THEIVANAI AMMAL COLLEGE FOR WOMEN (AUTONOMOUS)
VILLUPURAM
(Re-Accredited by NAAC with 'A' Grade & ISO 9001:2008 Certified)
(A UNIT OF E.S.S.K. EDUCATIONAL CHARITIES)

ACADEMIC COUNCIL BOOKLET – X

IQAC and Science (Master Copy)

11th July 2018

CONTENT **PAGE NO**

Internal Quality Assurance Cell

UG COURSE PROFILE –Allotment of Hours

(With effect from 2018-2021 batch onwards)

PREAMBLE

Course profile for UG, PG, M. Phil are presented in this Booklet

Components	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem
Part I Tamil/Hindi/French(2 Levels)	4	4	4	4	-	-
Part II English	5	5	5	5	-	-
Part III Major core & Allied Major optional Project/ Core paper	19 - -	15* - -	19* - -	17* - 2	24* - 4	23 5 -
Part IV Non major elective Online course * Value education Soft skill	- - 2 -	4 - - 2	- - 2 -	- - - 2	- - 2 -	- - - 2
Part V Extension activity/Physical education outside class hours	60 Hours(Compulsory)		60 Hours (Optional)		60 Hours(Optional)	
Total Hours	**30**	**30**	**30**	**30**	**30**	**30**
Not more than six course per semester for Arts and seven courses per semester for science. **Three hours for online course has to be taken from part III in the respective semester as given in the profile**						

UG COURSE PROFILE –Allotment of Hours

(With effect from 2018-2021 batch onwards)

Components	Two year language Programme B.A., B.Sc.,		One year language Programme B.B.A., B.Com., B.Com(CA), BCA	
	Credit per semester	**Total Credit**	**Credit per semester**	**Total Credit**
Part I Tamil/Hindi/French (2 Levels)	2/3	8/12	2/3	4/6
Part II English (2 Levels)	3/4	12/16	3/4	6/8
Part III Major core & Allied Major Elective Comprehensive viva Summer Internship	 Depends upon the courses 4 1 -	 110 4 1 2 (Extra)	 Depends upon the courses 4 1 -	 115 4 1 2 (Extra)
Part IV NME Value Education Soft Skill Online Course	 2 1 1 -	 2 3 3 1/2	 2 1 1 -	 2 3 3 1/2
Part V Extension	1/2	1/6	1/2	1/6
Total		**140/156**		**140/152**

PG COURSE PROFILE – Allotment of Hours
(With effect from 2018-2020 batch onwards)

Components	I Sem	II Sem	III Sem	IV Sem
Major core Core-Interdisciplinary course	30 -	25 -	23 5	26 -
Project	-	-	2	4
Non major elective	-	5	-	-
Service learning (outside class hours)	40 hrs		-	-
Total Hours	**30**	**30**	**30**	**30**

PG COURSE PROFILE –Allotment of Credits
(With effect from 2018-2020 batch onwards)

Components	Credit per semester	Total credit
Major core	Depends upon the courses	75
Project	6	6
NME	4	4
Interdisciplinary	4	4
Service learning	1(one year)	1
Total Credit		**90**

M. Phil COURSE PROFILE – Allotment of Hours & Credits
(With effect from 2018-2019 batch onwards)

I Semester	II Semester	Credits	
		Minimum	**Maximum**
Paper I (6 hours)	-	5	5
Paper II (6 hours)	-	5	5
Paper III (Special area study paper)	-	5	5
-	Dissertation & Viva voce	15	15
▪ **Paper Presentation (minimum one) &** ▪ **Publication of articles in Journals (minimum one) are mandatory for submission of Dissertation.**		**30**	**30**

DEPARTMENT OF BIOCHEMISTRY

PREAMBLE

UG : Course profile and list of courses offered to other departments (With effect from 2018 –2021 batch onwards)

PG : Course profile and list of courses offered to other departments (With effect from 2018 –2020 batch onwards) and

M.Phil : Course profile and syllabi of courses offered in the first semester (With effect from 2018 – 2019 batch onwards) are presented in this booklet.

COURSE PROFILE B.Sc. (Biochemistry)

PSO1: Ability to analyze the various biological components through analytical tools in living cells.

PSO2: Development of practical laboratory skills and strong speculative foundation in the cross over discipline of Chemistry, Microbiology & Bioinformatics.

PSO3: Understanding of the applications of Biochemistry in various fields such as Clinical Biochemistry, Genetic Engineering, Molecular biology & Biotechnology.

