory of atom - Compton effect-wave particle duality- Heisenberg's uncertainty principle – quantum mechanical postulates - Wave function (Ψ) and significance of Ψ and Ψ^2 — Linear, commutator, Angular momentum, Laplacian, Hamiltonian, Ladder and Hermitian operators– Eigen values and Eigen functions – orthogonality and normalization - Hermitian properties.

4.2 Schrodinger equation - applications of Schrodinger's equation-the particle in a box (one, two and three dimensional cases),

UNIT V – APPLICATIONS OF QUANTUM CHEMISTRY

18 Hours

5.1 The harmonic oscillator-the rigid rotor-particle in a ring, Schrodinger equations for hydrogen (no derivation is required) and Hydrogen like atoms (He^+ and Li^{2+}) and their solutions.

5.2 The origin of quantum numbers (angular momentum and spin) - their physical significance -radial and angular probability distribution functions.

TEXT BOOKS:

1. C.N.Banwell and E.M.McCash, Fundamentals of Molecular spectroscopy IV Edition, Tata McGraw Hill, 2005.
2. D.N.Sathyanarayana, Vibrational Spectroscopy, New Age International publishers,2004.
3. J.Rajaram and J.C.Kuriacose, Kinetics and Mechanism Of Chemical Transformations.Macmillan India Ltd,1993.
4. R.J.Laidler, Chemical Kinetics, Harper And Row, New York, 1987.

5. D.A.Mcquarrie,QuantumChemistry,University Science Books,Mil Valley,California,1983.
6. Quantum Chemistry,Allyn And Bacon,Boston,1983.
7. R.Anantharaman,Fundamentals Of Quantum Chemistry,Mamillan India Limited,2001.

SUGGESTED REFERENCE BOOKS

1. Raymond Chang,BasicPrinciples Of Spectroscopy,Mcgraw Hill Ltd.,New York,1971.
2. P.W.Atkins,Advanced Physical Chemistry,Oxford Press,1990.
3. G.ArulDoss,Molecular Structure and Spectroscopy,Prentice Hall,2002.
4. R.G.Frost and Pearson,Kinetics And Mechanism,Wiley,New York,1961.
5. W.J.Moore and R.G.Pearson,Kinetics And Mechanism,1981.
6. C.Capellos and B.J.J.Bielski,KineticsSystems,Wisely Inter Science,New York,1972.
7. AmburandG.G.Hammes,ChemicalKinetics,Principles And Selected Topics,McgrawHill,New York,1968.
8. G.M.Harris,ChemicalKinetics,D.C.Heat And Co.,1966.
9. R.K.Prasad,QuantumChemistry,University Science Books,Mil Valley,California,1983.
10. J.Goodisman,Contemporary Quantum Chemistry,AnIntroduction,PlenumPress,New York,1997.
11. R.Mcweeny,Coulon'sValence,Elbs Oxford University Press,1979.
12. F.J.Bockhoff,Elements Of Quantum Theory,AddisionWesley,Reading Mass,1976.
13. P.W.Atkins,PhysicalChemistry,OxfordUniversity Press,1990.
14. H.Eyring,J.Walter and G.Gimball Quantum Chemistry,John Wiley And Sons,New York,1944.
15. Linus Pauling and Wilson Introduction To Quantum Mechanics,Mcgraw Hill Book Company,New York,1935.
16. P.W.Atkins,Molecular Quantum Mechanics,OxfordUniversity Press,Oxford,1983.
17. Principles of Quantum Chemistry, by R.K. Prasad.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACHPR21	CORE PRACTICAL 2	PHYSICAL PRACTICAL I	5	4

Aim: To learn the experiments in phase equilibrium.

COURSE OUTCOME:

1. Experimental understanding of the phase diagram and its construction
2. Distribution of benzoic acid between benzene and aqueous system deriving distribution coefficient.
3. Adsorption studies and finding the concentration of adsorbate molecules
4. Determination of molecular weight of organic substance by Rast method
5. Phase diagram for a simple binary system of naphthalene – Biphenyl or benzophenone - Diphenyl amine.
6. Determination of partition coefficient of succinic acid between ether and water.
7. Determination of Association factor and distribution coefficient of benzoic acid in benzene- water.
8. Determination of equilibrium constant of the reaction between iodine and potassium iodide by partition method and determine the concentration of the given unknown KI solution
9. Determination of K_f value of the given solvent and molecular weight of the given solute by Rast method.
10. Effect of NaCl on CST of phenol-water system and determination of the strength of NaCl.
11. Determination of viscosity coefficient of a liquid by Ostwald's viscometer.

Total 75 Marks

- | | |
|--------------|----------|
| 1. Practical | 55 Marks |
| 2. Viva-Voce | 10 Marks |
| 3. Record | 10 Marks |

Recommended Books:

1. Physical Practical Experiments by Palit
2. Advance Practical Chemistry by R. Mukhopadhyay & P. Chatterjee.

Reference Books;

1. Practical Physical Chemistry by Findler and Findler
2. Advanced Practical Physical Chemistry by J.B Yadav

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACHEP21	ELECTIVE PRACTICAL 2	PRACTICAL IV - ANALYSIS OF ORGANIC & INORGANIC MIXTURE I	5	5

OBJECTIVE:

1. To learn the separation of inorganic radicals & identify them.
2. To learn the separation and identification of components in a two component organic mixture, and preparation of their derivatives.
3. To determine b.pt. / m.pt. for components and m.pt. for the derivatives.

COURSE OUTCOMES:

1. Separate the inorganic radicals in a mixture.
2. Identify and confirm the radicals by systematic chemical analysis.
3. Separate the organic compounds by simple reagents and solvents in semi micro level.
4. Analyse the organic compounds by semi micro methods.
5. Determines the melting point and boiling point of chemicals in the laboratory.

I) INORGANIC

- c) Semimicro qualitative analysis of mixture containing two common and two rare cations.
- d) The following are the rare cations to be included. W, Ti, Te, Se, Ce, Th, Zr, V, U, Li, Mo.
- e) Estimation of hardness of water using EDTA.

II) ORGANIC

- a) Identification of components in a two component mixture and analysis of the individual compounds..
- b) Preparation of their derivatives in solid form .Determination of b.p. / m.p. for components and m.p. for the derivatives.

Total	75Marks
Experiment	55 Marks
Practical Viva	10 Marks
Record	10 Marks

RECOMMENDED BOOKS

1. Qualitative Inorganic Analysis by V.V. Ramanujam
2. Practical Inorganic Chemistry by Vogel.
3. Practical Organic Chemistry by Vogel.
4. Practical Organic Chemistry by Gnanaprakasam.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACHEP22	ELECTIVE PRACTICAL 2	MEDICINAL CHEMISTRY	6	4

OBJECTIVES: To design and classify the drugs by their mode of action. To synthesis drugs and establish the properties, structure activity relationship, mode of action etc.,

COURSE OUTCOMES :

1. Design drugs by learning various methods of synthesis and mode of action.
2. Classify the various drugs by their properties and mode of action in medical treatment.
3. Synthesise various drugs by their requirement in medical field.
4. Develop their ability to work in pharmaceutical industries.
5. Apply the knowledge gained into throughput methods of drug development.

UNIT – I BASIC CONCEPTS OF MEDICINAL CHEMISTRY 18 Hours

1.1 Drug design – analogues and pro-drugs, factors governing drug design, rational approach, method of variation and tailoring of drugs; physical properties – factors governing drug action at active site, factors governing ability of drugs to reach active site, dissociation constants, isosterism and bioisosterism.

1.2 General anaesthetics – inhalation anaesthetics, intravenous anaesthetics and basal anesthetics; mode of action; local anaesthetics – classification and synthesis, sedatives and hypnotics – classification, synthesis, mode of action and structure – activity relationship.

UNIT – II ANTICONVULSANTS, STIMULANTS AND ANTIPYRETIC ANALGESICS 18 Hours

2.1 Anticonvulsants – Classification, synthesis and mode of action; Muscle relaxants – classification, synthesis and mode of action.

2.2 Central nervous system stimulant – Classification, synthesis and mode of action; Antipyretic analgesics – classification, synthesis and mode of action.

UNIT – III OTHER ANALGESICS 18 Hours

3.1 Narcotic or Opiate analgesics – classification, preparation and mode of action; Narcotic antagonists; Cardiovascular drug – classification, synthesis and mode of action.

3.2 Autonomic drugs – synthesis and mode of action of sympathomimetic drugs, antiadrenergic drugs, cholinomimetic drugs, antimuscarinic drugs, ganglionic blocking agents

and adrenergic neurone blocking agents; Diuretics – synthesis and mode of action of mercurial and non-mercurial diuretics.

UNIT – IV ANTIHISTAMINES, ANTI-INFLAMMATORY AND ANTIPARKINSON DRUG

18 Hours

4.1 Antihistaminics – synthesis and mode of action of histamine H₁ receptor antagonists and histamine H₂-receptor blockers; prevention of histamine release; structure-activity relationships amongst H₁-receptor blockers.

4.2 Non-steroidal anti-inflammatory drugs (NSAID) – synthesis and mode of action of heteroarylacetic acid analogues, arylacetic acid analogues, arylpropionic acid analogues, naphthalene acetic acid analogues, gold compounds, salicylic acid analogues and pyrazolones and pyrazolodiones; Antiparkinsonism agents – synthesis and mode of action of piperidine analogues, pyrrolidine analogues and phenothiazine analogues.

UNIT – V OTHER DRUGS

18 Hours

5.1 Expectorants and anti tissusives – synthesis and mode of action of sedative expectorants, stimulant expectorants and centrally acting antitussive agents. Sulphonamides – Preparation and mode of action of sulphonamides for general, urinary, intestinal and local infection; sulphonamide inhibition.

5.2 Antimalarials – synthesis and mode of action of aminoquinoline analogues, aminoacridine analogues, guanidine analogues, pyrimidine analogues, sulfone and quinine analogues; Steroids – synthesis and mode of action of sterols, sex hormones, cardiac glycosides, bile acids and sapogenins. Antibiotics – synthesis and mode of action of penicillins, aminoglycoside antibiotics, chloramphenicol and tetracyclines.

Text Books:

1. AshutoshKar, Medicinal Chemistry, New age International, 1996.
2. W.O. Foye, Principles of medicinal chemistry, 2ndEdn. Lea &Febiger, Philadelphia, 1981.

Reference Books:

1. M.E. Wolff, Burger's Medicinal Chemistry, 4thEdn., John Wiley & Sons, New York, 1981.
2. F.F. Blicke and R.H. Cox, Medicinal Chemistry, John Wiley & Sons, New York, 1959.
3. D. Lednicer and L.A. Mitscher, Organic Chemistry of drug synthesis, John Wiley & Sons, New York, 1959.
4. J.E. Hoover, Remington's Pharmaceutical Sciences, 15thEdn. Mack Publ. Company, Easton. 1975.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACH01	CORE 1	RESEARCH METHODOLOGY	5	5

OBJECTIVES

Provide all students with the opportunity to acquire or develop skills and expertise relevant to their research interests as well as to be trained in more broadly applicable skills.

To know about the ethics in the field of research and publications.

To learn to acquire, develop and interpret the research data.

To gain knowledge in research communications involving review of literature, preparing of reports and adducing references.

COURSE OUTCOMES

COs	Course Name: Research Methodology	Code: MPH8CH01	Credit: 5
CO1	Justify research and identify areas of research based on ethical issues.		
CO2	Understand the research in scientific methods and research process.		
CO3	Able to design the research work by selecting a suitable problem.		
CO4	Gain the knowledge about methods of data collection and the techniques of data presentation.		
CO5	Acquire the knowledge of uses of computers in research, search engines and common software for documentation and presentation.		
CO6	Able to carry out the error analysis and also design methods to control error.		
CO7	Understand how to write a research paper and thesis.		

UNIT-I : RESEARCH METHODOLOGY

Meaning of research – Objectives of research - motivation of research – Types, approaches and significance – Methods versus methodology – Research in scientific methods – Research process – Criteria for good research – Problem encountered by research in India – Funding agencies.

Ethics with respect to Science and research- Intellectual honesty and research integrity; Scientific misconducts- Falsification, Fabrication and Plagiarism (FFP), duplicate and overlapping publications; Publication ethics- definition, introduction and importance.

UNIT-II : RESEARCH DESIGN

Research Problem: Selecting the problem – Necessity of defining the problem – Techniques involved in defining the problem – Research design – Needs and features of good design – Different research design – Basic principles of experimental designs.

UNIT-III : DATA COLLECTION AND DOCUMENTATION

Data collection methods – Data types – Processing and presentation of data – Techniques of ordering data – Meaning of primary and secondary data – The uses of computers in research – The library and Internet – Uses of search engines – virtual libraries – common software for documentation and presentation.

UNIT-IV : DATA AND ERROR ANALYSIS

Statistical analysis of data – Standard deviation – Correlation – Comparison of set of data – Chi squared analysis for data – Characteristics of probability distribution – Binomial, Poisson and normal distribution – Principle of least square fittings – Curve Fitting – Measurement of errors – Types and sources errors – Determination and Control of errors.

UNIT-V : RESEARCH COMMUNICATION

Meaning of research report – Logical format for writing thesis and paper – Essential of Scientific report: abstract, introduction, review of literature, materials and methods and discussion – Write up steps in drafting report – Effective Illustrations tables and figures – Reference styles: Harvard and Vancouver systems.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACH02	CORE 2	ADVANCED CHEMICAL ANALYSIS	5	5

UNIT-I

Instrumental methods of analysis: Atomic absorption and emission spectroscopy chromatography including GC and HPLC and electro-analytical methods (Colorimetry, cyclic voltammetry, polarography, amperometry, and ion selective electrodes).

UNIT-II

Spectroscopy:

Principle and applications in structure elucidation:

- (i) Rotational Diatomic molecules; isotopic substitution and rotational constants.
- (ii) Vibrational: Diatomic molecules, linear tritomic molecules, specific frequencies of functional groups in polyatomic molecules.
- (iii) Electronic: Singlet and triplet states; $n \rightarrow p^*$ and $\pi \rightarrow \pi^*$ transitions; application to conjugated double bonds and conjugated carbonyls – Woodward-Fieser rules; Charge transfer spectra.
- (iv) Nuclear Magnetic Resonance (1H NMR): Basic principle; chemical shift and spin-spin interaction and coupling constant.
- (v) Mass Spectrometry: Parent peak, base peak, metastable peak, McLafferty rearrangement.

UNIT-III

Applications of UV-visible, IR, NMR and Mass spectrometry in the determination of structures of organic molecules.

UNIT-IV

Applications of UV-visible, IR, NMR and Mass spectrometry in the determination of structures of inorganic molecules.

UNIT-V

Symmetry elements: point groups; (ii) optical activity its origin, atomic and conformation asymmetry; (iii) Variation of optical activity with wave length. Optical rotatory dispersion and circular dichroism curves and their application, In determining the configuration and conformation of different compounds. (iv) conformational analysis.

REFERENCE BOOKS:

1. H.H. Willand, L.L Merrit and J.A. Dean, Instrumental Methods of Analysis – D. Ven. Nostroud Co.
2. H.A. Stobel, Chemical Instrumentalism – Addition – Wesley Publishing Co.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACH04	ELECTIVE I	POLYMER SYNTHESIS AND CHARACTERIZATION	5	5

UNIT-I: BASIC CONCEPTS AND POLIMERIZATION TECHNIQUES

Basic concepts of polymer science – molecular forces and chemical bonding in polymers – classification of polymers – addition polymers – condensation polymers – Homopolymers and Copolymers (alternate, random, block and graft polymers) linear, branched and cross linked polymers – molecular weight of polymers – Bulk, Emulsion, solution and solid state polymerization techniques..

UNIT-II: CHARACTERIZATION METHODS

Crystalline nature – X-ray diffraction study of polymers – Degree of crystallinity – Differential Scanning Calorimetric (DSC) and Thermo gravimetric analysis of polymer (TGA) Glass transition temperature – Factors affecting glass transition temperature crystallinity and melting point – Relation to structure SEM, TEM, AFM, STM, GPC.

UNIT-III: BIOPOLYMERS

Classification – vegetable oil based polymers – starch and cellulose – bio polymers – Chitin – Chitosan – preparation of above polymers and its derivatives – application of above polymers in different fields – Bio degradation studies of polymers.

UNIT-IV: PHYSICAL PROPERTIES AND POLYMERS PROCESSING

Mechanical – stress vs strain measurements Elastomeric properties, Rheology – natural rubbers – Property improvements in rubber – polymer film preparation and characterization.

UNIT-V: POLYMER COMPOSITES AND NANO COMPOSITES

Fiber reinforced – metal oxide composites – clay nono composites – nano composite characterization – synthesis and applications Nano materials – classification – synthesis and characterization.

REFERENCE BOOKS:

1. V.R. Gowarikar, Viswanathan J. Sridhar, Polymer Science, Wiley Eastern, 2005.
2. F.W. Billmeyer textbook of Polymer Science, Wiley Inter Science, 3rd Edition 2005.
3. Joel R., Polymer Science and Technology, Fried Prentice Hall, India, Reprint 2000.
4. G.S. Mishra, Introduction polymer Chemistry, Wiley Eastern Ltd., Reprint 2005
5. M.S. Arora and M.Singh, Polymer Chemistry, Anmol Publications, Reprint 1996.
6. M.S. Batnagar, Textbook of Polymers, S. Chand and Company, First Edition 2004.
7. R.J. Young and P.A. Lovell, Introduction to Polymers, Nelson Thornes Ltd. 2004.
8. Analysis and Characterization of Polymer - Sukumar Maiti.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACH04	ELECTIVE I	OXIDATION AND REDUCTION REACTIONS IN ORGANIC CHEMISTRY	5	5

UNIT-I:

Oxidation – mechanisms – aromatization of six membered rings – uses of quinine – other methods of dehydrogenation – oxidation of alcohols.

UNIT-II:

Oxidation of phenols and amines – oxidations by $\text{Pb}(\text{OAc})_4$, HIO_4 , CrO_3 , Ozone, RuO_4 .

UNIT-III:

Oxidations of aromatic side chains and aryl methanes – Oxidation of methylene to carbonyl – Oxidation of ethers – oxidation of olefins – uses of peroxides.

UNIT-IV:

Reduction of functional groups – stereochemistry and selectivity in reduction reactions – reduction of carbonyl to methylene – reductions with LAH, DIBAL and boron hydrides.

UNIT-V:

Synthetic importance of – clemmenson – wolf-kishner reduction – birch reduction – MPV reduction – sommelet reduction – Catalytic hydrogenation – uses of tin hydrides and hydrazines.

REFERENCE BOOKS:

1. Advance Organic Chemistry by J. March.
2. Advance Organic Chemistry by Sanbery and Carey.
3. Modern Synthetic Organic Chemistry by Smith.
4. Synthetic Organic Chemistry by H.O. House.
5. Modern Synthetic Organic Chemistry by Carruthers.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACH04	ELECTIVE I	KINETIC STUDIES OF COORDINATION COMPLEXES	5	5

UNIT I: Co-ordination Chemistry: Reactions, Kinetics and Mechanisms.

Substitution reactions in square planar complexes, thermodynamic and kinetic stability, kinetic of octahedral substitution, mechanism of Redox reactions

UNIT II: Bio-Chemical applications

The Cell, Processes coupled to phosphate hydrolysis, nucleotide transfer-DNA polymerase, phosphate transfer, pyruvate kinase, Glucose Storage-Phosphoglucomutase, phosphate storage in muscles-creatine kinase.

UNIT III Oxygen carriers

Haemoglobin and myoglobin, Cobalamine, Vitamin B12 coenzyme, Electron transfer agents, cytochromes, Iron- Sulphur protein, Nitrogen fixation.

UNIT IV Analysis of Kinetic results

Differential method, method of integration, first order reactions, second order reactions. Isolation method, Half life method, opposing reactions, reactions in flow system, technique of very fast reactions, influence of temperature on reactions rates.

UNIT V: Theories of reaction rates

Rate theories based on thermodynamics, rate theories based on statistical mechanics, early dynamical theories of rates, conventional transition state theory, extension of transition state theory, microscopic reversibility and detailed balance, Isotopic effects-primary kinetic isotopic effect, secondary isotopic effect.

References:

1. Chemical Kinetics, K.J. Laidler, III edition
2. Inorganic Chemistry, J.E. Hughey, E.A Keiter and R.L. Keiter, IV edition
3. Inorganic Chemistry K.F. Purcel and J.C. Kotz. IV edition
4. Electron transfer reactions, Henry Taube.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACH04	ELECTIVE I	POLYMER AND ADVANCED ORGANIC CHEMISTRY	5	5

UNIT I

Introduction to Polymer systems- Basic structure and classification of Polymers. Simple bonding in polymers, Polymerisation reactions. Polysaccharides - Cellulose and cellulose derivatives. Polyamides and related polymers – few applications.

UNIT II

Natural polymers – Nitrogen containing polymers – Chitin and Chitosan – Synthesis, solubility, Derivatives of Chitin. Applications of Chitin and Chitosan.

UNIT III

Chromatography – Gas chromatography, Thin layer chromatography – Principles, instrumentation and applications.

UNIT IV

HPLC – principles, instrumentation and applications. Comparison of High Performance liquid chromatography with Gas-Liquid chromatography.

UNIT V

Advanced spectrochemical techniques – fourier transform IR and Fourier transform NMR – principles and instrumentation.

REFERENCES;-

1. Principles of polymer systems ----- FerDinand Rodriquez.
2. Principles of Instrumental analysis ---- Douglas. A. Skoog.
3. Instrumental methods of Chemical analysis --- H.H. Willard, A. A. Dean, L. Merritt and Settle.
4. Chitin Chemistry ---- George F. Roberts.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACH04	ELECTIVE I	COMPUTATIONAL CHEMISTRY	5	5

Unit I : Computers in Chemistry: What is Programming language? What is machine level language and Assembly level language? What is flow chart? Some applications of Computers and programmes in Chemistry using BASIC or C language.

Unit II: Internet and its applications: What is internet? Definitions of www, http, DNS, TCP/IP, url, DNS, ISP. What is FTP? What are bookmarks? Some browsing interfaces like IE, Firefox, Chrome. Search Engines. Spam and Virus.Antivirus.

Unit III: Hardware in use: Solid state disk.Compact Disc and the difference between it and Blue ray disc.CPU and PC, Notebook, Workstation and Server – definitions. What is cluster? Interface devices- scanner and printer. CRT, LCD and LED monitors and power consumptions

Unit IV: Applications of computing in Chemistry : Chemistry drawing software like Chemdraw, chemsketch and chemcraft. Coordinates – Cartesian& Unique and Zmatrix.2D and 3D diagrams and coordinate kick. Optimization and Molecular mechanics.

Unit V: Basics of quantum chemistry (no equations, Significance and applications).
Pauli exclusion principle, Hund's rule of maximum multiplicity, Theory of relativity, Heisenberg's uncertainty principle, Wave-particle duality, Photoelectric Effect, Fundamental forces of nature and fundamental particles of nature, Molecular orbital theory.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UASKB204	SKILL BASED	PROFESSIONAL ENGLISH FOR LIFE SCIENCES	4	3

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar
(Outcomes based on guidelines in UGC LOCF – Generic Elective)

NB: All four skills are taught based on texts/passages.

UNIT 1 : COMMUNICATION

- Listening** : Listening to audio text and answering questions
- Listening to Instructions
- Speaking** : Pair work and small group work
- Reading** : Comprehension passages –Differentiate between facts and opinion
- Writing** : Developing a story with pictures.
- Vocabulary** : Register specific - Incorporated into the LSRW tasks

UNIT 2 : DESCRIPTION

- Listening** : Listening to process description - Drawing a flow chart.
- Speaking** : Role play (formal context)
- Reading** : Skimming/Scanning-
Reading passages on products, equipment and gadgets.
- Writing:** Process Description –Compare and Contrast
Paragraph-Sentence Definition and Extended definition-
Free Writing.
- Vocabulary** : Register specific -Incorporated into the LSRW tasks.