PSO4: Acquire practical skills that will prepare for a future career in the interdisciplinary subjects.

Semester	Part	Category	Course code	Course Title	Hours per week	Credit	
						Min	Max
I	I	Language	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil I/ Advanced Tamil I/ Hindi I / French I	4	2	3
	II	English I	UENL107/ UENL108	General English I/ Advanced English I	5	3	4
	III	Core I	UBCM106	Fundamentals of Biochemistry	2	1	1
		Core II	UBCM105/ UBCM201	Cell Biology	6	6	6
		Core practical I	UBCR101	Cell Biology Practical	3	3	3
		Allied I	UCHA102	Chemistry	5	4	4
		Allied I practical	UCHR102	Chemistry Practical	3	2	2
	IV	Value education			2	1	1
				TOTAL	**30**	**22**	**24**
II	I	Language	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil II/ Advanced Tamil II/ Hindi II/ French II	4	2	3
	II	English II	UENL207/ UENL208	General English II/ Advanced English II	5	3	4
	III	Core III	UBCM202	Biomolecules	5	5	5
		Core practical II	UBCR201	Qualitative analysis of Biomolecules	3	3	3
		Allied II	UMBA201	Microbiology	4	4	4
		Allied II practical	UMBR201	Microbiology Practical	3	2	2
	IV	Non Major elective			4	2	2
		Soft skill			2	1	1
	V	Extension activity/ Physical Education/NCC			-	1	2
				TOTAL	**30**	**23**	**26**
III	I	Language	UTAL305/ UTAL306/ UHIL301/ UFRL301	Basic Tamil III/ Advanced Tamil III/ Hindi III/ French III	4	2	3
	II	English III	UENL307/	Basic English III/ Advanced	5	3	4

			UENL308	English III			
	III	Core IV	UBCM304	Biochemical Techniques	6	6	6
		Core practical III	UBCR301	Biochemical Techniques practical I	5	5	5
		Allied III	UMAA305	Biostatistics	5	4	4
	IV	Online courses		NPTEL/Spoken Tutorial	**3**	**1**	**2**
		Value Education			2	1	1
				TOTAL	**30**	**22**	**25**
IV	I	Language	UTAL405/ UTAL406/ UHIL401/ UFRL401	Basic Tamil IV/ Advanced Tamil IV/ Hindi IV/ French IV	4	2	3
	II	English IV	UENL407/ UENL408	Basic English IV/ Advanced English IV	5	3	4
	III	Core V	UBCM403	Immunology	6	6	6
		Core VI	UIDM401	Pharmaceutical chemistry	6	5	5
		Core practical IV	UBCR401	Biochemical Techniques Practical II	5	5	5
		Core X	UBCP501	Project	2	-	-
	IV	Soft skill			2	1	1
	V	Extension activity/ Physical Education/NCC			-	-	2
				TOTAL	**30**	**22**	**26**
V	III	Core VII	UBCM501	Enzymes & Intermediary metabolism	6	6	6
		Core VIII	UBCM502	Human Physiology	6	6	6
		Core IX	UBCM503	Basics of Bioinformatics	6	6	6
		Core practical V	UBCR501	Enzymology practical	6	3	3
		Core X	UBCP501	Project	4	4	4
		Value education			2	1	1
				TOTAL	**30**	**26**	**26**
VI	III	Core X1	UBCM601	Introduction to Biotechnology	5	4	4
		Core XII	UBCM602	Clinical Biochemistry	5	5	5
		Core XIII	UBCM603	Molecular Biology	5	5	5
		Core XIV	UBCM604	Comprehensive Viva voce	-	1	1
		Core practical VI	UBCR601	Clinical Biochemistry practical	5	3	3
		Core practical VII	UBCR602	Hematology & Urine analysis	3	2	2
		Major Elective	UBCO604	Stem cell Biology	5	4	4
			UBCO605	Molecular Endocrinology			
			UBCO606	Pathobiology of Human Diseases and Disorders			
			UIDM601	Nanotechnology in medicine			
	IV	Soft skill			2	1	1
	V	Extension activity/ Physical Education/NCC			-	-	2
				TOTAL	**30**	**25**	**27**
				GRAND TOTAL	**180**	**140**	**154**

COURSES OFFERED TO OTHER DEPARTMENTS
NON MAJOR ELECTIVES

Semester	Part	Category	Course code	Course Title	Contact Hour/ Week	Credit	
						Min	Max
II	IV	Non Major Elective	UBCE202	Biomedical Techniques	4	2	2
			UBCE401/UBCE203	Nutrition & Health			
			UBCE502/UBCE204	Women's Health, Nutrition & Disorders			
			UBCE304/UBCE208	Mushroom Cultivation			
			UBCE209	Clinical Diagnostics			
			UBCE210	Reproductive Biology			

EXTRA CREDIT EARNING PROVISION (Only for Interested Students)

Semester	Category	Course Code	Course Title	Credit
II	Internship	UBCI201	Summer Internship	1
IV	Internship	UBCI401	Summer Internship	1

UBCM106 FUNDAMENTALS OF BIOCHEMISTRY

Semester :I **Credit : 1**
Category :Core I **Hours/week: 2**
Class & Major:I B.Sc. Biochemistry **Total Hours:26**

Objectives

To enable the students

- Understand the importance and scope of biochemistry, biosafety measures in laboratory.
- Gain adequate knowledge about structure, properties and functions of biomolecules.
- Evaluate the bioenergetics using biochemical calculations.

UNIT - I INTRODUCTION TO BIOCHEMISTRY **5 Hrs**

History and Scope of Biochemistry, Importance of Biochemistry and its applications in various fields. Cells – types, Subcellular organelles; Tissues – types.

UNIT - II BIOMOLECULAR CHEMISTRY **5 Hrs**

Structure and Properties of water - Definition & Importance of Carbohydrates, Amino acids - Proteins - Lipids - Nucleic Acids - Vitamins and Hormones.

UNIT - III CELLULAR CHEMISTRY **5 Hrs**

Structure of matter - atomic structure, molecular structure; Bonding – Ionic, Covalent, Hydrogen, Co ordinate and Vander walls interaction and chemical reactions; Inorganic compounds - Salts, Ions, Acids and Bases; pH, biological buffers and their significance.

UNIT - IV BIOENERGETICS AND BIOCHEMICAL CALCULATIONS 6 Hrs

Laws of thermodynamics- Zero, First and Second Law, oxidation and reduction reaction, redox potential and energy transfer.

Units of measurements of solutes in solution - Normality, Molality, Molarity, Osmolarity, Ionic strength; Percentage, mole fraction.

UNIT - V QUALITY CONTROL PRACTICES AND BIOSAFETY 5 Hrs

Precision, accuracy, specificity, sensitivity, percentage error and quality control for laboratory methods. Calibration of volumetric- pipette, burette and SMF.

Do's and Don'ts in the laboratory, **l**aboratory associated infections and other hazards, assessment of biological hazards and levels of biosafety, prudent biosafety practices in the laboratory/ institution.

Text Books

- Gupta P.K, "*A Text-book of Cell and Molecular Biology"*, Rastogi Publications, Meerut, India, 2005.
- Campbell M.K. "*Biochemistry*, Saunders College Publishing", Philadelphia, (Jd Edition) 2006.

Reference Books

- Ambika Shanmugam, "*Fundamentals of Biochemistry"*, 4th edition, Published by Author, 2006.
- Marshal V. C, "*Major Chemical Hazards"*, 3rd edition, Ellis Horwood Ltd., Chichester, United Kingdom, 2005.
- Raghavan K. V & Khan A.A, "*Methodologies in Hazard Identification and Risk Assessment"*, 3rd edition, Manual by CLRI, 2002.
- Sadasivam .S and Manickam.A, "*Biochemical Methods"*, 3rd Edition, New age International (P) Ltd, 2008.

UBCM105/UBCM201 CELL BIOLOGY

Semester :I **Credit : 5**
Category :Core I **Hours/week : 6**
Class & Major:I B.Sc. Biochemistry **Total Hours:78**

Objectives
To enable the students

- Understand the dynamic nature of the Cell.
- Specify the structural features and differences between prokaryotes and eukaryotic cells.

UNIT - I ORGIN & CLASSIFICATION OF CELLS **15 Hrs**

An overview of cells- origin and evolution of cells. Cell theory, Classification of cells- prokaryotic and eukaryotic cells,comparison of prokaryotic and eukaryotic cells. Molecular composition of cells- water, carbohydrates, lipids, nucleic acids and proteins.

UNIT - II CELL MEMBRANE **15 Hrs**

Cell membrane- Fluid mosaic model of membrane structure. Membrane proteins and their properties Membrane carbohydrates and their role. Transport across membranes- Diffusion, active and passive transport.