UNIT 3: NEGOTIATION STRATEGIES

Listening : Listening to interviews of specialists / Inventors in fields
(Subject specific)

Speaking : Brainstorming (Mind mapping)

Small group discussions (Subject- Specific)

Reading : Longer Reading text.

Writing : Essay writing (250 words)

Vocabulary : Register specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS

Listening : Listening to lectures.

Speaking : Short talks

Reading : Reading Comprehension passages

Writing : Writing Recommendations

Interpreting Visuals inputs

Vocabulary : Register specific - Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS

Listening : Listening comprehension- Listening for information

Speaking : Making presentations (with PPT- practice).

Reading : Comprehension passages – Note making.

Comprehension: Motivational article on Professional Competence,
Professional Ethics and Life Skills)

Writing : Problem and Solution essay– Creative writing –Summary writing

Vocabulary : Register specific - Incorporated into the LSRW tasks

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABI1001	CORE 1	BIO-ORGANIC CHEMISTRY	5	5

Objectives: To understand structure, properties and functions of various biomolecules.

Course Outcome

CO1	Classify carbohydrates along with their functions.
CO2	Identify and name lipids along with their functions.
CO3	Understand Structure, classification and functions of amino acids and proteins.
CO4	Identify and compare nucleic acids along with their functions.
CO5	Understand the principles of the chemistry connected to living systems and correlate the chemical structure of biomolecules to reactivity.
CO6	Apply rules for description of the structure and stereochemistry of bioorganic compounds.

UNIT - I: Carbohydrates

15 Hrs

Classification (mono-, di-, oligo- & polysaccharides). Chiral carbon atoms & rule of 'n'. Isomerism in carbohydrates (DL, +/-, $\alpha\beta$, epimers, aldose-ketose, pyranose-furanose). Mutarotation. Structure, occurrence & biomedical importance of some carbohydrates (glc, gal, fru, mal, lac, suc, starch, glycogen).

UNIT - II: Lipids

15 Hrs

Classification fatty acids (saturated/unsaturated, odd/even carbon, chain length, essential).

Classification lipids (simple, complex, derived and precursor lipids).

Structure & biomedical importance of some lipids (lecithin, phosphatidylinositol, sphingomyelins, and cholesterol).

UNIT - III: Amino acids

15 Hrs

Classification, structure and isomerism of standard amino acids. Zwitter ion. Essential & non-essential amino acids.

UNIT - IV: Proteins

15 Hrs

IUPAC, nutritional & functional classification of proteins. Primary, secondary, tertiary and quaternary structures of proteins.

UNIT – V: Nucleic Acids

15 Hrs

Structure of nitrogenous bases (A, T, G, C, U), ribose & deoxyribose, phosphoric acid, nucleosides & nucleotides. Watson& Crick model of DNA. Structure and types of RNA.

TEXTBOOKS:

1. Harper's Biochemistry –Rober K.Murray, 31st edition, McGraw Hill, Lange Medical Books. 2018.
2. Biochemistry- U. Satyanarayana, Revised 5th edition, Books & Allied Pvt. Ltd. 2019.

REFERENCES:

1. Biochemistry- Lubert Stryer, 6th edition, W. H. Freeman & Company. 2006
2. Fundamentals of Biochemistry, D.J. Voet, J.G. Voet, C.W. Pratt, 4th edition, John Wiley & Sons. 2011
3. Lehnigers Biochemistry - Nelson & Cox, 6th edition, W. H. Freeman Company. 2017

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
	CORE PRACTICAL 1	QUANTITATIVE & QUALITATIVE ANALYSIS	2	0

OBJECTIVES

1. Student should know the principles, theory and calculation of each experiment.
2. They should know to prepare all the solutions by themselves. They should standardize their solutions individually.

Course Outcome

CO1	The distinction between qualitative and quantitative chemical analysis.
CO2	Methods for calibration and sampling applied to quantitative analysis.
CO3	Assessment methods of analysis related to carbohydrates, amino acids and fats.
CO4	The application of analytical methods based on titrations.
CO5	Students will be able to determine rancidity in edible oil and its applications.
CO6	Students will be able to perform qualitative tests for carbohydrates.

I. QUANTITATIVE ANALYSIS

- i) Estimation of amino acids by formal titration method.
- ii) Determination of Saponification value of edible oil.
- iii) Determination of Acid number of edible oil.
- iv) Iodine value of oil.

II. QUALITATIVE ANALYSIS

- i) Reaction of simple sugars including glucose, fructose, galactose, mannose, pentose, maltose, sucrose, lactose, starch, glycogen and dextrin.

TEXT BOOKS

1. Laboratory manual in Biochemistry – Jayaraman, Wiley Eastern Limited, 1981.
2. Biochemical methods – S.Sadasivan and Manickam, 2nd edition, New Age International Publications, 1996.

REFERENCES

1. Practical Clinical Biochemistry – Harold Varley, 5th edition, WH Medical Books, 2002.
2. Medical Laboratory Technology – Kanai L. Mukherjee, 3rd edition, Tata McGraw Hill., Vol. I, II, III. 2017.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABI2001	CORE 2	CELL BIOLOGY	5	5

Objectives:

- To understand various types of cells.
- To understand cellular architecture and organization.
- To understand functions of various cell organelles.

Course Outcomes:

CO1	Analyze the structures and basic components of prokaryotic cells.
CO2	Able to explain the structures and purposes of basic components of eukaryotic cells, especially macromolecules, cytoskeleton, membranes, and organelles.
CO3	Evaluate the difference between prokaryotic and eukaryotic cells.
CO4	Correlate composition and structure of biomembranes, transport mechanisms across biological membranes.
CO5	Understand how these cellular components are used to generate and utilize energy in cells.
CO6	Understand the cellular components underlying cell division.
CO7	Discuss the role of compartmentalization in cellular biology.

UNIT –I: Cell Organization

15 Hrs

An overall view of cells. Classifications of cell - Prokaryotic and Eukaryotic cells – virus, archaea, eubacteria, plant and animal cells. Differentiate plant and animal cells. Cell – cell communications, cell functions.

UNIT – II: Cell Membrane

15 Hrs

Fluid Mosaic Model of cell membrane. Membrane lipids, proteins, carbohydrate and their properties. Functions of biological membrane. Transport across membranes- diffusion, active and passive transport. Uniport, symport and antiport. Exocytosis and Endocytosis.

UNIT – III: Cell Organelles

15 Hrs

Ribosomes-types, structure and functions. Endoplasmic reticulum – types, structure and functions. Golgi apparatus- structure and functions.

UNIT –IV: Cell Respiration and Motility

15 Hrs

Mitochondria: Structure and function. Microtubules - structure and functions. Lysosomes-structures and functions.

UNIT –V: Nucleus and Cell Division**15 Hrs**

Ultrastructure and functions of nucleus. Cell cycle - phases of cell cycle. Cell division- mitotic and meiotic cell divisions.

TEXTBOOKS:

1. Cytology- P.S. Verma, V.K.Agaraval, 3rd edition, S. Chand Publications. 1999.
2. The Cell – M. Cooper, 7th edition, Sinauer Associates Publications. 2015.

REFERENCES:

1. Biochemistry – H. Garrett Grisham. 6th editon, Mary Finch Publishers. 2012.
2. Molecular Cell Biology – Lodish, Berk, Zipursky, Baltimore, Freeman Publisher. 2016.
3. Cell and Molecular Biology – E.D.P. De Robertis, 8th edition, Lea & Febiger Publisher. 2011.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABIPR21	CORE PRACTICAL 1	QUANTITATIVE & QUALITATIVE ANALYSIS	2	2

OBJECTIVES

1. Student should know the principles, theory and calculation of each experiment.
2. They should know to prepare all the solutions by themselves. They should standardize their solutions individually.

Course Outcomes

CO1	Students will develop practical skills and gain an understanding of the distinction between qualitative and quantitative chemical analysis.
CO2	Students will develop practical skills and gain an understanding of the application of analytical methods based on titrations.
CO3	Students will be able to perform qualitative tests for amino acids.
CO4	Students will develop practical skills and gain an understanding of assessment methods of analysis related to carbohydrates and amino acids.

I. QUANTITATIVE ANALYSIS

- i. Estimation of ascorbic acid by titrimetric method using 2, 6 – Dichlorophenol indophenol.
- ii. Estimation of reducing sugar from biological fluids by Benedict's titrimetric method.
- iii. Estimation of reducing sugar by iodimetry

II. QUALITATIVE ANALYSIS

- i. Reaction of Proteins – Solubility, Denaturation, precipitation by acidic reagents, pH change. Biuret, Millons, Xanthoproteic test. Colour reaction of amino acids like typtophan. Tyrosine, cystine, Methonine. Arginine, Proline and histidine.
- ii. Reactions of lipids – Solubility, Saponification test for unsaturation, Liebermann Burchard test for cholesterol.

TEXT BOOKS

1. Practical Clinical Biochemistry – Harold Varley, 5th edition, WH Medical Books, 2002.
2. Medical Laboratory Technology – Kanai L. Mukherjee, 3rd edition, Tata McGraw Hill., Vol. I, II, III. 2017.

REFERENCES

1. Laboratory manual in Biochemistry – Jayaraman, Wiley Eastern Limited, 1981.
2. Biochemical methods – S.Sadasivan and Manickam, 2nd edition, New Age International Publications, 1996.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABI1001	ELECTIVE I	BIOMOLECULES	6	5

Objectives:

The objective is to impart knowledge on the structure and functions of biomolecules.

Course outcome:

CO1	Understand the structure, properties and functions of Amino acids and proteins
CO2	Identify the structure, properties and functions of Glycoprotein's
CO3	Determine the structure, types and functions of nucleic acids.
CO4	Identify the structure and functions lipoproteins.
CO5	Understand the sources, requirements, functions and deficiency disorders of vitamins.
CO6	Discuss the sources, requirements, functions and deficiency disorders of minerals.
CO7	Impart knowledge on the structure and functions of Biomolecules

Unit I - Proteins

20 Hrs

Amino acids - structure and properties. The peptide bond: The Ramachandran plot - Orders of protein structure. Primary structure- Determination of amino acid sequence of proteins. Secondary structures- α -helix, β -sheet and β -turns. Collagen triple helix. Super secondary structure- helix-loop-helix, hairpin β motif, Greek key motif and β - α - β motif. Structural classification of proteins based on protein motifs. Tertiary structure- All α , all β , α/β , $\alpha+\beta$ domains. Structural motifs-protein family and superfamily. Quaternary structure – protomers, multimers – rotational and helical symmetry.

Unit II - Glycosaminoglycans & Glycoconjugates

15 Hrs

Glycosaminoglycans, structure, location and biological role of hyaluronic acid, chondroitin sulphate, keratin sulfate, heparin sulfate, dermatan sulfate and heparin. Sialic acid- structure and significance. Proteoglycans. Glycoproteins and their biological importance, Major classes of glycoproteins. Lectins - structure, function, applications. Blood group antigens and bacterial cell wall polysaccharides.

Unit III - Nucleic Acids

20 Hrs

DNA double helical structure- Watson and Crick model. A, B and Z forms of DNA. Unusual structures – palindrome, inverted repeats, cruciform and hairpins. DNA supercoiling and linking number. Properties of DNA: buoyant density, viscosity, UV absorption, hypochromic effect, denaturation and renaturation, the cot curve. Differences between DNA and RNA. Major classes of RNA - mRNA, rRNA, tRNA: structure and biological functions. Minor

classes of RNA [snRNA, miRNA and siRNA]. Nucleic acid- binding proteins- DNA and RNA binding motifs in proteins.

Unit IV – Lipids

15 Hrs

Fatty acids- saturated, unsaturated and hydroxy fatty acids. Eicosanoids- structure and biological actions of prostaglandins, prostacyclins, thromboxanes, leukotrienes and lipoxins. Phospholipids and glycosphingolipids- structure and biological functions. Steroids- plant and animal sterols. Structure, properties and functions of cholesterol.

Lipoproteins- classification and composition. Amphipathic lipids (membranes, micelles, emulsions and liposomes). Lipid and protein composition of bio-membranes.

Unit V – Vitamins & Minerals

20 Hrs

Vitamins - water soluble - thiamine, riboflavin, niacin, pyridoxine, folic acid, ascorbic acid- sources, structure, biochemical functions, deficiency diseases, daily requirements; fat soluble - vitamin A, vitamin D2, vitamin E and vitamin K - sources, structure, biochemical functions, deficiency diseases, daily requirements. Minerals - Sources, daily allowance, absorption, metabolism, biological role and clinical significance of calcium, phosphorus, iron, magnesium Copper, zinc, selenium, cobalt, manganese and fluoride.

Text Books

1. Fundamentals of Biochemistry – Voet and Voet. 3rd edition, Wiley 2008.
2. Harper's illustrated Biochemistry 27th edition 2006, McGraw Hill.

References

1. Principles of Biochemistry. Lehninger Nelson Cox Freeman Publishers, 2008, 5th ed.
2. Biochemistry Zubay 4th edition 1998 William C. Brown Publication.
3. Fundamentals of Biochemistry by U.Sathyanarayana Revised 3rd Edition Books and allied Pvt ltd.
4. Biochemistry Stryer 6th edition Freeman, 2006.
5. Text books of Biochemistry by R.C. Dubey

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABI1002	Core 2	ENZYMOLOGY	6	5

Objectives:

To understand the structure, properties, biological action and industrial applications of enzymes.

Course outcome:

CO1	Identify the structure, classification, properties and functions of enzymes.
CO2	Understand enzymes kinetics and their mechanism of action.
CO3	Explain the mechanism of enzyme inhibition.
CO4	Discuss the applications of coenzymes.
CO5	Understand the clinical applications of Isoenzymes
CO6	Analyze the role of enzymes in industries.
CO7	Understand techniques of enzyme immobilization.

Unit I - Introduction & Classification

20Hrs

Classification of enzymes, specificity and active site. Fundamentals of enzyme assay – enzyme units, enzyme coupled kinetic assay. Compartmentation of enzymes. Enzyme purification by different separation techniques. Factors affecting velocity of enzyme catalyzed reactions. Kinetics of enzyme catalyzed reactions – Initial velocity studies and rapid reaction techniques. A brief account of non-protein enzymes- ribozymes and DNA enzyme. Enzyme Specificity- Lock & Key and Induced Fit hypothesis.

Unit II - Enzyme Kinetics

20 Hrs

Factors affecting enzyme activity: Enzyme concentration, Substrate concentration, pH and temperature. Derivation of Michaelis – Menten equation for unisubstrate reactions. K_m and its significance. Lineweaver – Burke plot and its inhibitors, Importance of K_{cat}/K_m . Kinetics of zero and first order reactions. Significance and evaluation of energy of activation and free energy. Pre-steady state kinetics. Kinetics of multi-substrate enzyme catalyzed reaction – ping-pong bi-bi, random order and compulsory order mechanism.

Unit III - Enzyme Catalysis & Inhibition

20 Hrs

Chemical nature of enzyme catalysis: general acid – base catalysis, electrostatic catalysis, covalent catalysis, intermolecular – catalysis, metal ion catalysis, proximity and orientation. Catalytic mechanisms of chymotrypsin, Trypsin, Carboxypeptidase, Ribonuclease and Lysozyme.

Enzyme inhibition: Types of inhibitions, irreversible, reversible, competitive, non-competitive, un – competitive, mixed inhibition and partial inhibition. Substrate inhibition, feedback inhibition and allosteric inhibition.

Unit IV - Coenzymes & Isoenzymes**15 Hrs**

Coenzymes - Structure and functions of- nicotinamide nucleotides (NAD⁺, NADP⁺), flavin nucleotides (FMN, FAD), adenosine triphosphate, Coenzyme A, thiamine pyrophosphate, pyridoxyl phosphate, tetrahydrofolate and biotin.

Isoenzymes - Lactate dehydrogenase and multienzyme complexes (pyruvate dehydrogenase complex).

Unit V - Industrial Enzymes**15 Hrs**

Industrial uses of enzymes – detergent, textile, leather and food industries (amylase, cellulase, protease, lipase, peroxidase, invertase, pectinase, catalase, rennin. Immobilization of enzymes and their applications.

Text Books

1. Understanding enzymes by Palmer, Prentice Hall, 4 sub editions (1995)
2. Harper's Biochemistry, Murray, Granner, Mayes, Rodwell 25th Edition. McGrawhill Co.

References

1. Biochemistry by Metzler. Academic press (2000)
2. Biochemistry by Stryer. W.H. Freeman 6th edition (2006)
3. Enzymes by Boyer. Academic press 3rd edition (Nov 1983)
4. Enzymes by Dixon and Webb, Academic Press (1964)

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIPR11	CORE PRACTICAL 1	ISOLATION AND ESTIMATION OF BIOMOLECULES	6	4

Objectives

To introduce the principles and protocols of spectrophotometric determination. Calculate quantities and concentration of biomolecules from standard curve

Course outcome:

CO1	Carryout colorimetric techniques for the estimations of biological macromolecules and other organic compounds
CO2	Apply basic techniques used in the laboratory for isolation/extraction, and purification of biological compounds from their sources.
CO3	Isolate biological macromolecules
CO4	Quantify the biological macromolecules
CO5	Understand the principles and protocols of spectrophotometric determination of Biomolecules
CO6	Correlate theory with practice.

1. Isolation and estimation of DNA from liver
2. Isolation and estimation of RNA from yeast
3. Isolation and estimation of Glycogen from liver
4. Isolation and estimation of Ascorbic acid from lemon
5. Estimation of Pyruvate.
6. Estimation of lactate.
7. Estimation of Tryptophan.
8. Estimation of Protein by Lowry's method.
9. Estimation of Inorganic Phosphorus by Fiske and Subba Rao method.

Text Books

3. Practical Clinical Biochemistry – Harold Varley, CBS, New Delhi
4. Medical Laboratory Technology – Kanai L. Mukherjee, Tata McGraw Hill., Vol. I, II, III.

References

3. Laboratory manual in Biochemistry – Jayaraman
4. Biochemical methods – S.Sadasivan and Manickam

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIPR12	CORE PRACTICAL 2	ENZYME KINETICS AND CLINICAL ENZYMOLOGY	6	4

Objectives: To make the students understand the basic steps involved in extraction and determination of enzyme activities and Learning the techniques concerned with clinically important enzyme detection in blood.

Course outcome:

CO1	Understand the kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process.
CO2	Demonstrate the effect of pH on enzyme catalyzed reaction.
CO3	Analyze the effect of temperature and substrate concentration on enzyme catalyzed reaction.
CO4	Understand the basic steps involved in extraction and assay of enzyme activities.
CO5	Identify the clinically important enzymes in biological samples
CO6	Correlate theory with practice.

Enzyme Kinetics

1. Preparation of buffer/solution of given pH, molarity, normality and molality
2. Determine the effect of pH, temperature, enzyme concentration and substrate concentration (K_m and LB plot) of acid phosphatase.
3. Determine the effect of pH, temperature, enzyme concentration and substrate concentration (K_m and LB plot) of alkaline phosphatase.
4. Determine the effect of pH, temperature, enzyme concentration and substrate concentration (K_m and LB plot) of salivary amylase.

Clinical Enzymology

5. Estimation of serum amylase
6. Estimation of alkaline phosphatase from serum
7. Estimation of acid phosphatase from serum
8. Assay of Alaline Aminotransferase Activity (SGOT) from serum
9. Assay of Aspartate Aminotransferase Activity (SGPT) from serum
10. Assay of Lactate dehydrogenase from serum

Text Books

1. Laboratory manual in Biochemistry – Jayaraman
2. Biochemical methods – S. Sadasivan and Manickam

Reference

1. Medical Laboratory technology – kanai L. Mukherjee, Tata McGraw Hill Publication and Co. ltd., vol. I, II, III.
2. Practical clinical biochemistry – Harold Varley, CBS, New Delhi.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIEP11	ELECTIVE I	MOLECULAR CELL BIOLOGY	6	4

Objective: To understand the structure, functions and dynamics of cells.

Course outcome:

CO1	Understand the structures and components of prokaryotic and eukaryotic cells.
CO2	Analyze the properties and functions of plasma membrane
CO3	Understand the organization of chromosome in higher organisms
CO4	Identify the different stages of cell cycle and its regulations.
CO5	Understand biology of stem cells and its functions
CO6	Understand the mechanisms of programmed cell death
CO7	Correlate the cellular dynamics in subcellular organs

Unit I - Membrane Structure & Function

20 hrs

Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

Unit II - Structural Organization & Function

20 hrs

Structural organization and function of intracellular organelles (Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, Ribosomes, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility).

Unit III - Organization of Genes & Chromosomes

20 hrs

Organization of genes and chromosomes - structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons. Unusual chromosomes – polytene and Lampbrush chromosome. Mechanism of chromosome formation.

Unit IV - Cell Cycle & Cell Death

15 hrs

Eukaryotic cell cycle and its regulation. Phases of cell cycle. Mitosis and its regulation and control mechanisms. Meiosis and its regulation and control mechanisms. Cell death – necrosis and apoptosis.

Unit V - Stem Cell Biology**15 hrs**

Stem cell biology – concept, methods, isolation, identification, expansion, differentiation and applications. Stem cell engineering - applications in medicine - tissue engineering and transplantation. Stem cell therapy.

Text Books

1. Stansfield et al. Molecular Cell Biology. Schaum's Series. McGraw Hill, 1996.
2. Nelson Cox. Lehninger's Principles of Biochemistry. Freeman Worth Publ. 4th ed. 2005.

References

1. De Robertis and De Robertis. Cell and Molecular Biology. Lea and Febiger. 8th ed.
2. Lodish et al. Molecular Cell Biology. Scientific 5th ed. Freeman.
3. Karp G. Cell and Molecular Biology. 3rd ed. John Wiley and Sons. 2002.
4. Wilson and Walker. Practical Biochemistry. Cambridge University Press. 2000

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIEP12	ELECTIVE I	ANIMAL CELL SCIENCE AND TECHNOLOGY	6	4

Objectives:

To understand the basics of animal cell culture and maintenance

Course outcome:

CO1	Preparation of culture media for animal and plant cell culture.
CO2	Understand the sterilization methods in plant and animal cell culture.
CO3	Understand the different types of culture methods.
CO4	Analyze the characterization of cultured cells.
CO5	Understand the steps involved in producing of transgenic animals.
CO6	Apply practical knowledge in plant and animal cell culture.
CO7	Understand the basic principles of plant and animal cell culture and its maintenance.

Unit I - Animal Cell Culture

20 hrs

Animal cell and tissue culture – History and scope – advantages and disadvantages, laboratory facilities, the substrate, culture media and culture procedures. Primary culture, cell lines, maintenance of cultures, cell lines. Cloning of cell lines. Cancer cell lines.

Unit II - Sterilization & Preparation of Media

20 hrs

Preparation and Sterilization of cell culture media and reagents. Introduction to the balance salt solutions and simple growth medium. Chemical, physical and metabolic functions of different constituents of culture media. Role of carbon dioxide in animal cell culture.

Unit III - Tissue Culture

20 hrs

Tissue culture- slide, flask and test tube culture. Embryo culture, Organ culture, Somatic cell hybridization and expression of cloned genes in cultured cells.

Stem cells – isolation, identification, expansion, differentiation and uses. Stem cell engineering.

Unit IV - Characterization of Cultured Cells

15 hrs

Role of serum and supplements, Serum & protein free defined media and their applications. Measurement of viability and cytotoxicity. Biology and characterization of cultured cells, measuring parameters of growth.

Unit V - Transgenic Animals

15 hrs

Methods for producing transgenic mice, Retroviral, DNA microinjection and engineered stem cell methods. Applications of transgenic mice. Transgenic cattle, sheep, goats, pigs and fish. Transgenic animals as models of human disease.