UNIT-III ENDOPLASMIC RETICULUM, GOLGI APPARATUS & LYSOMES 15 Hrs

Endoplasmic reticulum- types, structure and functions. Golgi apparatus- structure and function. Lysosomes- structure and functions, morphology and functions of peroxisomes and glyoxysomes.

UNIT - IV MITOCHONDRIA CYTOSKELETON **15 Hrs**

Mitochondria- structure and functions. Cytoskeleton- types of filaments and their functions Microtubules- chemistry and functions. Cilia and flagella.

UNIT - V NUCLEUS CHROMOSOMES **18 Hrs**

Nucleus- structure and functions. Chromosomes- chromatin structure. The cell cycle- Phases of cell cycle. Meiotic and mitotic cell division**.** Apoptosis and Necrosis.

Text Books

- Lohar, S.Prakash., "*Cell and Molecular Biology"*,MJP publishers, 2007.
- Verma.P.S and Agarwal., "*Cell biology, Genetics, Molecular Biology, Evolution and Ecology",* S.Chand Publication, 2008.

Reference Books

- Cooper.M., "*The cell-A molecular approach"*, ASM Press, 1995.
- Harvey Lodish, Baltimore and Arnold Berk, et.al ., , "Third Edition, *Molecular and cell biology",* 1995.
- Rastogi.S.C., "*Biochemistry"*.Second Edition, Delhi,Tata Mc Graw Hill, 2007.

UBCR101 CELL BIOLOGY PRACTICAL

Semester :I **Credit : 3**
Category :Core Practical **Hours/Week: 3**
Class & Major:I B.Sc. Biochemistry **Total Hours:39**

Objectives
To enable the students

- Understand plant and animal cells.
- Gain practical insight of structural features of prokaryotes and eukaryotic cells.
- Apply the methods in cell biology.

1. Use of Microscopes.

2. Blood Smear preparation

3. Mounting buccal epithelium and observing living cells using vital staining.

4. Mitosis in Onion root tip squash.

5. Study of prepared slides of histology(any five)

    a) Columnar Epithelium

    b) Ciliated Epithelium

    c) Glandular Epithelium

    d) Alveolar Connective tissue

    e) Cartilage T.S

    f) Cardiac muscle

    g) Striated muscle

    h) Non Striated muscle

    i) Nervous tissue

6. Barr Body staining from buccal epithelial cells

7. Isolation of chloroplast from spinach leaves.

Text Book

- Dr.S.Rajan & Mrs. R.Selvi Christy, "*Experimental procedure in Life Science"*, First Edition, Anjanaa Book House, Chennai, 2010.

Reference books

- Chris Hawes & Beatrice Satiat Jeunermaitre(Editors) *Plant Cell Biology: "A practical Approach"*, 2nd Edition, Oxford University Press, USA 2001.
- John Dawey & Mike Lord, "*Essential Cell Biology: A practical approach Vol.2"*, 2nd Edition, Oxford University Press, USA 2003.

UBCM202 BIOMOLECULES

Semester :II **Credit : 5**
Category :Core III **Hours/week: 5**
Class & Major:I B.Sc. Biochemistry **Total Hours:65**

Objectives

To enable the students

- Understand the principles of the structure of molecules associated with life processes. and their roles in the functioning of living cells.
- Elucidate the roles of biomolecules in the functioning of living cells.

UNIT- I CARBOHYDRATES **12 Hrs**

Classification of carbohydrates, physical properties- Stereo & optical isomerism, anomeric form & Mutarotation. Occurrence and biological importance of mono, di & polysaccharides - Cellulose, starch, glycogen, pectin. Introduction to mucopolysaccharides (proteoglycans, glycosaminoglycans).

UNIT- II PROTEINS AND AMINOACIDS **15 Hrs**

Classification based on solubility, shape, composition and function. Stereo & optical isomerism, Zwitterions, physical & chemical properties, titration of amino acids, Essential amino acids. Protein Introduction, classification based on solubility, shape, composition and function. Functional aspects of protein. Structure of protein- Primary, secondary, tertiary & quaternary structure of protein. Biologically important peptides. Structure and function (Insulin, glutathione, vasopressin).

UNIT - III LIPIDS **15 Hrs**

Definition, classification,& function of fatty acids, phospholipids, glycolipids, sphingomyelin, Plasmalogen & sterol. Essential fatty acid and non- essential fatty acid.

UNIT - I NUCLEIC ACIDS **13 Hrs**

Nature of nucleic acids, structure of purines, pyrimidines, nucleosides & nucleotides. Structure of DNA - Watson and Crick models. Types of DNA. Structure of RNA and its types. Properties – Denaturation, Renaturation, Tm, Hypo & Hyperchromicity.

UNIT - V VITAMINS **10 Hrs**

Vitamins: Classification of vitamins – water soluble vitamins and non water soluble vitamins. General biological function.

Text Books

- Eric E. Conn, Paul K. Stumpf, George Bruening and Roy H.Dol.,"*Textbook of Biochemistry"*, John Wiley and Sons, 2005.
- Jain.J.L, Sunjay Jain and Nitin Jain., "*Fundamentals of Biochemistry"*, S.Chand Publication, 2008.

Reference Books

- Ambika Shanmugam., *Fundamentals of Biochemistry,* Seventh Edition, published by Author, 2006.
- David L.Nelson, Michael M.Cox .,*Lehninger's Principles of Biochemistry* , Fourth edition, Newyork,W.H.Freeman and Company, 2005.
- Satyanarayan.V, Chakrapani.V .,*Essentials Of Biochemistry,* second edition, Kolkota, Books & Allied, 2007.

UBCR201 QUALITATIVE ANALYSIS OF BIOMOLECULES PRACTICAL

Semester :II **Credit : 3**
Category :Core practical II **Hours/week: 3**
Class & Major:I B.Sc. Biochemistry **Total Hours:39**

Objectives

To enable the students

- To acquire the ability to solve problems related to biochemical techniques.
- To analyze the biological fluids for the diagnosis of the diseases.

QUALITATIVE ANALYSIS

1. ANALYSIS OF CARBOHYDRATES **12 Hrs**

Colour reactions of sugars and osazone test.

a) Monosaccharides: Pentoses- Ribose and Arabinose Hexoses- Glucose, Fructose, Galactose and Mannose.
b) Disaccharides: Sucrose, Maltose, Lactose.
c) Polysaccharides: Starch, Dextrin and Glycogen.

2. ANALYSIS OF AMINOACIDS **9 Hrs**

Colour reactions of aminoacids such as Tyrosine, Tryptophan, Arginine, Histidine and Cysteine.

3. ANALYSIS OF PROTEINS **9 Hrs**

Egg albumin-Solubility, Biuret, Millons, Xanthoproteic, Denaturation by heat,pH change and Precipitation by acidic reagents.

4. ANALYSIS OF LIPIDS **9 Hrs**

Solubility, Saponification tests for unsaturation and Liebermann Burchard test for cholesterol.

Text Book

- Jayaraman.J., "*Laboratory manual in Biochemistry"*, New Age International Limited Publication.

Reference Books

- Pattabiraman.," *Laboratory Manual in biochemistry"*, CBS Publication.
- Singh.S.P., "*Practical Manual of Biochemistry"*, Sixth Edition, CBS Publication, 2006.
- Varley., "*Practical biochemistry"*, CBS Publication.

UMBA201 MICROBIOLOGY

Semester :II **Credit : 4**
Category :Allied II **Hours/week: 4**
Class & Major:I B.Sc. Biochemistry **Total Hours:52**

Objectives

To enable the students

- Understand the living microbes present in the environment.
- Specify the impact of endemic bacterial and viral infections on health.

UNIT - I INTRODUCTION **10 Hrs**

History and Scope of Microbiology- Prokaryotes and Eukaryotes- Bacteria, Fungi, Algae, Protozoa and Viruses- Structure and functions of the cellular components-Growth and nutrition- media and culture.

UNIT - II CLASSIFICATION OF MICROBES **10 Hrs**

Classification of microbes- Numerical taxonomy-Molecular taxonomy- methods of microbial identification. Gram positive and gram negative bacteria.

UNIT - III ENVIRONMENTAL MICROBIOLOGY **10 Hrs**

Microbiology of soil – soil microflora - role of soil microbes in biogeochemical cycles(C,N,S) – Role of microbes in waste water treatment-water purification and sewage treatment. Marine and fresh water microbiology.

UNIT - IV MEDICAL MICROBIOLOGY **12 Hrs**

Disease reservoirs- Epidemiological terminologies, Infectious disease transmissions. Respiratory infection caused by bacteria and viruses; Tuberculosis, AIDS, water borne diseases. Antimicrobial agents, antibiotics, Penicillins and cephalosporins, broad spectrum antibiotics.