Text Books

1. Animal Cell Culture Techniques. Ed. Martin Clynes, Springer.
2. Animal Biotechnology, M. M. Ranga, III Revised edition, Agrobios (India), Jodhpur.
3. Animal Cell Culture- Practical Approach. John, R.W.Masters. 2000. 3rd Edi.

References

1. Freshney. Culture of Animal Cells: A manual of basic techniques. 4th ed. Wiley – Liss 2000.
2. Culture of Animal cells, 3rd Edition, R. Ian Freshney. A John Wiley & Sons, Inc., publications.
3. Animal Cell Culture- Practical Approach, R.W. Masters, Oxford.
4. Animal Cell Biotechnology, Methods and protocols, Nigel Jenkins, Humana Press.
5. Biotechnology of Animal Tissue. P.R.Yadav& Rajiv Tyagi. 2006. Discovery Publishing House. New Delhi.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABI2001	Core 3	ANALYTICAL TECHNIQUES	5	5

Objectives:

The objective is to educate the students on the basic principles, instrumentation and applications of the analytical tools of biochemistry

Course outcome:

CO1	Understand the principle, instrumentation and applications spectroscopy
CO2	Assess the radio labelled components
CO3	Determine the molecular weight of protein and DNA by Electrophoretic techniques
CO4	Understanding the basic principles, methods, instrumentation and applications of chromatography techniques
CO5	Separation of subcellular components by centrifugation techniques
CO6	Identification of structure of biological macromolecules.
CO7	Understand the basic principles, instrumentation and applications of the analytical tools of biochemistry

Unit I – Spectroscopy

15 Hrs

Laws of absorption and absorption spectrum. Principle, instrumentation and applications of UV-visible, spectro-fluorimetry, Luminometry, Turbidometry & Nephelometry. Atomic absorption spectroscopy. Flame emission spectrophotometry. Basic principles of NMR, ESR and mass spectrometry and their biological applications. X-ray diffraction, ORD and CD-elementary details.

Unit II - Radioisotope Techniques & Microscopy

15 Hrs

Nature and units of radioactivity. Detection and measurement of radioactivity- Geiger-Muller counter, solid and liquid scintillation counting. Autoradiography. Applications of radioisotopes in biology- Radiation hazards.

Microscopy – Basic principles. Light, bright field, phase – contrast and fluorescence microscopy. Electron microscopy – preparation of specimens. TEM and SEM. Microtomy Fixation and staining. Flow cytometry, FACS.

Unit III - Electrophoresis & Blotting Techniques

15 Hrs

Electrophoresis: General principles. Electrophoresis of proteins- SDS-PAGE, native gels, isoelectric focusing, Cellulose acetate electrophoresis. Electrophoresis of nucleic acids- agarose gel electrophoresis, pulsed-field gel electrophoresis.

Blotting techniques: Southern, Northern and Western blotting techniques. DNA fingerprinting.

Unit IV – Chromatography

15 Hrs

Principle, instrumentation and applications of thin layer chromatography, gas liquid chromatography, ion-exchange chromatography, Molecular exclusion chromatography and Affinity chromatography. Principle, instrumentation and applications – HPLC, Capillary electro-chromatography.

Unit V - Centrifugation & Tissue Fractionation

15 Hrs

Basic principles of sedimentation. Ultracentrifuge: analytical and preparative ultracentrifuge-instrumentation and applications. Subcellular fractionation by differential centrifugation. Density-gradient centrifugation- rate zonal and isopycnic. Cell disruption, homogenization and extraction of membrane bound proteins-cell disruption methods – organ and tissue slice techniques.

Text Books

1. Practical Biochemistry by Wilson and Walker. 5th edition Cambridge Univ 2005.
2. Introductory Practical Biochemistry (Narosa, 2000) by Shawney & Randhir Singh.

References

1. Physical Biochemistry by David Friefelder, W.H. Freeman 2nd edition (1982).
2. Introduction to Medical Laboratory Techniques by Mukherjee, Volume I, II & III.
3. Introduction to instrumental analysis by Robert D.Brown, Pharma Book Syndicate (2006).
4. Boyer, R. Modern Experimental Biochemistry. 3rd ed. Addison Wesley Longman, 2000.
5. Upadhyay, Upadhyay and Nath. Biophysical Chemistry Principles and Techniques. Himalaya Publ. 1997
6. Sambrook. Molecular Cloning. 2nd edition. Cold Spring Harbor Laboratory, 2001.
7. David Friefelder Physical Biochemistry – Applications to Biochemistry and Molecular Biology. WH Freeman & Co. 2nd edition 1999.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABI2002	Core 4	BIOENERGETICS AND INTERMEDIARY METABOLISM	6	5

Objectives:

The objective of this paper is to make the students learn metabolic pathways of biomolecules and understand the interrelationship between the pathways and the mechanisms of regulation.

Course outcome:

CO1	Students will able to Understand the metabolic pathways, the energy yielding and energy requiring reactions in living systems
CO2	Students will able to Understand the metabolism of carbohydrates
CO3	Students will able to Understand the metabolism of lipids and its regulations
CO4	Students will able to Understand the metabolism of Amino Acid And Protein
CO5	Students will able to Understand the metabolism of purine and pyrimidine nucleotides
CO6	The objective of this paper is to make the students learn metabolic pathways of biomolecules
CO7	The objective of this paper to understand the interrelationship between the pathways and the mechanisms of regulation

UNIT I – BIOENERGETICS AND BIOLOGICAL OXIDATION

15 Hrs

Definition – Laws of Thermodynamics and its Applications, Free energy, Enthalpy and entropy, endergonic and exergonic reactions, Calculation of Free energy change in Biological Reactions. High-energy phosphates. Enzymes involved in redox reactions. The electron transport chain- organization of respiratory chain complexes I, II, III, IV and electron flow. Oxidative phosphorylation- electron transfer reactions in mitochondria. F₁F₀ ATPase- structure and mechanism of action. The chemiosmotic theory. Inhibitors of respiratory chain and oxidative phosphorylation- poisons, uncouplers and ionophores. Regulation of oxidative phosphorylation.

UNIT II - CARBOHYDRATE METABOLISM

15 Hrs

Overview of glycolysis. The citric acid cycle and regulation. The pentose phosphate pathway and uronic acid pathway. Glycogenesis, gluconeogenesis, Glycogenolysis its Regulation. Metabolism of glycogen and regulation. The glyoxylate cycle. Cori cycle.

UNIT III LIPID METABOLISM

15 Hrs

Oxidation of fatty acids- role of carnitine in fatty acid transport, α , β and ω -oxidation. Biosynthesis of fatty acids - Fattyacid synthase complex – regulation of lipogenesis.

Metabolism of triglycerides, phospholipids and sphingolipids. Cholesterol- biosynthesis, regulation, transport and excretion.

UNIT IV AMINO ACID AND PROTEIN METABOLISM,

15 Hrs

Overview of Biosynthesis of the nutritionally essential and nonessential amino Acids. Conversion of amino acids to specialized products. Catabolism of amino acid nitrogen- transamination, deamination, ammonia formation and the urea cycle.

UNIT V - PURINE AND PYRIMIDINE METABOLISM

15 Hrs

Metabolism of purines- de novo and salvage pathways for biosynthesis. Purine catabolism. Biosynthesis and catabolism of pyrimidines. Regulation of purine and pyrimidine metabolism.

TEXT BOOKS:

1. Harper's Biochemistry, Murray, Granner, Mayes, Rodwell 25th Edition. McGrawhill Co.
2. Davidson and Sittman 1999. Biochemistry NMS 4th edition. Lippincott. Williams and Wilkins.

REFERENCES:

1. Stryer. Biochemistry. Freeman. 6th ed. 2006.
2. Nelson Cox. Lehninger's Principles of Biochemistry. 5th ed. Freeman, 2008.
3. Donald Voet, J.G. Voet, John Wiley, Biochemistry, 3rd edition 2008.
4. Kuchel and Ralston. Biochemistry. 2nd ed. Schaum's Outlines Mc Graw Hill, 2006.
5. Davidson and Sittman. Biochemistry NMS. 4th ed. Lippincott. Williams and Wilkins, 1999.
6. Campbell and Farrell. Biochemistry 4th ed. Brooks/Cole Pub Co. 2002.
7. Elliot and Elliot. Biochemistry and Molecular biology 3rd edition Oxford University Press Inc, 2005.
8. Zubey Biochemistry 4th edition, WCB Publishers, 1998.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIPR21	CORE PRACTICAL 3	BIOCHEMICAL ANALYSIS OF BLOOD	6	4

Objectives: To have knowledge about the normal and abnormal biochemical constituent of blood.

Course outcome:

CO1	Plan and carry out estimations of biochemical constituents of blood
CO2	Able to operate autoanalyser and correlate their experience with manual biochemical methods.
CO3	Perform analysis of normal and abnormal biochemical constituent of blood.
CO4	Determine lipid profile.
CO5	Analyze the blood sugar and Glucose tolerance
CO6	Able to correlate theory with practice.

1. Collection and preservation of biological fluids (blood, plasma serum, urine and CSF)
2. Estimation of glucose by GOD & POD method
3. Estimation of Glucose by Orthotoulidine (OT) method.
4. Glucose tolerance test
5. Estimation of glycosylated hemoglobin
6. Estimation of protein by Bradford's method
7. Estimation of blood urea by DAM method
8. Estimation of blood uric acid.
9. Estimation of serum creatinine alkaline picrate method.
10. Estimation of serum cholesterol.
11. Estimation of serum bilirubin.
12. Demonstration of Auto Analyser.

Text Books

1. Practical Clinical Biochemistry – Harold Varley, CBS, New Delhi
2. Medical Laboratory Technology – Kanai L. Mukherjee, Tata McGraw Hill., Vol. I, II, III.

References

1. Laboratory manual in Biochemistry – Jayaraman
2. Biochemical methods – S. Sadasivan and Manickam

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIPR22	CORE PRACTICAL 4	HEMATOLOGY AND SEROLOGY	5	4

Objectives: To have knowledge of blood cells count and investigation of human viral diseases.

Course outcome:

CO1	Collect, preserve, store, and transport blood and urine specimens in the laboratory for examinations.
CO2	Apply basic techniques used in the laboratory for determination of hematological parameters.
CO3	Determination of serological parameters using commercially available diagnostic kits.
CO4	Operate blood cell counter and correlate their experience with manual biochemical methods.
CO5	Able to operate ELISA reader and correlate their experience with manual biochemical methods.
CO6	Carryout the blood cells count for the investigation of diseases.

Hematological Studies

1. Collection preservation and storage of Blood
2. Total RBC count.
3. Total WBC count.
4. Calculation of RBC indices: MCV, MCH, MCHC
5. Differential WBC count (DC).
6. Estimation of hemoglobin content.
7. Determination of Packed Cell Volume.
8. Absolute Eosinophil count (AEC).
9. Total platelet count.
10. Determination of bleeding time.
11. Determination of clotting time.
12. Determination of ESR.
13. Demonstration of cell counter.

Serological Studies

1. Grouping of blood and Rh typing
2. Widal Test.
3. CRP Test.

4. Rheumatoid arthritis Test.
5. Pregnancy Test
6. Demonstration of ELISA reader

Text Books

1. Practical Clinical Biochemistry – Harold Varley, CBS, New Delhi
2. Medical Laboratory Technology – Kanai L. Mukherjee, Tata McGraw Hill., Vol. I, II, III.

References

1. Laboratory manual in Biochemistry – Jayaraman

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIEP21	ELECTIVE II	HUMAN PHYSIOLOGY	6	4

Objectives

- To understand the anatomical structures and the physiological functions of body systems.
- To understanding of neurophysiology, respiratory, cardiovascular and digestive and excretory physiology of human system.

Course outcome:

CO1	Understand the physiology of blood and muscles
CO2	Describe the mechanism of cardiac cycle and functions of sensory organs
CO3	Understand the mechanism of respiration and thermoregulation.
CO4	Able to explain the mechanism of central nervous system and reproductive system.
CO5	Discuss the process of digestion and absorption of food.
CO6	Understand the anatomical structures of human respiratory system, nervous system, cardiovascular and digestive and excretory system.
CO7	Correlate the physiological functions of human Respiratory system, nervous system, respiratory system, cardiovascular and digestive and excretory system.

Unit I - Blood & Muscle Physiology

20 Hrs

Blood corpuscles, hemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups and Rh typing, hemoglobin, immunity, hemostasis. Mechanism of Blood clotting. Muscle – types and their mechanism of action.

Unit II - Cardiovascular System & Sense Organs

15 Hrs

Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above, Pace maker.

Physiology of vision: Structure of eye, image formation and defects of the eye, Receptor mechanism of the eye, photo pigments, Visual cycle and colour adaptation.

Sense organs – structure of hearing, defect of hearing and tactile response.

Unit III -Respiratory System & Thermoregulation

15 Hrs

Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Thermoregulation - Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization

Unit IV -Nervous System&Reproductive System

20 Hrs

Neurons, action potential, gross neuro-anatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture. Nerve impulse, conduction of nerve impulse - myelinated, non-myelinated fibres, synapse, synaptic transmission, neuro macular junction, reflex action.

Reproductive organ - Hormonal regulation of testicular and ovarian function. Spermatogenesis and Oogenesis. Puberty, pregnancy and lactation. Contraceptive methods.

Unit V - Digestive & Excretory System

20 Hrs

Digestion and absorption of carbohydrates, protein, fat, energy balance, BMR. Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.

Text Books

1. Human Physiology 11th Edition (Volume 1) by C.C.Chatterjee 2016.
2. Human Physiology: An Integrated Approach 5th Edition by Dee Unglaub Silverthorn 2010.
3. Text Book of Medical physiology – Guyton & Hall, 2015.
4. Human Physiology – Dr. N. Arumugam, Saras publications.
5. Human Physiology and Mechanisms of Disease by Guyton, 6th edition, Saunders Publications 1996.
6. Review of medical physiology, William. F. Ganong, 14th edition, A Lange Medical book.
7. Human physiology, 2nd edition- BJ Mejer, HS Meij, AC Meyer, AITBs publishers abd distributers.

References

1. Human Body in health and Diseases, Barbara Janson Cohen, Jasan J Taylor, Memmler's 10th edition, Lippincott Williams & Wilkins publications.
2. Review of Medical Physiology by William. F. Ganong. McGraw-Hill Medical; 22 edition 2005.
3. Human Physiology & Mechanism of Disease by Guyton MD, Arthur C, 6th edition.
4. Vander's Human Physiology 11th edition, Widmaler, E.P, Raff.H, Strang,K.T McGraw Hill International Publications 2008.
5. Human Physiology 7th edition Fox, S.I. McGraw Hill Publications 2002.
6. A Hand Book of Basic Human physiology- K. Saradha subramanyam, S. Chand & Co., Ltd.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABIEP22	ELECTIVE II	NANO BIOTECHNOLOGY	6	4

Objectives: This helps the students to understand the various nanomaterials, their construction and biological approach of the same in medical field.

Course outcome:

CO1	Understand the fundamental principles of nanotechnology.
CO2	Identify the types and applications of biopolymers.
CO3	Evaluate the biocompatible nucleic acid-based nanomaterials.
CO4	Understand nanotechnology with reference to therapeutics, drug targeting and drug delivery.
CO5	Identify the various plant-based nanomaterials applicable in medical field.
CO6	Gain practical knowledge of synthesizing of nanomaterials using natural sources

Unit I - Introduction

20 Hrs

Nanotechnology – definition and scope, nanobiotechnology- recent development and applications, Bioconjugation mediated drug delivery, carbon nanotubes – types and their biomedical applications. Immunotoxin are targeted cell killers. General medicine is changing into personalized nanomedicine.

Unit II - Biopolymer

20 Hrs

Biopolymer- classification and types, polymer nanofibers - electrospinning method and their biomedical applications, biocompatible polymer and their application in tissue engineering, polymer nanocomposite- bone and dental restorations, polymer-controlled drug delivery for the treatment of cancer and other diseases. Biodegradable polymer derived from amino acid.

Unit III - Biocompatible Nanomaterials

20 Hrs

Metal Microbes interaction, Biological metal nanoparticle synthesis and biomedical application – Dendrimers, quantum dots, Biodegradable optical nanoparticles for tumor diagnosis and treatment. PLA and PLGA Based nanoparticulate delivery system.

Unit IV - Nucleic Acid Based Nanomaterials

15 Hrs

DNA based artificial nanostructures; Fabrication, properties and application-Nucleic acid engineered nanomaterials and their applications. Protein patterning for applications in biomaterials. DNA lipoplexes – Lipofection efficiency In Vitro and In Vivo, Polymer controlled delivery of therapeutic nucleic acid.

Unit V - Liposphere in Drug Target and Delivery

15 Hrs

Liposome - liposomes in sensor technology, polymeric Micelles – Production of Lipospheres for Bioactive compound delivery – Melt dispersion technique, Solvent evaporation technique and Invitro drug release - Polymeric biodegradable liposphere for vaccine delivery.

Text Books

1. Pradeep T, 2007, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TATA Mc Graw – Hill Education.
2. Nano Biology Veenita Singh
3. A Hand Book of Nano biotechnology Rita Khare.
4. Nano Biotechnology Subbiah Balaji.
5. Biomaterials Sciences: An Introduction to Materials 2nd Edition, Buddy D.Ratner, Allan S.Hoffman, Frederick J.Schoen and Jack E.Lemons

References

1. Challa S.S.R. Kumar (Ed). 2006. Biological and pharmaceutical nanomaterials. Wiley-VCH Verlag GmbH & Co., KgaA.
2. K.K. Jain 2006 Nanobiotechnology in Molecular Diagnostics: Current Techniques and Application Horizon Biosciences.
3. Niemeyer, C.M. Mirking C.A., (Eds.) 2004. Nano biotechnology concepts Applications and Perspectives, Wiley- VCH, Weinheim-2004
4. Molecular Design and Synthesis of Biomaterials Biological Engineering Division, MIT Open Course Ware, 27th May 2005
5. Nanotechnology: A General Introduction to the Next Big Idea Mark Ratner and Daniel Ratner: Pearson Education Publishers, 2002
6. Encyclopedia of Nanoscience & Nanotechnology, H.S.Nalwa (Ed.,) American Scientific Publishers, California, 2004.
7. Nano Biotechnology: Concepts, applications and perspectives. Christofer M.Niemayer, Chad A.Mirkin, Wiley VCH Publishers 2004.
8. Nano-Biotechnology concepts, Application & Perspectives, Edited by C.M. Niemeyer, C.A.Mirkin, Wiley-VCH India Pvt. Ltd.

REFERENCE BOOKS:

1. Research Methodology, Methods and Techniques – C.R Kothari – Wishwa Prakasam Publications, II Edition.
2. Research: An introduction – Robert Ross – Harper and Row Publications.
3. Research methodology – P. Saravanavel – Kitlab Mahal, Sixth Edition.
4. A Hand book of Methodology of Research – Rajammal P.A. Devadass Vidyalaya Press.
5. Introduction to Computers – N. Subramanian
6. Statistical methods – G.W Snedecor and W. Cochran – Oxford and IBH, New Delhi.
7. Research Methodology Methods and Statistical Techniques – Santosh Gupta.
8. Statistical Methods – S.P Gupta
9. Scientific social surveys and research – P.Young – Asia Publishers, Bombay.
10. How to write and publish a scientific paper – R.A Day – Cambridge College Press.
11. Thesis and Assignment writing – Anderson – Wiley Eastern Ltd.
12. Ethics in Competitive Research- P. Chaddah (2018) ISBN:978-9387480865
13. Ethics in Science Education, Research and Governance (2019), Indian National Science Academy (INSA) ISBN:978-81-939482-1-7.
http://www.insaindia.res.in/pdf/ethics_Book.pdf.
14. What is ethics in research &why is it important, *National Institute of Environmental Health Science*, , Resnik, D.B(2012),
<http://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHABI01	CORE I	RESEARCH METHODOLOGY	5	5

Objectives:

The objective is to educate the students on the basic research, research design, and principle in scientific research, data collection and analysis of significance data.

Course outcome:

CO1	Understand the fundamentals of research methodology
CO2	Identify the research problems and research design
CO3	Propose the research hypothesis.
CO4	Collect and analyze the research data
CO5	Plan thesis and research paper writing.
CO6	Understand the basis of research, research design, and principle in scientific research data collection and analysis of significance data

UNIT I - Research Methodology and Research Ethics

Meaning of research –Objectives of research –motivation of research- Types, approaches and significance-Methods versus methodology – Research in scientific methods – Research process – Criteria for good research – Problem encountered by research in India – Funding agencies.

Research ethics with respect to science and research, scientific misconducts – Falsification, Fabrication and Plagiarism. Software tools – Plagiarism software like Turnitin, Urkund. Publication ethics and its importance.

UNIT II - Research Design

Research problem: Selecting the problem – Necessity of defining the problem – Techniques involved in defining the problem – Research design- Needs and features of good design – Different research design- Basic principles of experimental designs.

UNIT III – Data Collection and Documentation

Data collection methods- Data types- Processing and presentation of data- Techniques of ordering data-Meaning of primary and secondary data-The uses of computers in research-The library and internet-Uses of search engines-virtual libraries – common software for documentation and presentation.

UNIT IV – Data and Error Analysis

Statistical analysis of data-Standard Deviation-Correlation-Comparison of sets of data-Chi square analysis of data-Characteristics of Probability Distribution-Binomial, Poisson and normal distribution- Principle of least square fittings- Curve Fitting-Measurement of Errors- Types and sources of errors- Determination and control of errors.

UNIT V – Research Communication

Meaning of research report – logical format for writing thesis and paper- Essential of scientific report- Abstract, Introduction, Review of literature. Materials and methods and discussion- Write up steps in drafting report- Effective illustrations; Tables and figures – Reference styles; Harvard and Vancouver systems.

Text Books:

1. Research methodology, Methods and techniques- C.R.Kothari-Vishwapragasam Publications, 2nd edition.
2. A hand book of methodology of Research – Rajammal P.A.Devadas-Vidhalaya press.
3. Research methodology – P.Saravanel – Kitlab mahal, 6th edition.
4. Research; An introduction – Robert Ross – Harper and Row Publications
5. Research methodology methods and statistical techniques –Santhosh gupta.

Reference:

6. Introduction to computers – N.Subramanian
7. Statistical methods – G.W.Snedecor and W.Cocharan- Oxford and IBH, New delhi
8. Statistical methods- S.P.Gupta
9. Scientific social survey and research – P.Young –Asia publisher, Bombay.
10. How to write and publish a scientific paper – R.A.Day, Cambridge University Press.
11. Thesis and assignment writing- Anderson- Wiley Eastern Limited.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHABI02	CORE II	ANALYTICAL METHODS	5	5

Objectives:

The objective is to educate the students on the basic principles, instrumentation and applications of the analytical tools of biochemistry

Course outcome:

CO1	Understand the principle, instrumentation and applications spectroscopy
CO2	Isolation and separation of biological macromolecules
CO3	Discuss the basic principles, methods, instrumentation and applications of radioisotope techniques
CO4	Separation and identification of protein and DNA by Electrophoresis
CO5	Understand the basic principles, methods, instrumentation and applications of chromatography techniques
CO6	Understand the basic principles, methods, instrumentation and applications of centrifugation techniques
CO7	Apply the basic principles, instrumentation and applications of the analytical tools in biochemistry

UNIT I - Separation & Chromatographic Techniques

Centrifuge techniques, Preparative centrifugation, Density gradient, Analysis of subcellular fractions. Determination of molecular weight macromolecules, Analytical ultra-centrifugation.

Absorption chromatography, Partition chromatography, Ion exchange chromatography, Exclusion chromatography, Affinity chromatography, HPLC, Application of these techniques.