UNIT - V INDUSTRIAL MICROBIOLOGY **10 Hrs**

Industrial use of microbes - fermentors and fermentation technology, Industrial production of alcohol, antibiotics, aminoacids and enzymes. Microbiology of food - sources of contamination - food spoilage- food preservation methods. Fermentation.

Texts Books

- Pelczar, M.J., Chan, E.C.S., King, N.R. "*Microbiology- Concepts and Applications"*. 3rd edition, Tata McGraw – Hill, New Delhi, 2001.
- Ananthanarayan, R. and Paniker, C.K.J.. "*A text book of Microbiology"*, 6th edition,Orient Longman Ltd., Hyderabad, 2000.

Reference Books

- Kathleen Park Talaro and Talaro, A. "*Foundation in Microbiology"*, 3rd edition, McGraw-Hill, New York.
- Cappuccino, J.G and Sharman, N.. "*Microbiology: A Laboratory manua*l", 4th edition. Addition Wesley Longman Inc., New York.
- Daniel Lim. "*Microbiology"*, 2nd edition. McGraw-Hill, New York.

UMBR201 MICROBIOLOGY PRACTICAL

Semester :II **Credit : 2**
Category :Allied practical II **Hours/week: 3**
Class & Major:I B.Sc. Biochemistry **Total Hours:39**

Objectives
To enable the students

- Learn & practice in a microbiology laboratory.
- Obtain culture , identify and explain microorganisms in environmental cultures**.**

Experiments

1. Preparation of microbiological media.
2. Control of microbial contamination by sterilization techniques.
3. Identification of microbes through staining by simple & differential methods.
4. Microbial pure culture by isolation techniques.
5. Identification and enumeration of microorganisms from soil.
6. Determination of growth pattern by growth curve methods.

Reference books

- Kathleen Park Talaro & Talaro A., "*Foundation in Microbiology"*, 2nd edition, McGraw-Hill, New York, 2005.
- Cappuccino J.G & Sharman N., "*Microbiology*: *A Laboratory Manua"l,* 3rd edition, Addition Wesley Longman Inc., New York, 2005.
- Daniel Lim, "*Microbiology"*, 2nd edition, McGraw-Hill, New York, 2005.

UBCE202 BIOMEDICAL TECHNIQUES

Semester :II **Credit : 2**
Category :Non major elective **Hours/week: 4**
Class & Major:II UG **Total Hours:52**

Objectives
To enable the students

- Study the different techniques employed in Biochemistry and its importance.
- Experiment the techniques in sample analysis.

UNIT -I BASICS IN LABORATORY TECHNIQUES 12 Hrs

Instrumentation to laboratory equipments and basic laboratory operation and role of lab technician, types of specimen collection, and collection procedure- Blood and Urine. Unit of measurement, reagent preparation and laboratory calculation – metric system.

UNIT -II SEROLOGY 10 Hrs

Blood pressure, pulse, clotting time, bleeding time, Hb estimation, Total count- RBC, WBC, Differential WBC count , ESR and Haematocrit value

UNIT- III BLOOD COLLECTION AND GROUPING 10 Hrs

Blood grouping and Rh factors. Blood collection, screening test-HIV, HBs Ag. Blood grouping, Cross matching, Incompatible blood transfusion.

UNIT – IV HISTOPATHOLOGY 10 Hrs

Brief outline of Histopathology, Tissue cutting, Fixation Embedding Tissue slicing by microtome, slide mounting and staining techniques.

UNIT – V BIOCHEMICAL ANALYSIS 10 Hrs

Techniques of measuring: blood glucose, urea, uric acid, TG, AST, ALT, ALP, ACP, Cholesterol and Total protein.

Text Book

- Ambika Shanmugam., "*Fundamentals of Biochemistry for medical students"*, Published by the author, 2006.

Reference Books

- Ambika Shanmugam., "*Fundamentals of Biochemistry for medical students"*, Published by the author, 2006.
- Mukherjee.L., "*Medical laboratory technology",* 15th edition, Tata McGraw-Hill Publishing Company Limited, 2004.
- Talib.H., "*Medical laboratory technology"*, McGraw-Hill Publishing Company Limited

UBCE401/UBCE203 NUTRITION AND HEALTH

Semester :II **Credit : 2**
Category :Non major elective **Hours/week: 4**
Class & Major:II UG **Total Hours:52**

Objectives

To enable the students

- Study the relationship between nutrition and its importance in the well being of humans.
- Integrate the biochemical applications and diet therapy.

UNIT – I INTRODUCTION 15 Hrs

Introduction to nutrition – definition of nutrients, food as a source of nutrients, functions of foods, adequate, optimum and good nutrition, malnutrition; inter relationship between nutrition and health visible symptoms of good health.

UNIT – II NUTRIENTS 15 Hrs

Digestion, absorption, transport and utilization of nutrients in the body – Carbohydrates, fats and oils, proteins, vitamins and minerals.

UNIT – III NORMAL DIET **10 Hrs**

Role of dietician – hospital and community; basic concepts in diet therapy; therapeutic adaptation of the normal diet; routine hospital diets – regular diet, light diet, soft diet, full liquid diet and tube feeding.

UNIT – IV DIET THERAPY **10 Hrs**

Therapeutic diets for the following disorders – underweight – definition, etiology, treatment; obesity – definition, etiology, treatment; diseases of gastrointestinal tract; peptic ulcer and duodenal ulcer; dumping syndrome; acute and chronic diarrhea.

UNIT – FOOD PRESERVATION **10 Hrs**

Biochemical constituents of food grains, fruits and vegetables; changes during processing and preservation; general principles and method of food preservation; preservation with chemicals – mechanism of microbial inhibition, inorganic preservatives, antibiotics, mold inhibitors and antioxidants.

Text Books

- M. Swaminanthan. "*Essentials of Food and Nutrition (Vol I & Vol II)"*, Bappco publication, 1994.
- Davidson, Passmore. "*Human Nutrition and Dietetics"*, Bappco publications, 1987.

Reference Books

- Swaminanthan. "*Principle of Nutrition"*, Bappco publication, 1986.
- Robinson Cornell, "*Normal and Therapeutic Nutrition",* Bappco publication, 6th edition, 1982.
- Michael J. Gibney, Ian A Macdonald, Helen M Roche. "*Nutrition & Metabolism"*, Blackwel publishing ltd., 2004.

UBCE502/UBCE204 WOMEN'S HEALTH, NUTRITION & DISORDERS

Semester :II **Credit : 2**
Category :NME **Hours/week: 4**
Class &Major:II UG **Total hours:52**

Objectives

To enable the students

- Study the physiological changes that occurs during the women's life.
- Awareness on anaemia and about various diseases due to hormone imbalance.

UNIT - I WOMEN'S HEALTH **10 Hrs**

Women health – definition, concept, stages of women life - child hood, adolescence, young women, middle age, elderly women, physical & psychological changes, Steps to follow healthy life style.

UNIT - II PUBERTY **10 Hrs**

Puberty - definition, stages of development of secondary sexual characteristics, factors affecting the onset of puberty - genetic factors, psychological factors, geographical location, nutritional status, normal & abnormal influence of hormone on reproductive system.

UNIT – III PREGNANCY & LACTATION **10 Hrs**

Pregnancy - definition, stages of pregnancy, role of hormones during pregnancy, influence of drugs during pregnancy, parturition, Lactation, importance of breast feeding, precaution during pregnancy & lactation.

UNIT - IV DISORDERS **12 Hrs**

Menstrual cycle, role of hormone in menstrual cycle, menstrual disorders, premenstrual syndrome, PCOD, endometrioses, mennorhoea, dysmennorohea, amennorhoea, risk factors of hormone replacement therapy - heart attack, breast cancer, stroke. Osteoporosis - sign & symptoms of osteoporosis, treatment for osteoporosis.

UNIT - V ANAEMIA **10 Hrs**

Anaemia - Definition, types of anaemia - iron deficiency, microcytic & macrocytic anaemia, aplastic anaemia, sickle cell anaemia, vitamin deficiency anaemia, anaemia during chronic infection & pregnancy Signs & symptoms of anaemia, diagnosis, treatment & prevention.

Text Books

- Guyton, Arthu C, "*Textbook of Medical Physiology"*, 8th Edition, Philadelphia, W.B. Saunders , 1991.
- K. Sembulingam and Prema Sembulingam, *"Essentials of medical physiology"*, Publication, New Delhi, Jaypee Brothers, 2006.