UNIT II - Electrophoretic & Radio Isotope Techniques

General techniques, High voltage electrophoresis, Disc electrophoresis, Iso electric, focusing, Application of these techniques. Nature of radio activity Detection and measurements of radioactivity, Application in biological science, Safety Aspects.

UNIT III - Spectroscopic Techniques

Basic principle, Spectrophotometry, Fluorometry, Flame photometry, ESR, NMR

Mass Spec & Application of these techniques.

UNIT IV - Manometric & Immunological Techniques

Types of manometry, Warburgs constant volume, Oxygen electrode, Applications.

Introduction, Production of antisera and precipitation reaction, Precipitation in free solution, Precipitation in gel immuno diffusion, RIA, ELISA, Immuno fluorescence

UNIT V - Statistical Methods

Basic concepts, Law of chance, probability, mean, SD, binomial expression, hardy Weinberg laws, Test analysis of variance, co-efficient of correlation.

Text Books:

1. Practical Biochemistry by K.Wilson and J.Walker. 5th edition Cambridge Univ 2005.
2. Introductory Practical Biochemistry (Narosa,2000) by K.Shawney & Randhir Singh.
3. Introductory Practical Biochemistry by S.K. Sawhney (Editor), R. Singh (Editor)

Reference:

1. Physical Biochemistry by David Friefielder, W.H.Freeman 2nd edition (1982)
2. Introduction to Medical Laboratory Techniques by Mukherjee, Volume I,II & III
3. Introduction to instrumental analysis by Robert D.Brown, Pharma Book Syndicate (2006)

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHABI04	ELECTIVE I	GENETICS AND MOLECULAR BIOLOGY	5	5

Objectives:

- ✓ The major objective of the paper is to envisage thorough knowledge in genetics, genome organizations in organisms and their developmental aspects.
- ✓ To understand the basis of molecular biology
- ✓ To understand the genetic mutation and repair processes

UNIT-I MENDELIAN GENETICS

Monohybrid experiments: law of segregation - alleles, law of dominance, law of independent assortment – phenotype, genotype, test cross, back cross. Genic interaction, incomplete dominance & co-dominance.

UNIT-II REPLICATION

Experimental proof for DNA as genetic material -Types of replication, evidence for semi conservative replication – Messelson & Stahl's Experiment. Replication in circular chromosome –John Cairn's model, rolling circle model. Replication in prokaryotes, Ori-c initiation and inhibitors of replication. DNA polymerases I, II, & III, lagging & leading strand, Okazaki fragments. DNA gyrase, topoisomerase, DNA ligase. Reverse transcriptase, retroviruses, satellite DNA and Cot value.

UNIT-III TRANSCRIPTION

RNA polymerases –promoter regions in prokaryotes & eukaryotes. Role of sigma factor, initiation, elongation and termination. (Rho - dependent and independent). Inhibitors of transcription, post transcriptional modification of prokaryotes & eukaryotes- introns, exons, & enhancers. Overlapping genes.

UNIT-IV TRANSLATION

Activation of amino acids, initiation, elongation and termination of protein synthesis in prokaryotes- post translational modification of proteins. Genetic codes - definition, deciphering of genetic code, Khorana's work- salient features of genetic code. Components & functions of pro- & eukaryotic ribosome. Structure of t-RNA, coding and non-coding strands of DNA. Role of signal peptides. Brief outline of cloning, restriction enzymes, & protein targeting.

UNIT - V rDNA, GENE EXPRESSION, DNA REPAIR & MUTATION

rDNA mechanism: forms of recombination & applications. Mutagenesis & replication fidelity. DNA repair mechanism-excision repair, SOS and UV repair. Prokaryotic gene regulation - Lac operon, positive and negative control. Gene mutation types - point, transition, transversion, frame shift, insertion and deletion mutations.

Text Books

1. Principles and Techniques of Biochemistry and Molecular Biology, 7th edition Keith Wilson and John Walker, Cambridge University Press-New Delhi, 2010.
2. Molecular Biology by David Freifelder Published by Jones & Bartlett Publishers 2004.
3. Genes VIII. by Benjamin M Lewin. New York : Oxford University Press 2004.
4. Genes VII by Benjamin Lewin 7th Edition, Publisher: Oxford University Press, 2000.
5. Instant Notes in Molecular Biology 2nd edition P.C. Turner, A.G. McLennan, A.D. Bates, M. R. H. White, Published by Bios Scientific Publishers Ltd 2000.
6. Cell biology and Genetics - P.S. Verma and V.K. Agarwal, S. Chand publication
7. Concepts of Genetics, by William S. Klug, Michael R. Cummings, Charlotte A. Spencer, Michael A. Palladino (Author) 11th Edition, 1997.
8. Genetics - Manju yadav Ist Edition, Discovery publishing House 2003.

References

1. Lehninger Principles of Biochemistry 6th Edition by David L. Nelson, Michael M. Cox, New York: W.H. Freeman 2008.
2. Molecular Biology by Robert F. Weaver Hardcover, Third Edition Published March 19th 2004 by McGraw-Hill Science/Engineering/Math.
3. Cell and molecular biology concepts and experiments (3rd ed.): Karp, G. John Wiley & Sons, Inc., New York, 2002.
4. Molecular Biology of the Gene, 5th Edition, James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick, Pearson publication 2002.
5. Molecular Cell Biology 5th Edition by Harvey Lodish, Arnold Berk, Freeman publications, 2003.
6. Lehinger's principle of Biochemistry, Nelson and Cox 2000.
7. Harper's Biochemistry - Rober K. Murray, Daryl K. Grammer, McGrawHill, Lange Medical Books

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHABI04	ELECTIVE I	DIAGNOSTICS IN THE CONTROL OF DISEASE	5	5

Objectives:

- ✓ The major objective of the paper is to visualize thorough knowledge in molecular level approach in control of diseases.
- ✓ The objective is to educate the students on techniques to identify the diseases.

UNIT-1 MOLECULAR APPROACHES IN THE CONTROL OF DISEASE

Cancer, inherited disorder and infection disease. Potential diagnostic marker in cancer. Potential targets for therapy, therapeutic application of oncogenes and their products. Tumor suppressor genes as targets, gene therapy, use of receptor or adhesion analogs in the prevention of infection diseases

UNIT-2 MOLECULAR TECHNIQUES-1

Analysis of DNA/RNA ; PCR, mutation detection techniques- single stranded conformation polymorphism (SSCP) analysis, alleles- specific oligonucleotide hybridization (ASOH), hetro duplex analysis.

UNIT-3 MOLECULAR TECHNIQUES-2

Denaturation gradient gel electrophoresis (DGGE) chemical mismatch cleavage (CMC), RT-PCR, protein truncation test (PTT), DNA fragmentation, apoptosis, southern blotting, northern blotting, gene tracking with RFLP & micro-satellite instu hybridization, Fish, Human gene mapping

UNIT-4 MOLECULAR TECHNIQUES-3

Analysis of protein- production of antibodies, Western blotting, immuno histo-chemical techniques, flow cytometry (FACS). Receptor ligands binding assay. Scatchand plot. (identification, cloning, and expression of antigen with vaccine potential)

UNIT-5 MOLECULAR TECHNIQUES-4

Application of molecular techniques I,II&III, in the diagnosis and control of cancer, inherited disease and infection disease. Recent development in molecular diagnostics, chemical amplification of PCR reaction, development of the DNA chip, magnetic separation of single cells of diagnostic and prognostic value.

Reference

1. PCR- A practical approach vol 1&2. Ed: M. J. Mc phenson & G. R. Taylor.
2. Flow cytometry- A practical approach Ed: M. G. oxford univ press
3. Physical chemistry Ed. David friefields
4. Molecular cloning vol.1,2,3.
5. Molecular Diagnosis of Cancer Methods and protocol second edition Joseph E Roulston and John MS Bartlett
6. Molecular Diagnosis of Genetic diseases second edition Rob Elles

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABT1001	CORE 1	The Cell	5	5

Instructional Objectives:		
<ol style="list-style-type: none"> 1. To understand all types of cell with organelles. 2. To promote and develop the skills that has enduring value beyond the classroom. 		
Course Outcome: After completion of the course students will be able to		
Co Number	CO Statement	Knowledge Level (K1-K4)
CO1	Distinguish the various process involved in plant and animal development.	K1, K2
CO2	Recall the history of cytology and draw the structure of cell organelles and locate its parts along with functions	K4
CO3	Distinguish the structure of prokaryotic and eukaryotic cell.	K3
CO4	Summarize the definition, sources and applications of Organelle of the cells.	K4
CO5	Compare and contrast the events of cell cycle and its regulation.	K3
Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate		
Unit 1	Basics of Cell and its types	15 Hours
History of cell - cell as basic unit of life - cell theory, protoplasm theory and organismal theory - broad classification of cell types: prokaryotic and eukaryotic cells and their similarities and differences- blood cells – stem cells.		
Unit 2	Ultra structure of various cells	15 Hours
Size, shape and ultra structure: Plant cell – animal cell – bacterial cell – yeast cell – chlamydomonas.		

Unit 3	Structure and functions of cell wall	15 Hours
. Bacterial cell wall – plant cell wall - fungal cell wall - plasma membrane – exocytosis, endocytosis - phagocytosis – vesicles and their importance in transport - Cytoskeleton structure – microtubules, microfilaments and intermediate filament.		
Unit 4	Structure and functions of cell organelles	15 Hours
Endoplasmic reticulum (rough and smooth endoplasmic reticulum) - golgi apparatus – lysosomes - microbodies (peroxysomes and glyoxysomes) – vacuoles – ribosomes -centriole - basal bodies		
Unit 5	Central organelles and cell cycle	15 Hours
Mitochondria – organization of respiratory chain, chloroplasts – photophosphorylation, nucleus, nucleolus, nuclear membrane and organization of chromosomes - cell cycle and cell division (mitosis and meiosis).		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Verma P.S. and Agarwal V.K. (2016) Cell Biology (Cytology, Biomolecules, Molecular Biology), Paperback, S. Chand and Company Ltd. 2. S. Arumugam (2019), Cell and Molecular Biology, Saras publication. 3. Cell biology and Genetics, P.K. Gupta – Rastogi publication 2016 		
Books for References:		
<ol style="list-style-type: none"> 1. Cooper G.M. (2019) The Cell – A Molecular Approach, 8th Edn.,Sinauer Associates Inc., Oxford University Press p.813. 2. Alberts B., Johnson B., Lewis J., Morgan D., Raff M., Roberts K. and Walter P. (2015) Molecular biology of cell, 6th edn., Garland Science, Taylor and Francis, p. 1465 3. Mason K.A., Losos J.B. and Singer S.R. (2011) Raven and Johnson’s Biology. 9th Edn. McGraw Hill publications. p.1406. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABTPR11	CORE PRACTICAL 1	THE CELL AND MOLECULAR BIOLOGY - PRACTICAL	2	0

Instructional Objectives:

1. To understand and equip the cell types of both plant and animal structure.
2. To understand Mitotic cell division preparation, get knowledge about all kinds of cells.

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Observe various types of cells.	K2
CO2	Design the model of a cell.	K2
CO3	Perform squash preparation of onion root tip cells for observation of cell division.	K2, K4
CO4	Isolate the cell organelles by differential centrifugation technique.	K2
CO5	Measure the size of various cells.	K2, K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Practical

1. Observation of human Buccal cells	6 Hours
2. Observation of mitotic cell division in onion root tip	6 Hours
3. Observation of blood cell types	5 Hours
4. Fractionation of cell organelles by differential centrifugation	5 Hours
5. Identification of plant, animal, fungi, algal and bacterial cell.	4 Hours
6. Measurement of size of cells by micrometry	4 Hours

Books for study (Text Books):

1. Verma P.S. and Agarwal V.K. (2016) Cell Biology (Cytology, Biomolecules, Molecular Biology), Paperback, S. Chand and Company Ltd.
2. S. Arumugam (2019), Cell and molecular Biology, Saras publication.

Books for References:

1. Cooper G.M. (2019) The Cell – A Molecular Approach, 8th Edn., Sinauer Associates Inc., Oxford University Press p.813.
2. Alberts B., Johnson B., Lewis J., Morgan D., Raff M., Roberts K. and Walter P. (2015) Molecular biology of cell, 6th edn., Garland Science, Taylor and Francis, p. 1465
3. Mason K.A., Losos J.B. and Singer S.R. (2011) Raven and Johnson's Biology. 9th Edn. McGraw Hill publications. p.1406.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABTAL11	ALLIED 1	ALLIED - BIOMOLECULES	5	5

Instructional Objectives:

1. To make understand the structure and reactions of carbohydrates
2. Discuss the structure and biological functions of fats and lipids
3. Discuss the structure, properties and reactions of proteins and amino acids
4. To study the composition, structure and functions of nucleic acids

COURSE OUTCOME: After completion of the course students will be able to

CO No.	CO Statement	Knowledge level K1 – K6
CO1	Classify various biomolecules.	K4
CO2	Understand the structural diversification in carbohydrates	K1
CO3	Understand the properties of protein and its structures	K3
CO4	Understand the role of Vitamins and their functions	K2
CO5	Discuss the structure of Nucleic acids and its properties.	K6
CO6	Explain the mechanisms of enzyme actions	K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit 1	Carbohydrates	15 Hours
Classification of carbohydrates - Reactions of carbohydrates - Isomerism of carbohydrates, Fischer projections, Haworth structures, pyranose and furanose structures, Anomers, Epimers. Source-Structure and functions of Monosaccharides, Disaccharides and Polysaccharides.		
Unit 2	Lipids	15 Hours
Classification, occurrence, structure and biological functions - phospholipids- glycolipids- sphingolipids- cholesterol. Fatty acids- saturated and unsaturated fatty acids – essential and non essential fatty acids.		
Unit 3	Amino acids and proteins	15 Hours
Classification of amino acids based on structure, side chain, metabolic fate and nutritional requirement -Properties – Isoelectric Point – Colour reactions of amino acids - . Classification of proteins based on function, chemical nature and solubility– Structure – Primary, Secondary - Alpha helix & Beta pleated sheets, Tertiary and Quaternary.		
Unit 4	Nucleic acid	15 Hours
Structure of Purine and Pyrimidine bases – nucleosides and nucleotides- Structure of DNA - Watson and Crick model. Various forms of DNA. RNA and its types - mRNA, rRNA and tRNA.		

Unit 5	Enzymes and vitamins	15 Hours
Classification, Nomenclature, Mechanism of enzyme action. Classification, physiological functions & deficiency disorders of vitamins- A,D,E,K,B complex and C.		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Satyanarayana. U, 2007. Biochemistry- 3rd Edition, Books and Allied (P) Ltd. 2. Chatterjea MN, 2012. Text Book of Medical Biochemistry -8th Edition, Jaypee Publishers 3. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper's Biochemistry. 27th ed. McGraw Hill, 2006. 4. Thomas Devlin. M. Text Book of Biochemistry – 4th Edition, Wiley 5. Fundamentals of Biochemistry J L Jain, Nitin Jain & Sunjay Jain 1979. 6. Ambika Shanmugam's Fundamentals Of Biochemistry For Medical Students, 8ed. 2016. 		
Books for References:		
<ol style="list-style-type: none"> 1. Salway, J.G., 2000. Metabolism at a Glance. 2nd Edition, Blackwell Science Ltd.,. 2. Lehninger's Principles of Biochemistry by David L Nelson; A.L. Lehninger and Michael M. Cox, 5th edition, Worth Publishing. 3. Biochemistry by Donald Voet and Judith G. Voet, 3rd edition, Wiley John and Sons. 4. Berg.J.M, Tymoczko.J.L, Stryer, L. 2006. Biochemistry. 6th ed. Freeman,. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
	ALLIED PRACTICAL 1	BIOMOLECULES AND MICROBIOLOGY - PRACTICAL	2	0

Instructional Objectives:

1. Accuracy and Precision of analysis
2. Qualitative testing of Carbohydrates and fatty acids
3. Identification of amino acids and proteins

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Analyse the pH in Different samples	K4
CO2	Prepare solutions of different concentrations	K5
CO3	Prepare standard buffer solution of different pH	K5
CO4	Analyse the carbohydrate samples through chemical reactions and identify it	K4
CO5	Analyse the Amino acid samples through chemical reactions and identify it	K4
CO6	Detect the fatty acids in samples through chemical titrations	K4
CO7	Separate Amino acids using TLC technique	K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Practical

1	Measurement of pH	3
2	Preparation of solution concentrations	3
3	Preparation of Buffer solutions of known pH	3
4	Qualitative analysis of Carbohydrates	3
5	Qualitative analysis of Amino acids	4
6	Qualitative test for the presence of fatty acids by titrimetric method.	4
7	Amino acid separation by TLC	4

Books for study (Laboratory manual):

1. S. K. Sawhney, 2009. Introductory Practical Biochemistry. Narosa Publishers, India
2. Nigam, 2007. Lab Manual Of Biochemistry. Tata McGraw-Hill Education, USA.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABT2001	CORE 2	MOLECULAR BIOLOGY	5	5

Instructional Objectives:

1. To understand the chemical and molecular processes that occurs in and between cells.
2. To describe and explain processes and their meaning for the characteristics of living organisms.
3. To get insight into the most significant molecular and cell-based methods used today to expand our understanding of biology.

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Explain the structural levels of nucleic acids and genome organization in prokaryotes and eukaryotes.	K2
CO2	Understand the concept of Gene and the gene architecture.	K2
CO3	Overview of the central dogma of life and various molecular events.	K2, K4
CO4	Acquire the knowledge on molecular events in the DNA replication.	K2
CO5	Understand the molecular Events of Transcription and translation.	K2, K4
CO6	Explain the Operon concept with examples.	K2
Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate		
Unit 1	Nuclear organization	15 - Hours
Structure and function of Chromosome, nucleosomes. Modern Concept of gene organization. Structure of specialized chromosomes (polytene and lampbrush chromosomes) – karyotyping – Introns, Exons, repetitive DNA sequences.		
Unit 2	DNA: Replication, damage & repair and mutation	15 - Hours
Mechanism of DNA replication in prokaryotes and eukaryotes – enzymology of DNA replication - DNA damage and repair mechanism - Gene mutation: Types of mutations – Gene		
Unit 3	Transcription	15 - Hours
Mechanism of transcription in prokaryotes and eukaryotes - Components of transcription factors: Promoter sequences, TATA box, Hogness Box, CAAT box, Enhancers, upstream activating sequences –Transcription events: Initiation, elongation and termination - RNA processing in Prokaryotes Vs Eukaryotes.		
Unit 4	Translation	15 - Hours
Prokaryotic and Eukaryotic translation, the translation machinery, Mechanisms of initiation,		

elongation and termination, Regulation of translation. Post-translational modifications and inhibitors of Translation.

Unit 5	Control of gene expression	15 - Hours
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Control of gene expression in prokaryotes and eukaryotes - Operon concept: lac, trp and arb operon, Autogenous regulation, Feedback inhibition, Lytic cascades and lysogenic repression.

Books for study (Text Books):

1. Molecular Biology Labfax, T.A. Brown (Ed.), Bios Scientific Publishers Ltd. (1991)
2. Molecular Biology of the Gene, Watson JD. Hopkins NH. Roberts JW.,Steitz JA and Weiner AM (The Benjamin/Cummings Publ.Co.), (1996).
3. Molecular cell Biology (1999) Lodish, H., Baltimore, D., Berk, A, Zipursky SL, Paul M and Darnell J.

Books for References:

1. Molecular cell biology - Harvey lodish, David Baltimore, 2000
2. Molecular Biology of the Cell, Alberts B., Bray D, Lewis J., Ralf M., Roberts K. and Watson J.D., Garland Publishing Inc. (2001).
3. Molecular Biotechnology – Principles and Application of recombinant DNA – Glick, Pasternak, 2002, Panima Pub.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABTPR21	ALLIED PRACTICAL 1	THE CELL AND MOLECULAR BIOLOGY PRACTICAL	2	2

Instructional Objectives:

1. To understand and apply the principles and techniques of molecular biology which prepares students for further education and/or employment in teaching, basic research, or the health professions.

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Understand and perform the most important methods in molecular biology.	K2
CO2	Extract the DNA from various tissues.	K2
CO3	Perform, interpret and analyze core/widely used molecular biology techniques.	K2, K4
CO4	Observe the giant nature of chromosome in Chironomus Larva	K2

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Practicals

1. Extraction of genomic DNA from prokaryote – bacteria	5 Hours
2. Extraction of genomic DNA from Eukaryote – plant	5 Hours
3. Extraction of genomic DNA from Eukaryote – animal	5 Hours
4. Extraction of genomic RNA	5 Hours
5. Observation of giant chromosome in chironomus larva	5 Hours
6. Nuclear Staining method	5 Hours

Books for study (Text Books):

1. Molecular Cloning: a laboratory manual, Sambrook J., Fritsch EF. and Maniatis T, Cold Spring harbor Laboratory Press, (2000)
2. Practical Biochemistry, Plummer L, Tata McGraw-Hill, (1990).
3. Biochemistry, Stryer I., H.Freeman and Company, (2000).
4. Green, M. R. and Sambrook, J. (2012). Molecular Cloning: A Laboratory Manual Vol 1, 2 & 3, CSHL Press. New York.

Books for References:

1. Molecular Biology of the Gene, Watson JD. Hopkins NH. Roberts JW.,Steitz JA and Weiner AM (The Benjamin/Cummings Publ.Co.), (1996).
2. Molecular cell Biology (1999) Lodish, H., Baltimore, D., Berk, A, Zipursky SL, Paul M and Darnell J.

3. Molecular Biology Labfax, T.A. Brown (Ed.), Bios Scientific Publishers Ltd. (1991)

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABTAL21	ALLIED 2	MICROBIOLOGY	5	5

Instructional Objectives:

- To impart knowledge of the basic principles of bacteriology, virology, mycology, phycology and microbial techniques.
- To promote and develop skills and competencies that has enduring value beyond the classroom.

COURSE OUTCOME: After completion of the course students will be able to

CO No.	CO Statement	Knowledge level K1 – K4
CO1	Recall the history and classification of microbes.	K1, K2
CO2	Evaluate the structure of bacteria and staining of bacteria.	K4
CO3	List and describe the types and structure of viruses	K3
CO4	Classify and characterize the fungi and algae	K4
CO5	Apply the different methods of sterilization; types of microscopes.	K3

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- analyze; K5- Synthesize; K6- Evaluate

Unit 1	Microbial techniques	15 Hours
Microscopy – principle and applications of light, dark, phase contrast, fluorescent and electron microscope- (Transmission and Scanning electron) – sterilization technique – Physical and chemical method of sterilization.		
Unit 2	Introduction to Microbiology	15 Hours
Introduction to microbes – History of Microbiology - Robert Hooke, Anton van Leeuwenhoek John Needham, Lazzaro Spallanzani, Nicolas Appert, and Theodor Von Dusch –Louis Pasteur, John Tyndall, Robert Koch, Edward Jenner - Lord Joseph Lister, Elie Metchnikoff – Scope of Microbiology – classification of microbes – Five kingdom concepts - three kingdom concept.		
Unit 3	General Bacteriology	15 Hours
Morphology and ultra structure of bacteria – general classification of bacteria– growth and multiplication of bacteria – factor affecting growth - bacterial nutrition – principles of bacterial staining techniques – simple, differential, endospore, acid fast and capsular staining – culture medium – types.		
Unit 4	Basic concepts of Virology	15 Hours
General characteristics of viruses, differences between bacteria and viruses. Classification of viruses, Physical and chemical Structures of different Viruses – TMV, HIV, Corona virus.		

Unit 5	Introduction to Mycology and Phycology	15 Hours
General characteristics, classification and reproduction of fungi - <i>Saccharomyces cerevisiae</i> (yeast) - Mushrooms and their medical values. General characteristics, classification and reproduction of algae – commercial importance of algae.		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Anandanarayanan R, 2010. Text book of Microbiology, Universities press. 2. Arumugam N et al, 2014. Microbiology, Saras Publications. 3. Dubey RC and Maheshwari DK, 2013. A text book of Microbiology, S. Chand Publishing. 4. M.J. Pelzer Jr., E.C.S. Chan and N.R Kreig, 1993. Microbiology. McGraw Hill Inc., New York. 		
Books for References:		
<ol style="list-style-type: none"> 1. Prescott, 2011. Microbiology, McGraw Hill Education. 2. Edward A. Birge, 1992. Modern Microbiology, Wm. C. Brown Publishers, Inc. U.S.A. 3. Anandthanarayan, 2013. Text book of Microbiology (9th Edn), Universities press. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UABTAP21	ALLIED PRACTICAL 1	BIOMOLECULES AND MICROBIOLOGY – PRACTICAL	5	5

Instructional Objectives:

1. To get basic knowledge about the microbial techniques in an aseptic environment and demonstrate competency in documenting laboratory results.
2. To understand media preparation, sterilization procedures, isolation and pure culture techniques.

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Apply physical and chemical methods to sterilize glasswares, liquid media etc.	K3
CO2	Perform aseptic inoculation of microbes.	K3
CO3	Prepare culture media for microbes.	K3
CO4	Analyse the culture characteristic of bacteria.	K4
CO5	Perform different culture techniques.	K3
CO6	Apply staining technique to identify microbes.	K3

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Practical

1	Handling and calibration of Microscopy	3
2	Preparation of culture media –Agar plate, agar slant, agar butt and nutrient broth and PDA plate.	5
3	Aseptic transfer of inoculums	2
4	Sterilization techniques – Physical and chemical	3
5	Observation of culture characteristics of bacteria	3
6	Culture techniques – streak plate, spread plate and pour plate method, lawn culture.	3
7	Staining technique – simple staining, Gram's staining and lactophenol cotton blue staining	6
8	Observation of algal cells using permanent slides – BGA, Diatoms and dinoflagellates	3
9	Demonstration for the presence of cyanophages.	2

Books for study (Laboratory manual):

1. Abdul Jaffar Ali H, 2018. Microbiology Laboratory Manual, Vijay Nicole Imprints Pvt Ltd.
2. Ramamurthy VR, 2013. Microbiology laboratory, Black Prints.
3. Dubey RC and Maheshwari DK, 2012. Practical Microbiology, S. Chand publication.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABT1001	CORE 1	INTERACTIONS AND METABOLISM IN BIOMOLECULES	6	5

Instructional Objectives:		
1. To understand molecular interactions in living system. 2. To understand how the metabolism of macromolecules and the regulatory mechanism functions.		
COURSE OUTCOME: After completion of the course students will be able to		
CO No.	CO Statement	Knowledge level K1 – K6
CO1	Analyze the various types of weak interactions between the biomolecules and water. Classify bonds with examples.	K4, K3
CO2	Understand the carbohydrate metabolic pathways and its regulations.	K2
CO3	Describe the structure, biosynthesis and oxidation of fatty acids.	K1
CO4	Describe common pathways of amino acid catabolism to release ammonia.	K1
CO5	Explain nucleotide biosynthetic pathways.	K5
Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate		
Unit 1	Interactions in Biomolecules	18 Hours
Interactions in Aqueous system: Water: Solvent of life – structure- Weak Interactions in Aqueous Systems - Hydrogen Bonds with Polar Solutes, Electrostatic interactions with Charged Solutes, Amphipathic compounds in aqueous solution, Van der Waals Interactions. Noncovalent Interactions among macromolecular in Aqueous Solvent. Chemical Bonds: - ionic bond - hydrogen bonds, Covalent bond- Coordination compound - ligands and chelates - peptide bond, disulfide bond, and co-ordinate bonds with examples.		
Unit 2	Interactions and metabolism of Carbohydrate	18 Hours
Glycosidic bond formation – linkages - Carbohydrate Metabolism: Aerobic & Anaerobic glycolysis, sequence of reactions in glycolysis, regulation in glycolysis, citric acid cycle, glycogenesis, glycogenolysis, Pentose-phosphate pathway -energetic of carbohydrates.		
Unit 3	Interactions and metabolism of Lipid	18 Hours
Ester bonds in lipids - Structures and roles of Fatty acids & Glycerols, beta oxidation of saturated fatty acids, oxidation of unsaturated fatty acids, oxidation of odd chain fatty acids, energy yield, ketone bodies.		
Unit 4	Interactions and metabolism of Amino acid	18 Hours
Protein-protein interactions - Dynamics of intramolecular structural changes. Amino acid Metabolism: Amino acid breakdown (amino acid deamination, Urea cycle, metabolic		

breakdown of individual amino acids – glucogenic & ketogenic amino acids), amino acids as biosynthetic precursors (haem biosynthesis & degradation, biosynthesis of epinephrine, dopamine, serotonin, histamine, glutathione); biosynthesis of essential & non-essential amino acids.

Unit 5	Interactions and metabolism of Nucleotide	18 Hours
Nucleic acid interactions: DNA Binding Proteins, Nuclear Receptors, Antisense & small molecule ligand - Histones and chromatin. Nucleotide Metabolism: biosynthesis of purine & pyrimidine (de novo & salvage pathway); degradation of purine & pyrimidine.		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Satyanarayana. U, 2007. Biochemistry- 3rd Edition, Books and Allied (P) Ltd. 2. Chatterjea MN, 2012. Text Book of Medical Biochemistry -8th Edition, Jaypee Publishers 3. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper's Biochemistry. 27th ed. McGraw Hill, 2006. 4. Thomas Devlin. M. Text Book of Biochemistry – 4th Edition, Wiley 		
Books for References:		
<ol style="list-style-type: none"> 7. Salway, J.G., "Metabolism at a Glance". 2nd Edition, Blackwell Science Ltd., 2000. 8. Lehninger's Principles of Biochemistry by David L Nelson; A.L. Lehninger and Michael M. Cox, 5th edition, Worth Publishing. 9. Biochemistry by Donald Voet and Judith G. Voet, 3rd edition, Wiley John and Sons. 10. Berg.J.M, Tymoczko.J.L, Stryer, L. Biochemistry. 6th ed. Freeman, 2006. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABT1002	CORE 2	ENVIRONMENTAL BIOTECHNOLOGY	6	5

Instructional Objectives:

1. To provide basic knowledge of common analytical techniques for analysis of inorganic ions, natural substances, metabolites and toxicants in environmental matrices.

Course Outcomes: After completion of the course, the students will be able to

CO Number	CO statement	Knowledge Level (K1-K6)
CO1	Understand the Ecosystem and its functioning.	K2
CO2	Analyse the various environmental pollutions.	
CO3	Evaluate the microbial waste water treatment system.	K4
CO4	Identify and describe steps that are included in a complete analysis as sampling, sample preparation, separation, detection and data evaluation.	K2, K4
CO5	Classify and evaluate the global and environmental problem.	K4, K6
CO6	Sample inorganic and organic compounds in soil, water and air	K2, K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit 1	Environment and Pollution	18 Hours
Introduction to environment, Ecosystem structure and functions, abiotic and biotic component, Energy flow, food chain, food web, Ecological Pyramids-types, biogeochemical cycles, ecological succession, Ecads and ecotypes. Environmental pollution, Types; Air pollution: sources and measurement, water pollution: sources and measurements, Soil pollution: sources and measurements. Noise pollution, Thermal pollution, Marine pollution and Radiation pollution.		
Unit 2	Microbiology of waste water treatment	18 Hours
Water as scarce natural resources, Need for water management-waste water collection. Physical, chemical and biological waste water treatment methods. Aerobic waste water treatment: Activated sludge process, Oxidation Ponds, Oxidation ditches, trickling filters, towers, rotating discs. Anaerobic processes: Anaerobic digestion, anaerobic filters, anaerobic sludge, membrane bioreactors, Reverse osmosis and ultrafiltration. Treatment of industrial effluents (Dairy, distillery, tannery, antibiotic industries, Textile, paper and Sugar		
Unit 3	Solid waste Management and Bioremediation	18 Hours
Sources and types of solid wastes, Strategies for Management (Composting, vermiculture, and methane production), treatment of hazardous wastes, and Biomedical wastes. Solid and wasteland-Bioremediation using microbes, in situ & ex-situ Bioremediation, Biosorption, &		

Bioaccumulation of heavy metals, Phytoremediation. Xenobiotics in environment: Bioaccumulation, Biomagnification, Biodegradation, Role of degradative plasmids, degradation of hydrocarbons: substituted hydrocarbons.		
Unit 4	Global Environmental Problems	18 Hours
Acid rain, Ozone depletion, UV-B Radiation Flux increase, effect of UV-light on biological system, Green house effect, Implications of global warming, Effects and measures to control environmental problems. Environmental impact of Pharma manufacturing. Ethics in Environment Management.		
Unit 5	Bioleaching	18 Hours
Introduction and Principles of Bioleaching, Types of Bioleaching, Bioleaching of Copper, Iron, Gold, Uranium, Nickel and microorganisms involved in bioleaching. <i>In situ</i> bioleaching and <i>ex-situ</i> bioleaching. Merits and demerits of bioleaching.		
Books for study (Text Books):		
1. M Arora, (2001), Environmental Management of Toxic and Hazardous Chemicals. Delhi. fvy Pub House 2. Arceivala, S. J. & Asolekar, S. R. (2015). Wastewater Treatment for Pollution Control and Reuse (3rd Edition), McGraw Hill Education India Pvt. Ltd., New Delhi. 3. Mahajan, S.P. (2012), Pollution Control in Process Industries (27th Edition), Tata McGraw-Hill.		
Books for References:		
1. Christson, J. Harst (1997) Manual of Environmental Microbiology, ASM Press, Washington. DC. 2. Geetha Bali et al eds (2001) Environmental Biotechnology, ApS Pub. 3. Hurst C.J. et al eds (1997) Environmental microbiology, ASM Press, Washington, D.C. 4. Moo –Young M (Ed-in-Chief), (2000) Comprehensive Biotechnology, Vol. 4- Pergamon Press, Oxford.		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTPR11	CORE PRACTICAL 1	INTERACTIONS AND METABOLISM OF BIOMOLECULES - PRACTICAL	6	4

Instructional Objectives:

1. To analyze the biomolecules with accuracy and Precision.
2. To estimate the Nucleic acids and proteins.
3. To separate and identify amino acids and sugars using TLC.

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Prepare Buffers of different pH	K5
CO2	Apply Beer Lamberts Principle in Identifying biomolecules	K3
CO3	Quantitatively check the protein concentration in biological samples	K4
CO4	Calculate the concentration of Nucleic acids	K4
CO5	Separate Amino acids using TLC	K4
CO6	Determine the amount of lipid in the samples	K4
CO7	Analyse the carbohydrate sample both qualitative and quantitatively	K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Practicals

1	Buffer preparation and pH measurement	9
2	Preparation of Concentration, Percentage, W/V, V/V, Molarity, Molality and Normality.	9
3	Verification of Beer-Lambert's Law	9
4	Estimation of carbohydrate by anthrone reagent method	9
5	Estimation of protein by Folin Lowry method	9
6	Estimation of lipid by Bragdon method	9
7	Estimation of RNA by Orcinol method	9
8	Estimation of DNA by Diphenyl Amine method	9
9	Separation of Amino acids using Thin Layer Chromatography.	9
10	Separation of sugars using Thin Layer Chromatography	9

Books for study (Laboratory manual):

3. S. K. Sawhney, 2009. Introductory Practical Biochemistry. Narosa Publishers, India
4. Nigam, 2007. Lab Manual Of Biochemistry. Tata McGraw-Hill Education, USA.
5. [Harold Varley](#), [Alan H. Gowenlock](#), 1980. Practical Clinical Biochemistry, Volume

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTPR12	CORE PRACTICAL 2	ENVIRONMENTAL BIOTECHNOLOGY - PRACTICAL	5	5

Instructional Objectives:

1. To estimate the various environmental parameters in air and water.

Course outcomes: After completion of the course, the students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Estimate the water quality parameters to assess the portability of water.	K2, K4
CO2	Assess microbial contamination in sewage	K3, K4
CO3	Isolate Xenobiotics degrading bacteria	K5
CO4	Estimate the level of heavy metals in drinking water	K3
CO5	Assess microbial contamination in drinking water and air	K3, K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Practicals

1	Estimation of Dissolved Oxygen in various water samples.	8
2	Estimation of Total Dissolved Solids / Total Suspended Solids.	8
3	Estimation of Alkalinity / Salinity	8
4	Determination of BOD / COD from sewage sample	8
5	Isolation of Xenobiotics degrading bacteria – by selective enrichment technique.	8
6	Detection of microbes in potable water.	8
8	Estimation of Arsenic level in water	8
9	Estimation of nitrate in drinking water	8
10	Estimation of Chromium level in water	8
11	Analysis of Microbial contamination in air by open plate method	12
12	Production of microbial fertilizers (Demonstration)	6

Books for reference (Laboratory manual):

1. Pepper et. al. 2005. Environmental Microbiology-A laboratory Manual, Academic Press.
2. Michael R. 1974. Introduction to Environmental Microbiology, Prentice Hall
3. B.C. Bhattacharyya and R. Banerjee, 2004. Environmental Biotechnology, Oxford University Press.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTEP11	ELECTIVE I	STEM CELL BIOLOGY	6	4

Instructional Objectives:

To make the student gain knowledge in

1. Stem cell basics
2. Growing of ES cells in lab
3. Differentiation of stem cells
4. Application of stem cells

Course Outcomes: After completion of the course, the students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Understand the implications of the functioning of genes in stem cells.	K2
CO2	Describe basic concepts in stem cell biology, including origin and plasticity.	K2
CO3	Differentiate between embryonic and adult stem cells, and describe their characteristics.	K2
CO4	Understand the applications of stem cell genetics including for tissue engineering and in vitro directed differentiation purposes.	K2 & K4
CO5	Define the molecular mechanisms of stem cell differentiation. Discuss potential therapeutic applications of stem cells.	K3

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit 1	Stem Cell Basics	18 - Hours
Stem Cells sources - Unique properties of stem cells – embryonic stem cells - adult stem cells – umbilical cord stem cells – similarities and differences between embryonic and adult stem cells. Properties of stem cells – pluripotency and totipotency.		
Unit 2	Embryonic Stem cells	18 - Hours
<i>In vitro</i> fertilization –culturing of embryos-isolation of human embryonic stem cells – blastocyst – inner cell mass –growing ES cells in lab – laboratory tests to identify ES cells – stimulation ES cells for differentiation – properties of ES cells. Applications of Embryonic stem cells.		
Unit 3	Adult Stem Cells	18 - Hours
Somatic stem cells – test for identification of adult stem cells – adult stem cell differentiation – trans differentiation –plasticity – different types of adult stem cells -bone marrow derived stem cells- liver stem cells-skeletal muscle stem cells.		
Unit 4	Stem Cell In Drug Discovery And Tissue Engineering	18 - Hours

Target identification – Manipulating differentiation pathways – stem cell therapy vs cell protection - stem cell in cellular assays for screening – stem cell based drug discovery, drug screening and toxicology - tissue engineering application – production of complete organ - kidney – eyes - heart – brain.		
Unit 5	Genetic Engineering And Therapeutic Application Of Stem Cells	18 - Hours
Gene therapy – genetically engineered stem cells – stem cells and Animal cloning – transgenic animals and stem cells. Therapeutic applications – Parkinson disease - Neurological disorder – limb amputation – heart disease - spinal cord injuries – diabetes –burns - HLA typing- Alzheimer’s disease. Ethics in Stem Cell Therapy.		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Potten.C S, “<i>Stem Cells</i>,” Elsevier, 1996. 2. Kursad and Turksen. 2002. <i>Embryonic Stem cells</i> by. Humana Press. 3. <i>Stem cell and future of regenerative medicine</i>. By committee on the Biological and Biomedical applications of Stem cell Research.2002.National Academic press. 4. Robert Lanza, “<i>Essentials of Stem Cell Biology</i>,” Academic Press, 2009. 		
Books for References:		
<ol style="list-style-type: none"> 1. Peter Quesenberry, “<i>Stem cell biology and Gene Therapy</i>,” Wiley-Liss, 1998. 2. Daniel R. Marshak, “<i>Stem cell biology</i>,” Cold Spring Harbor Laboratory Press, 2001. 3. Ariff Bongso, EngHin Lee, “<i>Stem Cells: From Bench to Bedside</i>,” World Scientific, 2011. 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTEP12	ELECTIVE I	CELL COMMUNICATION AND SIGNALING	6	4

Instructional Objectives:

1. To understand the cellular interactions with the cellular microenvironment
2. To understand the various cell signaling pathways.

Course Outcomes: After completion of the course, the students will be able to

Co Number	CO Statement	Knowledge Level (K1-K6)
CO1	Recall the basics of cell signaling	K2
CO2	Evaluate the characterization of signaling compounds.	K2
CO3	Recognize and discuss the main types of cell communication, and understand the importance of cell signaling in biology and to be able apply this knowledge in future laboratory work.	K2, K4
CO4	Classify the protein information	K2
CO5	Apply the Major and Minor signaling pathways. Evaluate the connection between cellular signal pathways and medical phenomena, using examples.	K2, K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit 1	Basics of cell signaling	18 Hours
Basic principles of cell signaling. Types of Cell Signaling Molecules - Stages of Cell Signaling - Cell Signaling Pathways		
Unit 2	Characterization of signaling components	18 Hours
signaling molecules, receptors, second messengers, effectors, signaling complexes. Integration and amplification of signals. Basic classification and characterization of membrane receptors. Intracellular/nuclear receptors		
Unit 3	Principle of transfer information	18 Hours
Post translation modification of proteins and conformation coupling. Protein phosphorylation/dephosphorylation (protein kinases and protein phosphatases - characterization and classification),		
Unit 4	Minor principles of signaling	16 Hours
oxidation, methylation, acetylation, sumoylation and ubiquitination. Structural domains and interaction of proteins. Signaling defects.		
Unit 5	Major signaling pathways (SPs)	20 Hours
SPs associated with second messengers (Ca ²⁺ , cAMP, cADPR, InsP ₃ , DAG, Ptd Ins4,5P ₂ - signaling, NO/cGMP); redox signaling, MAPK signaling, NF-κB signaling, JAK/STAT signaling, Pi3 Kinase pathway, AKT kinase pathway, TGF-β/SMAD signaling and Wnt		

signaling. Cell signaling and apoptosis. Cell cycle control.

Books for study (Text Books):

1. Frederich Marks, Ursula Klingmuller, and Karin Muller-Decker. 2017. Cellular Signal Processing. An introduction to the molecular mechanisms of signal transduction. Second Edition.
2. Bruce Alberts, Alexander D. Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. 2007. Molecular Biology of the Cell. Garland Science; 5th edition
3. Harvey Lodish; Arnold Berk; Chris A. Kaiser; Monty Krieger; Anthony Bretscher; Hidde Ploegh; Angelika Amon; Kelsey C. Martin. 2016. Molecular Cell Biology. W. H. Freeman. 8th edition

Books for References:

BECKERMAN , M. *Molecular and Cellular Signaling*. USA: Springer Science+Business Media, Inc, 2010. 592 p.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABT2001	CORE 3	DNA BARCODING TECHNOLOGY	5	5

Instructional Objectives:

4. To make good understanding of emerging technology of identifying organisms at molecular level and other applications.

COURSE OUTCOME: After completion of the course students will be able to

CO No.	CO Statement	Knowledge level K1 – K4
CO1	Analyze the various limitation in traditional taxonomy and Identify and describe the various nuclear and molecular markers	K1, K3
CO2	Sample and Process the parts of organisms for DNA isolation	K4
CO3	Recognize and explain the gene amplification technique and quantify the DNA.	K3
CO4	Provide an detailed explanations of Gene sequencing methods	K2, K5
CO5	Submit gene sequences in various gene sequence database.	K3

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit I	Concept of DNA barcoding	15 hours
Introduction to DNA barcoding - Historical perspective - limitations in traditional taxonomy –Birth of DNA barcoding - DNA barcode regions for bacteria, fungi, plants and animals - Nuclear Markers (RAPDs, AFLPs, VNTRs, SNPs, ITS, ESTs and Microsatellites) - Mitochondrial DNA markers (16S rRNA, 18S rRNA, CO1, COII, COIII, Cyt – b). Structure of mt DNA.		
Unit II	Components of DNA barcoding – 1. Sampling to purification of DNA	15 hours
Collection and storage of samples - Selection of animal parts and plant parts for molecular studies - Storage and medium of storage – Principle of whole genomic DNA isolation - Purification and precipitation of DNA - Factors affecting DNA isolation - Principle of Quantification of DNA – A260/A280 method - Purity of DNA - RNA contamination		
Unit III	Components of DNA barcoding 2. Amplification of Gene of interest	15 hours
Principle and mechanisms of AGE - Gel concentration - EtBr staining –Principle and application of PCR in DNA barcoding. Principle of various types of PCR - Gradient PCR, Non – gradient PCR, Nested PCR, RT PCR - Optimization of PCR - Primers – Definition – specificity, stability and compatibility - Primer designing		
Unit IV	Components of DNA barcoding 3. Gene sequencing	15 hours
DNA sequencing – Types - principle of Maxam – Gilbert sequencing, Sangar chain termination method, Next generation sequencing – metagenomics		

Unit V	Molecular phylogeny	15 hours
Phylogeny - Phylogenetic trees - homology - Molecular phylogenetic analysis - Neighbour joining - maximum parsimony and maximum likelihood - Genetic distance and variations. Uses of Sequence scanner – DNA barcoding tools: Bioedit, MEGA, Sequin, PHYLIP – NCBI, GenBank and BOLD.		
Books for study (Text Books):		
1. Abdul Jaffar Ali H, 2016. DNA Barcoding: Methods and Protocols, Vijay Nicole Imprints Pvt Ltd. 2. Abdul Jaffar Ali H, 2017. A text book on DNA barcoding technology, Vijay Nicole Imprints Pvt Ltd.		
Books for Reference:		
1. Phillips, R.L., Vasil, Indra K, 2001. DNA-Based Markers in Plants, Springer Netherlands, 2. Tietz, Dietmar, 1998. Nucleic Acid Electrophoresis, Springer-Verlag Berlin Heidelberg. 3. David M. Hillis , Craig Moritz, Barbara K. Mable, 1996. Molecular Systematics, Second Edition 2nd Edition, Sinauer Associates, Inc 4. Nikolaus J., Hennell, James R., Carles, Maria C. 2012. Plant DNA Fingerprinting and Barcoding: Methods and Protocols, Humana Press		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABT2002	CORE 4	GENE CLONING	5	5

Instructional Objectives:

1. To strengthen the knowledge on various cloning and expression vectors.
2. To impart the importance of vectors in gene cloning
3. To strengthen the knowledge on various Strategies of gene cloning
4. To impart the importance of Gene Cloning

Course outcomes: After completion of the course, the students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Understand Gene Cloning and Gene Cloning vehicles.	K2
CO2	Comprehend the cloning principles and strategies	K4
CO3	Explain the restriction enzymes and their applications in the field of Genetic Engineering.	K5
CO4	Understand the regulation of gene expression in prokaryotes using Operon concept and Eukaryotes.	K2
CO5	Explain the methods of DNA sequencing and various tools and techniques of molecular biology.	K5

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit 1	Basics Concepts	18 - Hours
DNA Structure and properties; Restriction Enzymes; DNA ligase, Klenow enzyme, T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase; Cohesive and blunt end ligation; Linkers; Adaptors; Homopolymeric tailing; Labelling of DNA: Nick translation, Random priming, Radioactive and non-radioactive probes.		
Unit 2	Cloning Vectors	18 - Hours
Plasmids; Bacteriophages; M13 vectors; PUC19 and Bluescript vectors, Phagemids; Lambda vectors; Insertion and Replacement vectors; EMBL; Cosmids; Artificial chromosome vectors (YACs; BACs); Animal Virus derived vectors-SV-40; vaccinia/baculo& retroviral vectors; Expression vectors; pMal; GST; pET based vectors.		
Unit 3	Cloning Methodologies	18 - Hours
Insertion of Foreign DNA into Host Cells; Transformation; Construction of libraries; Isolation of mRNA and total RNA; cDNA and genomic libraries; cDNA and genomic cloning; Expression cloning; Jumping and hopping libraries; South-western and Far-western cloning.		
Unit 4	PCR And Its Applications	18 - Hours
Fidelity of thermostable enzymes; DNA polymerases; Types of PCR – multiplex, nested, real time PCR, touchdown PCR, hot start PCR, colony PCR.		
Unit 5	DNA Sequencing analysis And Manipulation Of Gene Expression	18 - Hours

Principles of DNA Sequencing – Analysis of sequence data, Analysis of genetic variations. Analysis of gene expression – analysing transcription and translation, Analysis of gene function – Genetic maps – linkage analysis – transposon mutagenesis – Manipulation of gene expression – Expression in Bacteria and Eukaryote host cells – in vitro mutagenesis. Medical applications – vaccines – human and genetic diseases – transgenics. Ethical Issues in Gene Cloning.
Books for study (Text Books):
<ol style="list-style-type: none"> 1. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 1-3, CSHL, 2001. 2. Primrose, S.B. and Twyman, R. (2006) Principles of Gene Manipulation and Genomics, Wiley Blackwell Publishers, New Jersey. 3. Brown, T.A. (2016) Gene Cloning and DNA Analysis, Wiley-Blackwell Publishers, New Jersey.
Books for References:
<ol style="list-style-type: none"> 1. Brown TA, Genomes, 3rd ed. Garland Science 2006 2. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc. 3. Nicholl, D.S.T. (2010) An Introduction to Genetic Engineering, Cambridge University Press, United Kingdom. 4. Glick, B.R., Pasternak, J.J., Patten, C.L., (2012) Molecular Biotechnology: Principles and Applications of recombinant DNA, ASM Press, Washington DC.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTPR21	CORE PRACTICAL 3	DNA BARCODING TECHNOLOGY - PRACTICAL	6	4

Instructional Objectives:

1. To identify the various organisms by molecular taxonomy (DNA barcoding)

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Apply standardized method to isolate genomic DNA of animal source.	K3
CO2	Extract genomic DNA from bacterial culture.	K3
CO3	Check the amount of DNA by standard method.	K4
CO4	Apply and design specific primer to synthesis barcode gene.	K3, K5
CO5	Analyse the molecular weight of amplified DNA in Gel Doc system.	K4
CO6	Separate the DNA bands in AGE.	K4
CO7	Apply bioinformatics tool to perform pair wise alignment of DNA sequences.	K3

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Practicals

1	Isolation of whole genomic DNA from animal tissue by Phenol – Chloroform method	12
2	Isolation of whole genomic DNA from Bacterial culture	12
3	Quantification of DNA by 260/280 ratio method	10
4	Amplification of DNA barcode gene by specific primer	12
5	Separation of amplified gene in AGE	10
6	Determination of molecular weight of amplified DNA in Gel Doc system	12
7	Pair wise alignment of DNA sequences using Bio edit	12
8	Submission of DNA sequences in Gen Bank, NCBI	10

Books for reference (Laboratory manual):

4. Fritsch E. F., Joseph Sambrook, and Tom Maniatis, 1982. Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, U.S.; 3rd Revised edition (5 December 2000).
5. Hirak Ranjan Dash Pankaj Shrivastava Surajit Das, 2020. Principles and Practices of DNA Analysis: A Laboratory Manual for Forensic DNA Typing. Springer Nature Switzerland AG.
6. Web source: https://manual.eg.poly.edu/index.php/DNA_Extraction_and_Gel_Analysis

7. Web source:
http://hpc.ilri.cgiar.org/beca/training/IMBB/course/LAB_MANUAL_IMBB_2013.pdf

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTPR22	CORE PRACTICAL 4	GENE CLONING – PRACTICAL	6	4

Instructional Objectives:

1. To understand the Gene cloning protocol.
3. To apply the knowledge to perform gene cloning in Bacteria.

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Comprehend the skills required to do experimental cloning	K2
CO2	Get insight into principles of gene cloning.	K2
CO3	Apply genetic engineering in biological research.	K2 & K3
CO4	Perform the Bacterial Transformation experiment	K2
CO5	Demonstrate Bacterial conjugation method	K2, K3 & K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

1. PCR amplification of gene of interest	10 Hours
2. Gel electrophoresis of PCR product	10 Hours
3. Restriction endonuclease digestion of DNA.	10 Hours
4. Ligation	12 Hours
5. Bacterial Transformation	18 Hours
6. Plasmid preparation	12 Hours
7. Bacterial conjugation	18 Hours

Books for study (Text Books):

1. Gene cloning - T.A. Brown, Chapman and Hall, 1995.
2. Sambrook, J. and Russell, D.W. (2012) Molecular Cloning: A Laboratory Manual –a set of 3 volumes, CSHL Press, New York.

Books for References:

1. DNA Cloning: a Practical Approach, D M Glover and B D Hames, IRL Press, Oxford 1995.
2. Genomes, Brown TA, 3rd ed. Garland Science 2006.
3. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTEP21	ELECTIVE I	ANIMAL TISSUE CULTURE	5	4

Instructional Objectives:		
1. To make the students understand the concept, technique and applications of animal tissue culture, an emerging areas of biotechnology industry.		
COURSE OUTCOME: After completion of the course students will be able to		
CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Acquire basic knowledge on animal tissue culture.	K2
CO2	Gain knowledge on animal tissue culture techniques.	K2
CO3	Correlate between different biological samples and understand the importance of different media in tissue culture.	K2 & K4
CO4	Get knowledge about cell culture methods.	K2
CO5	Comprehend the applications of animal cell culture in industry, healthcare and environment.	K2 & K3
Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate		
Unit 1	Introduction to Animal Cell Tissue Culture	15 - Hours
Historical Perspectives, early experiments & Scope of Animal Tissue culture. Biosafety Cabinet – Class II, Requirements for Animal cell culture. Media-Natural, Semi synthetic & Synthetic. Role of ingredients in Animal culture Media. Design & layout of ATC Laboratory.		
Unit 2	Tissue Culture Techniques	15 - Hours
Basic Techniques of mammalian cell culture; Disaggregation of animal tissue. Primary culture, Evolution of cell line, Organ culture, Stem cell culture, Embryo culture, Embryonic Stem cells and their application. Maintenance of cell culture Embryo culture.		
Unit 3	Methods in Cell Culture	15 - Hours
Micro and macro carrier culture, cell immobilization, animal cell bioreactor, large scale cell cultures for biotechnology, somatic cell fusion, flow cytometry, transfection.		
Unit 4	Medical Applications of Animal Cell Culture	15 - Hours
Stem cells and their applications, Hybridoma Technology and Monoclonal antibodies; Tissue culture as a screening system; Cytotoxicity and diagnostic tests; Mass production of biologically important compounds (e.g. Vaccines); Harvesting of products; purification and assays; Organ cultures and tissue engineering.		
Unit 5	Applications of Animal Cell Culture in cloning	15 - Hours
Application of Animal Cell culture in gene therapy, cloning from short-term cultured cells, cloning from long-term cultured cells, cloning for production of transgenic animals, cloning for conservation. Animal Ethics.		

Books for study (Text Books):
Freshney, R. I. (2010). Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley-Blackwell, 2010. 6th Edition.
Davis, J. M. (2008). Basic Cell Culture. Oxford University Press. New Delhi.
Davis, J. M. (2011). Animal Cell Culture. John Willy and Sons Ltd. USA.
Verma, A. S. and Singh, A. (2014). Animal Biotechnology. Academic Press, Elsevier, USA.
Books for References:
Cartwright, E. J. (2009). Transgenesis Techniques. Humana Press. London, UK.
McArthur, R. A. and Borsini, F. (2008). Animal and Translational Models for CNS Drug Discovery. Elsevier. London, UK.
Animal Biotechnology by Murray Moo-Young, Pergamon Press, Oxford.
Animal Cell Technology by AsokMukhopadhyay, IK Intl. Ltd.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PABTEP22	ELECTIVE I	PROTEOMICS AND GENOMICS	5	4

Instructional Objectives:		
1. To understand the various techniques in Genome analysis.		
2. To understand the applications of proteomics in different fields.		
COURSE OUTCOME: After completion of the course students will be able to		
CO Number	CO Statement	Knowledge Level (K1-K6)
CO1	Design the experiments using various techniques of genome sequencing as well proper organization of generated biological data.	K2
CO2	Understand the proteomics approaches and sequenced from proteins.	K2
CO3	Understand and analyze the structural and functional genomics approaches on newly sequenced genome for functional characterization of genes.	K2, K4
CO4	Understand the human genome database and sequences.	K2
CO5	Understand and analyze the pharmacogenomics and drug design.	K2, K4
Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate		
Unit 1	Proteomics	15 Hours
Proteomics: Identifying proteins in complex mixtures: Protein profiling, quantitative 2D GE, multidimensional chromatography, quantitative mass spectrometry, MALDI – TOF, TOF analysis and analytical protein chips. Protein structure databanks- protein databank.		

Unit 2	Genome Structure	15 Hours
Genome Structure: Genome sizes- microbial and organelle genomes - Centromeres and telomeres, tandem repeats- dispersed repeats (transposons). Basic Sanger sequencing - automated sequencing- sequencing simple genomes - Sequencing large genomes - finalizing sequences – resequencing and Next generation sequencing (NGS).		
Unit 3	Microarray	15 Hours
Microarray: DNA Micro array, Protein Micro array Transcriptomics, Applications and advantages of Micro arrays- DNA chips and SAGE technology- Organization of genome projects- human, plant, animal and microbial genome.		
Unit 4	Human Genome	15 Hours
Human Genome: Important genes associated with each chromosomes - Mendelian and sexlinked traits in human inheritance. Genetic diseases due to defects in autosomal and sex linked genes. Whole genome sequencing – Human Genome Project.		
Unit 5	Pharmacogenomics and New Drug Design	15 Hours
Pharmacogenomics and New Drug Design: Need for developing new drugs: Procedure followed in drug design; Molecular modification of lead compounds; Prodrug and soft drugs; Physico-chemical parameters in drug design; QSAR.		
Books for study (Text Books):		
1. Necia Grant Cooper; (Ed.). The Human Genome Project; Deciphering the blueprint of heredity University Science books, CA, USA. 1994. 2. Gary Zweiger. Transducing the Genome; Information, Anarchy and Revolution in Biomedical Sciences. Tata McGraw-Hill Publishers, New Delhi. 2003. 3. Branden, C and J.Troze. Introduction to Protein Structure. Second Edition. Garland Publishing, New Delhi. 1999. 4. Evans W.E. and Relling, M.V. Pharmacogenomics: translating functional genomics into rational therapeutics. Science 286:487. 1999. 5. Principles of Genome analysis and Genomics, 3 rd Edition, By S. B. Primrose and R. L. Twyman, Blackwell publishing (2003)		
Books for References:		
1. Baxevanis, A.D and Ouellette, B.F.F. Eds. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. Wiley Interscience. New York. 2001. 2. Higgins, D and Taylor, W (Eds). Bioinformatics: Sequence, Structure and Databnks. Oxford University Press, Oxford. 2000. 3. Principles and Practices of Plant Genomics (Volume 3), By Chittaranjan Kole and Albert G. Abbott. CRC Press (2017) 4. Genome Analysis: Current Procedures and Applications by Maria S. Poptsova. Caister Academic Press (2014)		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHABT02	CORE 2	ADVANCED BIOTECHNOLOGY	5	5

Instructional Objectives:		
The course is aimed to acquire knowledge on advanced in Biotechnology with the following objectives:		
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detection of single molecules.		
Unit 4	Microarray chips:	18 Hours
Concept, design of biochip, types of DNA chips Gene Therapy for Human Diseases. Protein Crystallization; Theory and methods: API Electro spray and MALDI-TOF. SNP's and GMS (Genome mismatch Signals).		
Unit 5	Biosensors:	18 Hours
Concept, principle, Organization of biosensors & types Biosensors: Health & Medicine Biosensors: Food technology, Environment monitoring Bacterial biosensors; Array Biosensors.		
Books for References		
<ol style="list-style-type: none"> 1. Morris MD. "Molecular Biotechnology". 2016. CBS publishers and distributors, India. 2. Nooralabettu Krishna Prasad. "Down Stream Process Technology". 2016. PHI learning private limited, New Delhi, India. 3. Sanjay Kumar Sharma. "Plant Tissue Culture". 2016. Book enclave, Jaipur, India. 4. Vyas SP and Mehta A. "Cell and Molecular Biology". 2014. CBS publisher & distributors, New Delhi, India. 5. Zingare AK. "Biotechnology in Plant Improvement". 2013. Satyam publishers & distributors, Jaipur, India. 6. Sheelendra M Bhatt. "Animal Cell Culture concept and applications". 2013. Narosa publishing house, India. 7. Deepa Goel and Shomini Parashar. 2013. "IPR, Biosafety and Bioethics". 1st Ed. Pearson Education, India. 8. Denis J. Murphy. "Overview of Applications of Plant Biotechnology". 2004. Wiley online library. https://doi.org/10.1002/0470869143.kc002 9. Adrian Slater, Nigel W. Scott, Mark R. Fowler. "Plant Biotechnology: An Introduction to Genetic Engineering". 2008. Oxford University Press. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHABT04	ELECTIVE I	BIOPROSPECTING TECHNOLOGY	5	5

Instructional Objectives:

1. To introduce Bioprospecting, its current practices and Act
2. To provide complete knowledge about the prospecting of Plants, Microbes and Marine microbes for the production of industrially and Pharmacologically active compounds

COURSE OUTCOME: After completion of the course students will be able to

CO No.	CO Statement	Knowledge level K1 – K6
CO1	Discuss the Bioprospecting practices	K6
CO2	Describe the assays for new drugs	K1
CO3	Gain better understanding on the marine sources for bioactive compounds	K2
CO4	Gain sufficient knowledge on the microbial bioactive compounds and its applications in industries	K2
CO5	Identify the bioactive compounds for various applications	K1

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- analyze K5- Synthesize; K6- Evaluate

Unit 1	Bioprospecting Practices and its Act	18 Hours
Bioprospecting: Definition, Introduction, Current practices in Bioprospecting for conservation of Biodiversity and Genetic resources. Bioprospecting Act: Introduction, Phases of Bioprospecting, Exemption to Act. Fields of Bioprospecting. Good laboratory practices. Good documentation processes. Handling of Biohazards.		
Unit 2	Plant Bioprospecting	18 Hours
Plant Bioprospecting: for new drugs, assays in Bioprospecting. Antioxidant assay – NO free radical scavenging assay, Antigenotoxicity assay – MTT assay, Antiviral activities of plants – SRB assay		
Unit 3	Marine Bioprospecting	18 Hours
Marine Bioprospecting: Sources of marine planktons and their Bioprospecting, Isolation and cultivation of Marine bioresources, Isolation of Marine Yeast and its industrial applications, Bioactive chemicals from Seaweeds and their applications.		
Unit 4	Microbial Bioprospecting	18 Hours
Microbial Bioprospecting: Isolation of Microbial metabolites and their bio-activity. Endophytic microbial products as Antibiotics. screening for industrially useful fungal metabolites; drugs and pharmaceuticals from fungi, Primary and secondary screening of antibiotic producers - auxanography- enrichment culture, techniques for strain improvement and Strain development		

Unit 5	Screening for active compounds	18 Hours
Screening for bioactivity, antimicrobials, pharmacologically active agents of microbial origin, bioprospecting for industrial enzymes, plant growth promoting agents, biotreatment, bioprospecting novel antifoulants and anti-biofilm agents from microbes		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Judith A. Scheppler, Patricia E. Cassin and Rosa M. Gambier. 2000. Biotechnology explorations: Applying the fundamentals, Zhingiang Ann (2005). Handbook of Industrial Mycology, CRC Press. 2. Jan S. Tkacz and Lene Lange (2004). Advances in fungal biotechnology for Industry, Agriculture, and Medicine, Springer. 3. Swaminathan, M.S. and Kocchar, S.L. (Es.) (1989). Plants and Society, MacMillan Publication Ltd 		
Books for References:		
<ol style="list-style-type: none"> 1. Hibbett DS, Binder M, Bischoff JF, Blackwell M, Cannon PF, Eriksson OE, et al. 2007. "A higher level phylogenetic classification of the Fungi" (PDF). Mycological Research 111 (5): 509–547. doi:10.1016/j.mycres.2007.03.004. PMID 17572334. 2. Harbhajan Singh, 2006. Mycoremediation: Fungal Bioremediation by, first edition, John Wiley and Sons, Hoboken, New Jersey.. 3. W.B.Hugo & A. D. Russell. Pharmaceutical Microbiology Sixth edition. Blackwell scientific Publications. 4. Casida L.E 2007. Industrial Biotechnology by Wiley publishers 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHABT04	ELECTIVE I	PLANT BIOTECHNOLOGY	5	5

Instructional Objectives:

1. To understand the basic aspects of biotechnology. To understand the advances in plant tissue culture and genetic engineering.

COURSE OUTCOME: After completion of the course students will be able to

CO Number	CO Statement	Knowledge Level (K1-K6)
CO1	Understand the concepts and techniques of plant biotechnology and their application to crop plants.	K2
CO2	Work in plant biotechnology laboratory.	K2
CO3	Gain the theoretical background knowledge in molecular, biochemical and plant sciences needed for an understanding of plant biotechnology	K2, K4
CO4	Appreciate the issues associated with growing and using transgenic plants as food crops.	K2
CO5	Develop the capacity to undertake research in plant biotechnology.	K2, K4

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit 1	In vitro culture technique of plants	18 Hours
History and Scope, Plant tissue culture general aspects, Plant tissue culture media, Protoplast culture and somatic hybridization. Selection and identification of haploid cells (Plants), Cybrids – Hybrids and somatic incompatibility, methodology of cybridization, #Applications of cybrids and somatic hybridization in plant tissue culture. Good laboratory practices. Good documentation processes. Handling of Biohazards.		
Unit 2	Molecular tools of genetic engineering	18 Hours
Restriction enzymes - Nomenclature, Restriction endonucleases, DNA Ligases, Polymerases. Vectors – The cloning vehicles – Plasmid types, Phage vectors, Cosmids, Phasmid vectors. Artificial chromosome vectors – Human artificial chromosome (HAC), Yeast artificial chromosomes (YACs), Bacterialartificial chromosomes (BACs). Shuttle vectors		
Unit 3	Techniques in plant genetic engineering	18 Hours
PCR and its applications, DNA markers and its applications – RAPD, RFLP, SSR, ISSR and AFLP. Basic steps in gene cloning , Nucleic acid blotting techniques – Sourthern blotting, Northern blotting, Western blotting, Dot blotting, Autoradiography, Colony and Plaque blotting#. DNA sequencing – Maxam and Gilbert technique.		
Unit 4	Genetic Engineering	18 Hours
Genetic engineering of plants: Gene transfer methods - vector mediated (Bacterial and Plant		

virus mediated) and vector less DNA transfer – Physical gene transfer methods, electroporation, Biolistics, microinjection, liposome mediated, chemical gene transfer methods and DNA imbibitions by cells/tissues, Applications of plant transformation - resistance to biotic and abiotic stresses, Plants with improved nutrition's.		
Unit 5	Transgenic plants	18 Hours
Transgenic plants as bioreactors: Metabolic engineering of carbohydrates – Starch, Cyclodextrins, fructans and Trehalose. Metabolic engineering of Lipids – Production of biodegradable plastics. Genetically engineered plants as protein factories and molecular farming – Approaches for protein production - Industrial and lysosomal enzymes in plants, antibodies, vaccines and therapeutic proteins in plants. Stress tolerance plants.		
Books for study (Text Books):		
1. Satyanarayana U. Biotechnology, Books and Allied Pvt. Ltd., 2007. 2. Dubey RC. A text book of Biotechnology, S. Chand Publishing House, 2010. 3. Adrian Slatter, Nigel Scott and Mark Fowler, Plant Biotechnology, Oxford University Press, I Pub, 2004.		
Books for References:		
1. Glick BR and Pasternak JK. Molecular Biotechnology: Principles and Applications of Recombinant DNA (4th edition), American Society for Microbiology, 2010. 2. Thieman W. Introduction to Biotechnology Paper back (3rd edition), Pearson Benjamin Cummings, 2012. 3. John E. Smith. Biotechnology (Studies in Biology) Kindle Edition (4th edition), Cambridge University Press, 2004.		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS04	ELECTIVE I	AQUACULTURE BIOTECHNOLOGY	5	5

Instructional Objectives:

1. To provide an overview of the application of biotechnological tools in fish breeding, feed, health, processing and other facets in fisheries.

COURSE OUTCOME: After completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K6)
CO1	Acquire knowledge on Aquaculture System.	K2
CO2	Gain knowledge on both freshwater and marine water aquaculture.	K2
CO3	Learn about fish breeding.	K2
CO4	Gain knowledge about feed technology	K2
CO5	Acquire knowledge about aquatic animals health management system.	K2

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- Analyze; K5- Synthesize; K6- Evaluate

Unit 1	Introduction to Aquaculture	18 - Hours
Introduction to aquaculture – history and scope – aquaculture in local, national and global scenario – cultivable fresh water, marine and ornamental species – Culture systems: Traditional, Extensive , Semi-intensive and intensive systems. Good laboratory practices. Good documentation processes. Handling of Biohazards.		
Unit 2	Freshwater and Marine water aquaculture	18 - Hours
Freshwater aquaculture – Introduction – monosex & poly culture, pokali culture, sewage fed fish culture, integrated fish farming – brackish water aquaculture – culture technique of carps. Marine aquaculture –sea ranching – cage culture – raft culture – rope culture – pen culture - culture technique of shrimps		
Unit 3	Biotechnology in Fish breeding	18 - Hours
Synthetic hormones for induced breeding – GnRH analogue structure and function; Selective breeding for improving fish stocks - hybridization in Indian fishes. Androgenesis, Gynogenesis, Polyploidy and Sex reversal.		
Unit 4	Biotechnology in Fish Feed technology	18 - Hours
Feed technology- Micro encapsulated feeds; micro coated feeds; micro particulate feeds and bio-encapsulated feeds; Mycotoxins and their effects on feeds. Algal biotechnology - Biotechnological approaches for production of important microalgae; single cell protein from Spirulina; vitamins, minerals and omega3 fatty acids from micro algae; enrichment of micro algae with micronutrients		

Unit 5	Biotechnology in Fish Health Management	18 - Hours
DNA and RNA vaccines, molecular diagnosis of viral diseases, PCR, Dot-blot, ribotyping of pathogenic microbes, RNAi, Biofilms and its impact on health management, genetically modified microorganisms as probiotics, immunostimulants, bioremediation of soil and water.		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Ramasamy Santhanam, N. Ramanathan, G. Jegatheesan. 1990. Coastal Aquaculture in India, CBS Publishers & Distributors. 2. Shanmugam K. 1992, Fishery Biology and Aqua culture-Leo Pathipagam – Chennai – India. Yadav. 1995: Fish and Fisheries, Daya Publ. Co., New Delhi – India. 3. Nair PR. 2008. Biotechnology and Genetics in Fisheries and Aquaculture. Dominant Publication. 		
Books for References:		
<ol style="list-style-type: none"> 1. Lakra WS, Abidi SAH, Mukherjee SC & Ayyappan S. 2004. Fisheries Biotechnology. Narendra Publ. House. 2. Jhingran V.G. 1985, fish & Fisheries of India, Hindustan publishing co. New Delhi 3. Barnabè, G. (Ed.) 1990. Aquaculture. Ellis Horwood. 2 Vols; 4. Mill Dick, 1993: Aquarium Fish, DK Publ. Co. Inc. New York – USA. 5. S. P. Malhotra, S.P. Malhotra V.R.P. Sinha. 2007. Indian Fisheries and Aquaculture in a Globalizing Economy, Volume 1Narendra Publishing House, - Technology & Engineering 6. Shammi, Q.J. and Bhatnagar, S., 2002. Applied Fisheries: Agrobios (India) 7. Pandian TJ, Strüssmann CA & Marian MP. 2005. Fish Genetics and Aquaculture Biotechnology. Science Publication. 		

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHAMS04	ELECTIVE I	MICROBIAL BIOTECHNOLOGY	5	5

Instructional Objectives:

1. To evaluate explicitly, the metabolic pathways, role of microbes in the production of commercially valuable products.

COURSE OUTCOME: After completion of the course students will be able to

CO No.	CO Statement	Knowledge level K1 – K6
CO1	Describe the cell structure and culture techniques	K1
CO2	Discuss the microbes used in food industries for fermentation	K6
CO3	Gain thorough understanding on fermentation process	K2
CO4	Gain sufficient knowledge on the food intoxication by microbes and Microbiological quality standards of food	K2
CO5	Identify the role of microbes in the advancement of technology	K1

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- analyze K5- Synthesize; K6- Evaluate

Unit 1	Microbes classification and Culture Techniques	Hours
Microorganisms: Classifications – Prokaryotes and Eukaryotes - cell structure; Screening of microorganisms: Microbial culture techniques – factors affecting growth – Isolation Purification and Preservation -Primary and Secondary screening. Strain improvement Staining techniques: – Simple and differential staining. Microscopy – Bright field, Dark field SEM, TEM. Good laboratory practices. Good documentation processes. Handling of Biohazards.		
Unit 2	Microbes in food Industries	Hours
Microbes in food -Food produced by microbes, bread, cheese, vinegar - fermented dairy products and oriental fermented foods, Probiotics - microbial cells as food-single cell proteins; pickling, mushroom cultivation, production of alcohol and fermented beverages, beer and wine.		
Unit 3	Fermentation Process	Hours
Fermentation- general concepts and applications; Range of fermentation process- microbial biomass, enzymes, metabolites, recombinant products, transformation process; Components of fermentation process. Types of fermentations- aerobic and anaerobic fermentation, submerged and solid-state fermentation, factors affecting submerged and solid-state fermentation, substrates used in solid-state fermentation and its advantages; Culture media-types, components, and formulations.		
Unit 4	Quality Assurances in foods	Hours
Foodborne infections and intoxications; bacterial with examples of infective and toxic types, Clostridium, Salmonella, Shigella, Staphylococcus, Campylobacter, Listeria. Mycotoxins in food with reference to Aspergillus species. Quality assurance: Microbiological quality		

standards of food. Government regulatory practices and policies. FDA, EPA, HACCP, ISI.		
Unit 5	Advances in Microbial Technology	Hours
Microorganisms as source of novel compound production. Biopolymer and bioplastics, algal biotechnology, bioweapons, and bioshields. Microbes as biocontrol agents (<i>Baculoviruses</i> , <i>Beauveria bassiana</i> , <i>Bacillus thuringiensis</i> , <i>Bacillus sphaericus</i> , <i>Bacillus popilliae</i>); Microbe derived inhibitors.		
Books for study (Text Books):		
<ol style="list-style-type: none"> 1. Joanne M. Willey, Linda M. Sherwood, Christopher J. Prescott's Microbiology, Woolverton 8th Edition McGraw-Hill Publishers. 2. M.J. Pelzer Jr., E.C.S. Chan and N.R. Kreig, 1993. Microbiology. McGraw Hill Inc. New York. 3. Wulf Cruger and Anneliese Cruger., Biotechnology, (A text book of industrial Microbiology), Panima Publishers, New Delhi, 2nd edition, 2003. 4. Crueger W. and Crueger, A., Biotechnology. A Textbook of Industrial Microbiology, Sinauer Associates. 14. 		
Books for References:		
<ol style="list-style-type: none"> 1. Reed, G., Prescott and Dunn's Industrial Microbiology, AVI publication 15. 2. Casida L. E. J. R., Industrial Microbiology, New Age (1968) 3. Brian J. Wood. Elsevier. Microbiology of Fermented Foods. Volume II and I. By Applied Science Publication 4. W.B. Hugo & A. D. Russell. Pharmaceutical Microbiology – Sixth edition. Blackwell scientific Publications 		

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACC1001	CORE 1	DIGITAL LOGIC FUNDAMENTALS & MICROPROCESSORS	7	5

COMMON TO B.Sc., (CS) / BCA

OBJECTIVES:

To understand number systems, logic fundamentals and circuits, organization of computers and its architecture, programming, interfacing and rudiments of system design of microprocessors.

Course Outcome

CO	Outcome
CO 1	Apply the principles of number system, binary codes and Boolean algebra to minimize logic expressions
CO 2	Develop K-maps to minimize and optimize logic functions up to 5 variables
CO 3	Acquire knowledge about various logic gates and logic families and analyze basic circuits of these families.
CO 4	Design various combinational and sequential circuits such as encoders , decoders and counters using multiplexers, and flip - flops
CO 5	Describe and compare various memory systems, shift registers and analog to digital and digital to analog conversion circuits
CO 6	Acquire knowledge of Microprocessors and their architecture

UNIT – I Digital Systems and Binary Numbers

10 Hours

Digital Systems – Binary Numbers – Number –Base Conversions -Octal and Hexadecimal Numbers – Complements of Numbers – Signed Binary Numbers – Binary Codes –Binary Storage and Registers – Binary Logic.(Chapter 1: sections : 1.1 to 1.9)

UNIT – II Boolean algebra and Gate-Level Minimization

15 Hours

Basic Definitions –Axiomatic Definition of Boolean Algebra – Basic Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms– Digital Logic Gates – Integrated Circuits -The Map Method – Four-Variable K-Map – Five-Variable K-Map –Product-of-Sums Simplification – Don't-Care Conditions. (Chapter 2: Sections: 2.2 to 2.6, 2.8, 2.9, Chapter 3: Sections: 3.2 to 3.6)

UNIT – III Combinational Logic

10 Hours

Combinational Circuits – Analysis Procedure – Design Procedure – Binary Adder-Subtractor - Decimal Adder - Decoders– Encoders (*Chapter 4: Sections: 4.2 to 4.6, 4.9 & 4.10*)

Unit – IV Synchronous Sequential Logic

10 Hours

Sequential Circuits – **Storage Elements:** Latches, Flip-Flops - **Register and Counters:** Register – Shift Registers – Ripple Counters – Synchronous Counters. (*Chapter 5: Sections: 5.2 to 5.4*)

Unit – V Microprocessor and Architecture (8085)

15 Hours

Microprocessor - Organization of Microprocessor based system- Microprocessor Instruction set and Computer languages- Microprocessor Architecture and its operations- Memory classification- Memory mapped I/O and I/O mapped I/O- Pin diagram and Internal Architecture of 8085. (*Text Book 2 Chapter 1: Sections: 1.1, 1.2 Chapter 3: Sections: 3.1, 3.2.7, 3.3 Chapter 4: Sections: 4.1 to 4.1.5*)

TEXT BOOK:

1. Digital Design with an Introduction to the Verilog HDL, M. Morris Mano & Michael D. Ciletti, 5th Edition, Person Education, 2013. (FOR Units I to IV).
2. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S.Gaonkar, Penram International Publishing (India) Pvt. Ltd. 6th Ed. 2013 (for Unit V).

REFERENCE BOOKS:

1. Morris Mano M, Kime .R.Charles, ||Logic And Computer Design Fundamentals|| (2nd Edition Updated).
2. Morris Mano M – —Computer System Architecture – PHI Third Edition.
3. Assembly Language Programming the IBM PC, Alan R. Miller, SubexInc.,.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACC2001	CORE 2	PROGRAMMING IN C	5	5

COMMON TO B.Sc., (CS) / BCA

OBJECTIVES:

The purpose of this course is to understand simple algorithms, language constructs and to develop programming skills in C.

Course Outcome

CO	Outcome
CO 1	Interpret the basic principles of C Programming.
CO 2	Acquire decision making and looping concepts.
CO 3	Design and develop modular programming.
CO 4	Explore usage of Arrays, strings, structures and files.
CO 5	Effective utilization of pointers and preprocessor directives.
CO 6	Illustrate the concepts of various data structures.

UNIT – I Fundamental Algorithms and Factoring Methods:

10 Hours

Algorithm characteristics, Structure of algorithm - Linear, iterative, loop, decision constructs – Flow chart – need – Illustrative examples through : Exchanging the values of two variables , Counting, Summation of a set of numbers, Factorial computation, Generation of Fibonacci sequence, Reversing the digits of a number, Base conversion, Finding the square root of a number, Smallest divisor of an integer, Greatest Common Divisor of two numbers, Generating prime numbers, Computing the prime factors, Generating the pseudo random numbers, Computing the nth Fibonacci number.(Chapter 2 & 3) (Text Book 1Chapter 2 & 3)

UNIT – II Introduction to C

10 Hours

Introduction- Structure of C Program- C Tokens – Character Set - Keywords – Identifiers – Basic Data types - Variables – Constants – Input and Output Statements – Operators in C- Type Conversion and Type Casting., Decision Control and Looping Statements (*Chapter 2: Sections : 2.1,2.2, 2.7 to 2.16, Chapter 3: Sections : 3.1 to 3.6*)

UNIT – III Functions, Arrays and Strings

15 Hours

Function Declaration/Function Prototype – Function Definition – Function Call – Return Statement – Passing Parameters to Functions – Storage Classes – Recursive Functions – **Arrays:** Declaration of Arrays – Accessing the Elements of an Array – Passing Array to

Functions – Two Dimensional Arrays – Multidimensional Arrays . **Strings:** Operations on String (*Chapter 4: Sections : 4.3 to 4.7 , 4.9 to 4.10, Chapter 5: Sections : 5.2,5.3 5.6 to 5.7, 5.10, Chapter 6: Sections : 6.4*)

UNIT – IV Pointers, Structure and Union

15 Hours

Declaring Pointer Variables – Pointer Expression and Pointer Arithmetic – Passing Arguments to Functions using Pointers – Pointers and Array – Array of Pointers – Dynamic Memory Allocation – Structure Introduction – Nested Structures – Structures and Functions – Unions (*Chapter 7: Sections : 7.3 ,7.4, 7.7, 7.8,7.12,7.20, Chapter 8: Sections : 8.1,8.2,8.4,8.6*)

UNIT – V Files

10 Hours

Introduction to Files - Using Files – Read Data From Files – Writing Data to Files – Detecting the End-of -file – Error Handling During File Operations – Accepting Command Line Arguments – Functions for Selecting a Record Randomly (*Chapter 9: Sections : 9.1 to 9.8*)

Text Books:

Total Hours: 60

- 1.R.G.Dromey, How to solve it by computer , PHI International (Unit I)
2. ReemaThareja, “Programming in C”, 2ndEdition , 2015, Oxford Publishers (Unit II to V)

Reference Books:

1. Kernighan, B.W. and Ritchie, D.M., “The C Programming Language (ANSIC)”, PHI.
2. Foster & Foster , “C by Discovery”, Penram International Publishers, Mumbai.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
UACCP21	CORE PRACTICAL 1	PROGRAMMING IN C LAB	2	2

COMMON TO B.SC., (CS) / BCA

Objective : Train the students to write programs using procedure oriented language C.
Improve Students program skill to do at least three exercise in first three module and two from remaining modules.

Course Outcome

CO	Outcome
CO 1	Analyze language constructs
CO 2	Apply array data structure
CO 3	Implement procedural concepts
CO 4	Apply other data structures
CO 5	Utilize the strength of pointers and dynamic memory allocation
CO 6	Explore and operate data in files

Module I. Programs using Control Constructs

4 Hours

1. Generate Fibonacci numbers and check if each number is prime or not.
2. Checking a number as Armstrong, Perfect and Adam
3. Sin, and Cos series
4. Sum digits a number and check it as palindrome .

Module II. Programs Using Arrays

4 Hours

1. Compute in an array of numbers its sum , average , biggest and smallest .
2. Sort an array .
3. Search for a value using linear and binary search technique.
4. Add , subtract and multiply two matrices of order mXn.

Module III. Programs Using Functions and Strings

4 Hours

1. Compute factorial of a given number.
2. To check a String as palindrome.
3. Compute factorial, Fibonacci, and GCD using recursion.
4. Count the number of vowels, consonants and words in a given text.
5. Compare two strings without using library string function.

Module IV Programs using Structure**4 Hours**

1. Process student marks in an examination using Structure.
2. Process salary of an employee using Structure.
3. Add two complex numbers using Structure.

Module V Pointer Concepts**4 Hours**

1. Sum of elements an integer array using Pointers
2. Determine the length of a given string and reverse it using Pointers.
3. Compares two integer arrays as identical using pointers.
4. Process exam marks of a set of students using structure pointers.

Module VI File Concepts**4 Hours**

1. Separate Odd and Even numbers in a files.
2. Prepare Electricity Bill using File concepts.
3. Prepare students marks sheet using File concepts.
4. Prepare salary bill of employees of a company using File concepts.

Reference : Lab Manual

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACS1001	CORE 1	MIDDLEWARE TECHNOLOGIES	6	5

Objective :

The objective of the course is to teach the role of middleware in the distributed environment and its common services.

Course Outcomes:

- To study the set of services that a middleware system constitutes of.
- To understand how middleware facilitates the development of distributed applications in heterogeneous environments.
- To study how it helps to incorporate application portability, distributed application component interoperability and integration.
- To learn the object oriented middleware basics through the example of the following CORBA objects.
- To understand the basics of Web services that is the most oft-used middleware technique.

Unit – I: Client / Server Concepts

9 Hours

Client – Server – File Server, Database server, Group server, Object server, Web server
.Middleware – General Middleware – Service specific middleware. Client / Server Building blocks – RPC – Messaging – Peer – to- Peer.

Unit – II: EJB Architecture

9 Hours

EJB – EJB Architecture – Overview of EJB software architecture – View of EJB – Conversation – Building and Deploying EJBs – Roles in EJB.

Unit – III: EJB Applications

9 Hours

EJB Session Beans – EJB entity beans – EJB clients – EJB Deployment – Building an application with EJB.

Unit – IV: CORBA

9 Hours

CORBA – Distributed Systems – Purpose - Exploring CORBA alternatives – Architecture overview – CORBA and networking model – CORBA object model – IDL – ORB - Building an application with CORBA.

Unit – V: COM**9 Hours**

COM – Data types – Interfaces – Proxy and Stub – Marshalling – Implementing Server / Client – Interface Pointers – Object Creation, Invocation , Destruction – Comparison COM and CORBA – Introduction to .NET – Overview of .NET architecture – Marshalling - Remoting.

Text Books:

1. Robert Orfali, Dan Harkey and Jeri Edwards, "The Essential Client/Server Survival Guide", Galgotia Publications Pvt. Ltd., 2002. (Unit 1)
2. Tom Valesky, "Enterprise Java Beans", Pearson Education, 2002.(Unit 2 & 3)
3. Jason Pritchard, "COM and CORBA side by side", Addison Wesley, 2000 (Unit 4 & 5)
4. Jesse Liberty, "Programming C#", 2nd Edition, O'Reilly Press, 2002. (Unit 5)

Refernces:

1. Mowbray, "Inside CORBA", Pearson Education, 2002.
2. Jeremy Rosenberger, " Teach yourself CORBA in 14 days", Tec media, 2000.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACS1002	CORE 2	OBJECT ORIENTED ANALYSIS AND DESIGN	6	5

OBJECTIVES:

To understand the fundamentals of object modeling

- To understand and differentiate Unified Process from other approaches.
- To design with static UML diagrams.
- To design with the UML dynamic and implementation diagrams.
- To improve the software design with design patterns.
- To test the software against its requirements specification.

OUTCOMES:

At the end of the course, the students will be able to:

Express software design with UML diagram

- Design software applications using OO concepts.
- Identify various scenarios based on software requirements.
- Transform UML based software design into pattern based design using design patterns.
- Understand the various testing methodologies for OO software.

UNIT I UNIFIED PROCESS AND USE CASE DIAGRAMS

9 Hours

Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case – Case study – the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – When to use Use-cases.

UNIT II STATIC UML DIAGRAMS

9 Hours

Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams.

UNIT III DYNAMIC AND IMPLEMENTATION UML DIAGRAMS**9 Hours**

Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modeling – When to use State Diagrams - Activity diagram – When to use activity diagrams
Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams – When to use Component and Deployment diagrams.

UNIT IV DESIGN PATTERNS GRASP:**9 Hours**

Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer –Applying GoF design patterns – Mapping design to code.

UNIT V TESTING**9 Hours**

Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans.

TEXT BOOKS:

1. Craig Larman, —Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Developmentll, Third Edition, Pearson Education, 2005.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition - 1999

REFERENCES:

1. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, —Design patterns: Elements of Reusable Object-Oriented Softwarell, Addison-Wesley, 1995.
2. Martin Fowler, —UML Distilled: A Brief Guide to the Standard Object Modeling Language ll, Third edition, Addison Wesley, 2003.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSPR11	CORE PRACTICAL 1	MIDDLEWARE TECHNOLOGIES LAB	5	5

OBJECTIVE: To provide a practical experience to develop an Enterprise Java Bean, COM, DCOM, .NET.

EXERCISES:

1. Create a distributed application to download various files from various servers using RMI.
2. Develop an Enterprise Java Bean for Basic Arithmetic Operations.
3. Develop an Enterprise Java Bean for banking operations.
4. Develop an Enterprise Java Bean for Library operations.
5. Develop an Enterprise Java Bean for User Registration and Login operation.
6. Develop a Component for Converting the Currency Values using COM/ .NET.
7. Develop a Component for Encryption and Decryption using COM / .NET.
8. Develop a Component for Retrieving Information from Message Box using DCOM / .NET.
9. Develop a Middleware Component for Retrieving Stock Market Exchange Information using CORBA.
10. Develop a Middleware Component for Retrieving Weather Forecast Information using CORBA.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSPR12	CORE PRACTICAL 2	OBJECT ORIENTED ANALYSIS AND DESIGN LAB	5	5

OBJECTIVES:

To capture the requirements specification for an intended software system

- To draw the UML diagrams for the given specification
- To map the design properly to code
- To test the software system thoroughly for all scenarios
- To improve the design by applying appropriate design patterns.
- Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Perform OO analysis and design for a given problem specification.
- Identify and map basic software requirements in UML mapping.
- Improve the software quality using design patterns and to explain the rationale behind
- Applying specific design patterns Test the compliance of the software with the SRS

EXERCISES:

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.

5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams.
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design.
8. Test the software system for all the scenarios identified as per the use case diagram.
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios.

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank.
3. Exam registration.
4. Stock maintenance system.
5. Online course reservation system.
6. Airline/Railway reservation system.
7. Software personnel management system.
8. Credit card processing.
9. E-book management system.
10. Recruitment system.
11. Foreign trading system.
12. Conference management system.
13. BPO management system.
14. Library management system.
15. Student information system.

HARDWARE REQUIREMENTS

Standard PC

SOFTWARE REQUIREMENTS

1. Windows 7 or higher
2. ArgoUML that supports UML 1.4 and higher
3. Selenium, JUnit or Apache JMeter

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSEP11	ELECTIVE I	THEORY OF COMPUTATION	6	4

OBJECTIVES:

To provide a study about Finite Automata and Non-Finite Automata, To understand regular expressions, context free grammars and languages and Realize some simple mathematical functions as Turing machines

COURSE OUTCOME

1. Understand, design, construct, analyze and interpret Regular languages, Expression and Grammars.
2. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
3. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.
4. Design different types of Push down Automata as Simple Parser.
5. Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.

UNIT I: AUTOMATA 9 Hours

Introduction to formal proof – Additional forms of proof–Inductive proofs–Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA)–Finite Automata with Epsilon on transitions. (Chapter: 1 Section 1.2 to 1.4, Chapter: 2 Section 2.1 to 2.3, 2.5).

UNIT II: REGULAR EXPRESSIONS AND LANGUAGES 9 Hours

Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages–Equivalence and minimization of Automata. (Chapter: 3 Section 3.1 to 3.2, Chapter: 4 Section 4.1 to 4.2, 4.4).

UNIT III: CONTEXT-FREE GRAMMARS AND LANGUAGE 9 Hours

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Push down automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG – Deterministic Pushdown Automata. (Chapter: 5 Section 5.1 to 5.2, 5.4, Chapter: 6 Section 6.1 to 6.4).

UNIT IV: PROPERTIES OF CONTEXT-FREE LANGUAGES 9 Hours

Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM. (Chapter: 7 Section 7.1 to 7.3, Chapter: 8 Section 8.2 to 8.3).

UNIT V: UNDECIDABILITY 9 Hours

A language that is not Recursively Enumerable (RE) – A non decidable problem that is RE – Undecidable problems about Turing Machine – Post's Correspondence Problem – The classes P and NP. (Chapter: 9 Section: 9.1 to 9.4, Chapter: 10 Sections 10.1).

TEXT/REFERENCE BOOKS Total Hours: 45

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, —Introduction to Automata Theory, Languages and Computations, second Edition, Pearson Education, 2007.
2. Thomas A. Sudkamp, —An Introduction to the Theory of Computer Science, Languages and Machines, Third Edition, Pearson Education, 2007.
3. Raymond Greenlaw, H. James Hoover, —Fundamentals of Theory of Computation, Principles and Practice, Morgan Kaufmann Publishers, 1998.
4. H.R. Lewis and C.H. Papadimitriou, —Elements of the theory of Computation, Second Edition, Pearson Education, 2003.
5. Michael Sipser, —Introduction of the Theory and Computation, Thomson Brooks/Cole, 1997.
6. J. Martin, —Introduction to Languages and the Theory of computation, Third Edition, Tata McGraw Hill, 2007

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSEP12	ELECTIVE I	PRINCIPLES OF PROGRAMMING LANGUAGE	6	4

OBJECTIVES:

To build a solid foundation of the most important fundamental subject in computer science. Creative thinking is essential to algorithm design and mathematical acumen and programming skills.

COURSE OUTCOME:

- Knowledge of, and ability to use, language features used in current programming languages.
- An ability to program in different language paradigms and evaluate their relative benefits.
- An understanding of the key concepts in the implementation of common features of programming languages.

UNIT I: INTRODUCTION**Hours 9**

The role of programming languages, Language Description: Syntactic Structure.

UNIT II: IMPERATIVE PROGRAMMING**Hours 9**

Statements-Structured Programming, Types: Data Representation-Procedure Activations.

UNIT III: OBJECT ORIENTED PROGRAMMING**Hours 9**

Groupings of data and operations, Object oriented Programming.

UNIT IV: FUNCTIONAL PROGRAMMING**Hours 9**

Elements of Functional programming-Functional programming in a typed language, Functional programming with Lists.

UNIT V: OTHER PARADIGMS**Hours 9**

Logic programming-An introduction to concurrent programming: Language Descriptions-Semantic Methods, static types and the Lambda Calculus.

TEXT BOOK

1. Ravi Sethi, — Programming Languages: Concepts and Constructs, 2nd Edition, Pearson Education, 2006.

REFERENCES:

1. Terrence W. Pratt and Marvin V. Zelkowitz, –Programming Language Design and Implementation, 4th Edition, Prentice Hall of India, 2005.
2. Peter Van Roy and Seif Haridi, –Concepts, Techniques and Models of Computer Programming, Prentice Hall of India, 2004.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACS2001	CORE 3	ARTIFICIAL INTELLIGENCE	5	5

OBJECTIVES: To understand the various characteristics of Intelligent agents

- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

OUTCOMES:

Upon completion of the course, the students will be able to: Use appropriate search algorithms for any AI problem

- Represent a problem using first order and predicate logic
- Provide the apt agent strategy to solve a given problem
- Design software agents to solve a problem
- Design applications for NLP that use Artificial Intelligence.

UNIT I INTRODUCTION**Hours 9**

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS**Hours 9**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

UNIT III KNOWLEDGE REPRESENTATION

Hours 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining- Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering- Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV SOFTWARE AGENTS

Hours 9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V APPLICATIONS

Hours 9

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

TEXT BOOKS:

- 1 S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
- 2 I. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCES:

1. M. Tim Jones, —Artificial Intelligence: A Systems Approach(Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, —The Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, —Multi Agent Systems, Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACS2002	CORE 4	DATA SCIENCE USING PYTHON	5	5

Objective:

The objective of this course is to introduce students to the Python programming language.

Course Outcomes:

On completion of the course the students should be able to define python environment and constructs of Python language.

- Construct scripts in Python language.
- Analyze data with Python Libraries.

Unit I: Python Introduction:

Hours 9

Installing and setting Python environment in Windows and Linux, basics of Python interpreter, Execution of python program, Editor for Python code, syntax, variable, types. Flow control: if, if-else, for, while, range () function, continue, pass, break. Strings: Sequence operations, String Methods, Pattern Matching.

Unit II: Lists:

Hours 9

Basic Operations, Iteration, Indexing, Slicing and Matrixes; Dictionaries: Basic dictionary operations; Tuples: Basic Operations, Iteration, Indexing, Slicing; Functions: Definition, Call, Arguments, Scope rules and Name resolution; Modules: Module Coding Basics, Importing Programs as Modules, Executing Modules as Scripts, Compiled Python files(.pyc), Standard Modules: OS and SYS, The dir() Function, Packages.

Unit –III Object Oriented Programming in Python:

Hours 9

Classes, Objects, Inheritance, Operator Overloading,

Unit –IV File Handling:

Hours 9

Errors and Exceptions Handling (try and except) User-Defined Exception Objects, Regular expressions, User Defined Package with Python.

Unit –V Python Packages for Data Sciences:

Hours 9

Mathematical and Statistical Analysis with NumPy, Manipulating and Visualisation of Data with SciPy, Data models, shaping, merging, reshaping, slicing datasets and Data structure with Pandas Library , 2d Plot with matplotlib and seaborn, Learning Package: sklearn

REFERENCES:

1. Mark Lutz., Learning Python, Latest Edition, O'REILLY Media, Inc., 2009.
2. Paul Berry. Head First Python, O'REILLY Media, Inc., 2011.
3. Jeeva Jose & P. Sojan Lal., Introduction to Computing & Problem Solving with Python 2016.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSPR21	CORE PRACTICAL 3	ARTIFICIAL INTELLIGENCE LAB	6	4

LIST OF EXPERIMENTS:

1. Study of facts, objects, predicates and variables in PROLOG.
2. Study of Rules and Unification in PROLOG.
3. Study of “cut” and “fail” predicate in PROLOG.
4. Study of arithmetic operators, simple input/output and compound goals in PROLOG.
5. Study of recursion in PROLOG.
6. Study of Lists in PROLOG.
7. Study of dynamic database in PROLOG.
8. Study of string operations in PROLOG. Implement string operations like substring, string position, palindrome etc.)
9. Write a prolog program to maintain family tree.
10. Write a prolog program to implement all set operations (Union, intersection, complement etc.)
11. Write a prolog program to implement Library Management system.
12. Write a prolog program to solve “Water Jug Problem”.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSPR21	CORE PRACTICAL 3	PYTHON FOR DATA SCIENCE LAB	6	4

1. Introduction to Python Libraries- Numpy, Pandas, Matplotlib, Scikit
2. Perform Data exploration and preprocessing in Python
3. Implement regularized Linear regression
4. Implement Naive Bayes classifier for dataset stored as CSV file.
5. Implement regularized logistic regression
6. Build models using different Ensembling techniques
7. Build models using Decision trees
8. Build model using SVM with different kernels
9. Implement K-NN algorithm to classify a dataset.
10. Build model to perform Clustering using K-means after applying PCA and determining the value of K using Elbow method

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSEP21	CORE PRACTICAL 3	MOBILE COMPUTING	6	4

OBJECTIVES:

To understand the concept of mobile communication and various issues related with mobile networks and WCDMA technology

Course Outcome:

- 1.Demonstrate their understanding of the fundamentals of Android operating systems ·
- 2. Demonstrate their skills of using Android software development tools ·
- 3.Demonstrate their ability to develop software with reasonable complexity on mobile platform ·
- 4. Demonstrate their ability to deploy software to mobile devices ·
- 5. Demonstrate their ability to debug programs running on mobile devices

UNIT – I

Hours 9

Introduction: Advantages of Digital Information - Introduction to Telephone Systems – Mobile communication: Need for Mobile Communication - Requirements of Mobile Communication - History of Mobile Communication.(Chapter 1:1.1,Chapter 2,Chapter 3:3.1 to 3.3)

UNIT – II

Hours 9

Introduction to Cellular Mobile Communication - Mobile Communication Standards - Mobility Management - Frequency Management - Cordless Mobile Communication Systems.(Chapter 4 to 8)

UNIT – III

Hours 9

Mobile Computing: History of data networks - Classification of Mobile data networks – CDPD System - Satellites in Mobile Communication: Satellite classification - Global Satellite Communication - Changeover from one satellite to other - Global Mobile Communication - Interferences in Cellular Mobile Communication.(Chapter 9:9.1 to 9.3,Chapter 10:10.1 to 10.3,Chapter 11,12)

UNIT – IV**Hours 9**

Important Parameters of Mobile Communication System - Mobile Internet: Working of Mobile IP - Wireless Network Security - Wireless Local Loop Architecture: Components in WLL - Problems in WLL - Modern Wireless Local Loop - Local Multipoint Distribution Service - Wireless Application protocol.(Chapter13,14:14.1,Chapter 15,16:16.1 to 16.4,Chapter 17)

UNIT – V**Hours 9**

WCDMA Technology and Fibre Optic Microcellular Mobile Communication - Ad hoc Network and Bluetooth technology - Intelligent Mobile Communication system - Fourth Generation Mobile Communication systems.(Chapter 18 to 21)

TEXT BOOK:

T'G. Palanivelu, R. Nakkeeran, Wireless and Mobile Communication, PHI Learning Private Limited.2009.

SEMESTER II				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
PACSEP22	ELECTIVE 2	DATA MINING	6	4

OBJECTIVES: To expose the students to the concepts of Data warehousing Architecture and Implementation and to Understand Data mining principles and techniques

COURSE OUTCOME:

CO	OUTCOME
CO 1	Store voluminous data for online processing
CO 2	Pre process the data for mining applications
CO 3	Apply the association rules for mining the data
CO 4	Design and deploy appropriate classification techniques
CO 5	Cluster the high dimensional data for better organization of the data
CO 6	Discover the knowledge imbibed in the high dimensional system
CO 7	Evolve Multidimensional Intelligent model from typical system

UNIT I INTRODUCTION AND DATA WAREHOUSING**Hours 9**

Introduction- Data Warehouse- Multidimensional Data Model- Data Warehouse Architecture- Implementation Further Development- Data Warehousing to Data Mining.

UNIT II DATA PREPROCESSING- LANGUAGE- ARCHITECTURES- CONCEPT DESCRIPTION

Hours 9

Why Preprocessing- Cleaning- Integration- Transformation- Reduction- Discretization- Concept Hierarchy Generation- Data Mining Primitives- Query Language- Graphical User Interfaces- Architectures- Concept Description- Data Generalization- Characterizations- Class Comparisons- Descriptive Statistical Measures.

UNIT III ASSOCIATION RULES

Hours 9

Association Rule Mining- Single-Dimensional Boolean Association Rules from Transactional Databases Multi-Level Association Rules from Transaction Databases

UNIT IV CLASSIFICATION AND CLUSTERING

Hours 9

Classification and Prediction- Issues- Decision Tree Induction- Bayesian Classification- Association Rule Based- Other Classification Methods- Prediction- Classifier Accuracy- Cluster Analysis- Types of dataCategorisation of methods- Partitioning methods- Outlier Analysis.

UNIT V RECENT TRENDS

Hours 9

Multidimensional Analysis and Descriptive Mining of Complex Data Objects- Spatial Databases- Multimedia Databases- Time Series and Sequence Data- Text Databases- World Wide Web- Applications and Trends in Data Mining

Total : 45 Hours

REFERENCES

1. J. Han, M. Kamber, —Data Mining: Concepts and TechniquesI, Harcourt India / Morgan Kauffman, 2001.
2. Margaret H.Dunham, —Data Mining: Introductory and Advanced TopicsI, Pearson Education 2004.
3. Sam Anahory, Dennis Murry, —Data Warehousing in the real worldI, Pearson Education 2003.
4. David Hand, Heikki Manila, Padhraic Symth, —Principles of Data MiningI, PHI 2004.
5. W.H.Inmon, —Building the Data Warehousell, 3rd Edition, Wiley, 2003.
6. Alex Bizon, Stephen J.Smith, —Data Warehousing, Data Mining & OLAPI, McGraw- Hill Edition, 2001. 7. Paulraj Ponniah, —Data Warehousing FundamentalsI, Wiley-Interscience Publication, 2003.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACS01	CORE 1	RESEARCH METHODOLOGY	5	5

UNIT I - Research Methodology

Meaning of Research - Objectives of research – motivation of research – Types, approaches and significance – Methods versus Methodology – Research in Scientific methods – Research process – Criteria for good research – Problem encountered by research in India – Funding agencies/

UNIT II - Research Design

Research problems – Selecting the problem – Necessity of defining the problem – Techniques involved in defining the problem – Research design – Needs and features of good design – Different research design – Basic principles of experimental designs.

UNIT III – Data Collection and Documentation

Data collection methods – Data types – Processing and presentation of data – Techniques of ordering data – Meaning of primary and secondary data – The uses of computers in research – The library and internet – Uses of search engines – virtual libraries - common software for documentation and presentation

UNIT IV – Data and Error analysis

Statistical analysis of data – Standard deviation – Correlation – Comparison of sets of data – Chi square analysis of data – Characteristics of Probability distribution – Binomial, Poisson and normal distribution - principles of least square fittings – Curve fitting – Measurement of errors – Types and sources of errors – Determination and control of errors.

UNIT V – Research Communication

Meaning of research report – logical format for writing thesis and paper – Essential of scientific report – Abstract, Introduction , Review of literature , Materials and Methods and discussion. Write up steps in drafting report – Effective illustrations : Tables and figures – Reference styles : Harvard and Vancouver Systems.

Reference Books

1. Research methodology , Methods and techniques – C.R. Kothari – Viswapragasam Publications, 2nd Edition.
2. Research : An Introduction – Robert Ross – Harper and Row Publications.
3. Research methodology – P. Saravanavel – Kitab Mahal, 6th edition.
4. A handbook of methodology of Research – Rajammal P.A. Devadas – Vidhalaya press
5. Introduction to computers – N. Subramanian
6. Statistical Methods – G.W. Snedecor and W. Cochran – Oxford and IBH, New Delhi
7. Research methodology methods and statistical techniques – Santhosh gupta.
8. Statistical Methods – S.P. Gupta
9. Scientific social survey and research - P. Young – Asia publisher, Bombay.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACS02	CORE 2	COMPUTER GRAPHICS AND IMAGE PROCESSING	5	5

UNIT I

Scan conversion – lines, circles and Ellipses; Filling polygons and clipping algorithms: Scan Converting Lines, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Scan Converting Ellipses, Filling Polygons, edge data structure, Clipping Lines algorithms– Cyrus-Beck, Cohen-Sutherland and Liang-Barsky.

UNIT II

Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting)

Illumination and Shading: Illumination and Shading Models for Polygons, Reflectance properties of surfaces, Ambient, Specular and Diffuse reflections, Atmospheric attenuation, Phong's model, Gouraud shading.

UNIT III

Image Enhancement and Image Restoration

Image Enhancement in the Spatial Domain: Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Spatial Filtering, Fuzzy sets for

spatial filters – Image Enhancement in the Frequency Domain: Frequency Domain Filters - Image

Restoration: Model of Image Degradation/Restoration Process, Noise Models, Linear and non linear

image restoration techniques, Blind Deconvolution

UNIT IV

Multiresolution analysis and Image Compression

Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Fast Wavelet Transforms,

Lifting scheme. Image Compression: Fundamentals – Models – Elements of Information Theory –

Error Free Compression – Lossy Compression-wavelet based image compression techniques –Compression standards-JPEG/MPEG, Video compression.

UNIT V

Image Segmentation and Description

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Based Segmentation, Basic Morphological Algorithms, Morphological Water

Sheds - Description: Boundary Descriptors, Regional Descriptors.

REFERENCES:

1. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and MPractice, Second Edition in C, Pearson Education, 2003.
2. D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition, 2004.
3. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition, 1990.
4. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, Third Edition, 2008.
5. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 2006.
6. Rafael C. Gonzalez, Richard E. Woods, and Eddins, "Digital Image Processing Using MATLAB",

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACS04	ELECTIVE I	BIG DATA ANALYTICS	5	5

Course Objectives:

- To provide an overview of an exciting growing field of Big Data analytics.
- To discuss the challenges traditional data mining algorithms face when analyzing Big Data.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql Map Reduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To introduce to the students several types of big data like social media, web graphs and data streams.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support.

Course Outcomes:

CO1: Explain the motivation for big data systems and identify the main sources of Big Data in the real world.

CO2: Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.

CO3: Implement several Data Intensive tasks using the Map Reduce Paradigm

CO4: Apply several newer algorithms for Clustering Classifying and finding associations in Big Data

CO5: Design algorithms to analyze Big data like streams, Web Graphs and Social Media data.

CO6: Design and implement successful Recommendation engines for enterprises.

UNIT I: Introduction to Big Data

Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options
Team challenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of
Big Data - Security, Compliance, auditing and protection - Evolution of Big data – Best
Practices for Big data Analytics - Big data characteristics - Volume, Veracity, Velocity,
Variety – Data Appliance and Integration tools – Greenplum – Informatics.

UNIT II: Data Analysis

Evolution of analytic scalability – Convergence – parallel processing systems – Cloud
computing – grid computing – map reduce – enterprise analytic sand box – analytic data sets
– Analytic methods – analytic tools – Cognos – Microstrategy - Pentaho. Analysis
approaches – Statistical significance – business approaches – Analytic innovation –
Traditional approaches – Iterative.

UNIT III: Stream Computing

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing,
Sampling data in a stream – Filtering streams – Counting distinct elements in a stream –
Estimating moments – Counting oneness in a window – Decaying window - Realtime
Analytics Platform(RTAP) applications IBM Infosphere – Big data at rest – Infosphere
streams – Data stage – Statistical analysis
– Intelligent scheduler – Infosphere Streams.

UNIT IV: Predictive Analytics and Visualization

Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Kohonen
models – Normal – Deviations from normal patterns – Normal behaviours – Expert options –
Variable entry - Mining Frequent itemsets - Market based model – Apriori Algorithm –
Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent
itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high
dimensional data Visualizations - Visual data analysis techniques, interaction techniques;
Systems and applications.

UNIT V: Frameworks and Applications

IBM for Big Data – Map Reduce Framework - Hadoop – Hive - – Sharding – NoSQL
Databases - S3 - Hadoop Distributed file systems – Hbase – Impala – Analyzing big data
with twitter – Big data for Ecommerce– Big data for blogs.

REFERENCES:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
2. Bill Franks, -Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley and SAS Business Series, 2012.
3. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, -Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2011.
4. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, -Harness the Power of Big data- The big data platform, McGraw Hill, 2012.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACS04	ELECTIVE I	CLOUD COMPUTING & VIRTUALIZATION	5	5

Course Objectives:

- Basics of cloud computing.
- Key concepts of virtualization.
- Different Cloud Computing services.
- Cloud Implementation, Programming and Mobile cloud computing.
- Key components of Amazon Web Services.
- Cloud Backup and solutions.

Course Outcomes:

CO1: Define Cloud Computing and memorize the different Cloud service and deployment models

CO2: Describe importance of virtualization along with their technologies.

CO3: Use and Examine different cloud computing services.

CO4: Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing.

CO5: Describe the key components of Amazon web Service.

CO6: Design & develop backup strategies for cloud data based on features.

UNIT 1: Overview of Virtualization

Basics of Virtualization – Types of Virtualization Techniques – Merits and demerits of Virtualization – Full Vs Para-virtualization – Virtual Machine Monitor/Hypervisor - Virtual Machine Basics – Taxonomy of Virtual machines – Process Vs System Virtual Machines – Emulation: Interpretation and Binary Translation

UNIT 2: Server Virtualization:

Virtual Hardware Overview - Server Consolidation – Partitioning Techniques - Uses of Virtual server Consolidation – Server Virtualization Platforms, **Network Virtualization:** Design of Scalable Enterprise Networks – Layer2 Virtualization – VLAN, **Storage**

Virtualization: AN backup and recovery techniques Virtual Storage: File System Level and Block Level, **Desktop Virtualization:** Potential Desktop Virtualization Scenarios - Desktop Virtualization Infrastructures, **Application Virtualization:** Application Management Issues - Redesign Application Management – Application Migration

UNIT 3: Understanding Cloud Computing:

Cloud Architecture – Cloud Storage DEVELOPING CLOUD SERVICES: Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

UNIT 4: Cloud Computing For Everyone

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT 5: Using Cloud Services

Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Project Management – Collaborating on Databases – Storing and Sharing Files.

REFERENCES:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Kumar Saurabh, –Cloud Computing– Insights into New Era Infrastructure, Wiley Indian Edition, 2011.
3. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
4. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Elsevier/Morgan Kaufmann, 2013.
5. James E. Smith, Ravi Nair, - Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
6. David Marshall, Wade A. Reynolds, - Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data

- Center, Auerbach Publications, 2006.
7. Kumar Reddy, Victor Moreno, - Network virtualization, Cisco Press, July, 2006.
 8. Chris Wolf, Erick M. Halter, - Virtualization: From the Desktop to the Enterprise, APress 2005.
 9. Danielle Ruest, Nelson Ruest - Virtualization: A Beginner's Guide, TMH, 2009.
 10. John Rittinghouse, James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACS04	ELECTIVE I	DATA MINING, DATA WAREHOUSING AND BUSINESS INTELLIGENCE	5	5

Course Objectives:

- To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.
- To enable students to effectively identify sources of data and process it for data mining.
- To make students well versed in all data mining algorithms, methods of evaluation.
- To impart knowledge of tools used for data mining.
- To provide knowledge on how to gather and analyze large sets of data to gain useful business understanding.
- To impart skills that can enable students to approach business problems analytically by identifying opportunities to derive business.

Course Outcomes:

CO1: Demonstrate an understanding of the importance of data mining and the principles of business intelligence

CO2: Organize and prepare the data needed for data mining using pre preprocessing techniques.

CO3: Perform exploratory analysis of the data to be used for mining.

CO4: Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.

CO5: Define and apply metrics to measure the performance of various data mining algorithms.

UNIT I: Introduction to Data Warehousing

Evolution of Decision Support Systems- Data warehousing Components – Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs. OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations.

UNIT II: Data Warehouse Process and Architecture

Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses. Data warehouse implementation, tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends - Business Applications- tools-SAS.

UNIT III: Introduction to Data Mining

Data mining-KDD versus data mining, Stages of the Data Mining Process-task primitives, Data Mining Techniques -Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns-association-correlation.

UNIT IV: Classification and Clustering

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Clustering techniques – , Partitioning methods- k-means- Hierarchical Methods – distance based agglomerative and divisible clustering, Density-Based Methods – expectation maximization -Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis.

UNIT V: Predictive Modeling of Big Data and Trends in Data mining

Statistics and Data Analysis – EDA – Small and Big Data –Logistic Regression Model - Ordinary Regression Model-Mining complex data objects – Spatial databases – Temporal databases – Multimedia databases – Time series and sequence data – Text mining – Web mining – Applications in Data mining

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition 2011, ISBN:1558604898.
2. Alex Berson and Stephen J. Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw Hill Edition, Tenth Reprint 2007.
3. G. K. Gupta, —Introduction to Data Mining with Case Studies, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Data Mining: Practical Machine Learning Tools and Techniques, Third edition, (The Morgan Kaufmann series in Data Management systems), Ian. H. Witten, Eibe Frank and Mark. A. Hall, 2011.
5. Statistical and Machine learning —Learning Data Mining, techniques for better Predictive Modeling and Analysis to Big Data.

REFERENCES:

1. Mehmed Kantardzic, —Data Mining concepts, models, methods, and algorithms, Wiley Interscience, 2003.
2. Ian Witten, Eibe Frank, Data Mining; Practical Machine Learning Tools and Techniques, third edition, Morgan Kaufmann, 2011.
3. George M Marakas, Modern Data Warehousing, Mining and Visualization, Prentice Hall, 2003.

SEMESTER I				
COURSE CODE	COURSE	COURSE TITLE	HRS. / WEEK	CREDIT
MPHACS04	ELECTIVE I	Wireless Networking & Pervasive Computing	5	5

Course Objectives:

- Understand the fundamentals of wireless networks.
- Learn and analyze the different wireless technologies.
- Evaluate Ad-hoc networks and wireless sensor networks.
- Understand and evaluate emerging wireless technologies and standards.
- Understand design considerations for wireless networks
- Learn and analyze and evaluate the security threats and related security standards

Course Outcomes:

CO1: Explain the basic concepts of wireless network and wireless generations.

CO2: Demonstrate the different wireless technologies such as CDMA, GSM, GPRS

CO3: Appraise the importance of Adhoc networks such as MANET and VANET and Wireless Sensor Networks.

CO4: Describe and judge the emerging wireless technologies standards such as WLL, WLAN, WPAN, and WMAN.

CO5: Explain the design considerations for deploying the wireless network infrastructure.

CO6: Differentiate and support the security measures, standards. Services and layer wise security considerations.

UNIT I: Introduction

Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies

– Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices.

UNIT II: 3G and 4G Cellular Networks

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP

UNIT III: Sensor and Mesh Networks

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks

– Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks.

UNIT IV: Context Aware Computing

Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis

– Delaunay Triangulation and Verona graphs – Types of Context – Role of Mobile Middleware– Adaptation and Agents – Service DiscoveryMiddleware.

UNIT V: Application Development

Three tier architecture - Model View Controller Architecture - Memory Management – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone.

REFERENCES:

1. AsokeTalukder,HasanAhmed,RoopaRYavagal,—MobileComputing:Technology, Applications and Service CreationI, Second Edition, Tata McGraw Hill,2010.
2. Reto Meier, -Professional Android 2 Application DevelopmentI, Wrox Wiley, 2010.
3. PeiZhengandLionelMLi,—SmartPhone&NextGeneration MobileComputing‘,Morgan Kaufmann Publishers,2006.
4. Frank Adelstein, __Fundamentals of Mobile and Pervasive Computing‘, TMH,2005.
5. JochenBurthardtetal,PervasiveComputing:Technologyand ArchitectureofMobileInternet Applications‘, Pearson Education,
6. Feng Zhao and Leonidas Guibas, Wireless Sensor Networks‘, Morgan Kaufmann Publishers, 2004.
7. Uwe Hansmaan et al, __Principles of Mobile Computing‘, Springer,2003.
8. Reto Meier, -Professional Android 2 Application DevelopmentI, Wrox Wiley, 2010.
9. StefanPoslad,—UbiquitousComputing: SmartDevices, EnvironmentsandInteractionsI, Wiley, 2010.