Reference Books

- W Ganong Lange, "*Review Of Medical Physiology"* , 21st Edition, 2003.
- Hillman RS, Kennet Ault, "*Hematology in Clinical Practice"*, 5th Edition, New York, McGraw-Hill, 2010.
- Paulman P (2011), Iron deficiency, In ET Bope, et al., eds., *"Conn's Current Therapy",* 2011, Philadelphia, Saunders.

UBCE304 /UBCE208 MUSHROOM CULTIVATION

Semester :III **Credit : 2**
Category :Non Major Elective **Hours/Week: 4**
Class & Major:II UG **Total Hours:52**

Objectives
To enable the students

- cite ideas on types and importance of mushroom.
- express the intricacies of mushroom cultivation.
- practice cultivation by set up of own unit.

UNIT- I INTRODUCTION TO MUSHROOMS AND ITS LIFE CYCLE **9 Hrs**

History of mushroom cultivation. Morphology, classification - edibile and poisonous mushrooms. Wild and cultivated mushrooms**.** Life cycle of *Agaricus spp* , characteristics and importance of *Volvariella spp., pleurotus spp., Calocybe spp.,* and *Lentinus spp.*

UNIT- II CULTIVATION AND BIOLOGICAL IMPORTANCE **9 Hrs**

Conditions for tropical and temperate countries - isolation, spawn production, growth media, spawn running and harvesting of mushrooms. Medicinal and nutritional value of mushrooms. Composting: importance in waste recycling.

UNIT- III DISEASES AND POST HARVEST TECHNOLOGY 8 Hrs

Diseases and pest affecting mushroom. Post harvest technology: Refrigeration – Freeze drying, drying, canning, irradiation and entrepreneurship.

UNIT- IV MUSHROOM CULTIVATION (PRACTICALS) 20 Hrs

Bed and shed preparation, sowing seedlings, pest control, fumigation and harvesting

UNIT- V MUSHROOM RECIPIES (PRACTICALS) 6 Hrs

Mushroom soup, Mushroom pickle, Mushroom Pulav, Mushroom Chips

Text Books

- Nital Bahl, "*Hand book on Mushroom*" 4th edition. Vijay primlani for oxford & IBH publishing co pvt ltd, New Delhi,2002.
- *"Hand book of mushroom cultivation*", TNAU publications,1999.

Reference books

- Chang T.S and Hayes W A, "*The biology and cultivation of edible mushrooms",* Academic press, New York, 1978.
- M.C.Nair, C.Gokulapalan and Lulu das, "*Topics on mushroom cultivation",* Scientific publishers, Jodhpur, India, 1997.

UBCE209 CLINICAL DIAGNOSTICS

Semester :II **Credit : 2**
Category : Non Major Elective **Hours/week : 4**
Class & Major:II UG **Total Hours:52**

Objectives
To enable the students

- Gain knowledge in Basic Biochemistry and in their applications to human health.
- Interpret the disease at an earlier stage.
- Acquire a thorough knowledge of normal and abnormal Biochemistry and to apply this knowledge to the understanding of human disease.
- Work effectively in a health care organization.

UNIT – I DISORDERS OF CARBOHYDRATE METABOLISM 12 Hrs

Diabetes mellitus – causes, types, complications and treatment. GTT. Difference between diabetes mellitus and diabetes insipidus. Protein calorie malnutrition, Kwashiorkor and Marasmus – causes, complications and its treatment.

UNIT – II DISORDERS OF LIPID METABLISM 10 Hrs

Abnormal lipid levels, role of HDL and LDL cholesterol, Atherosclerosis, Coronary heart disease, heart attack, Obesity and its complications.

UNIT – III HORMONAL IMBALANCE 10 Hrs

Menstrual cycle, Irregular menstrual cycle, Hormonal imbalance, PCOD and its effects, causes, detection and its treatment.

UNIT – IV KIDNEY DISORDERS **10 Hrs**

Kidney structure, function, kidney stones, difference between kidney and gall stones, chronic renal failure – causes, symptoms and its treatment.

UNIT – V BLOOD AND BMI **10 Hrs**

Blood pressure and its regulation, normal and abnormal levels, Blood grouping (ABO & Rh), BMI and its role.

Text Books

- M. N. Chatterjea, Rana Shinde, "*Textbook of Medical Biochemistry"*, Jaypee Publications, 2008.
- Mukherjee, "*Medical Laboratory Techniques"*, Tata McGraw – Hill Publishing Company Limited, 15th edition, 2004.

Reference Books

- Swaminathan, "*Nutritional Biochemistry"*, Bappco Publication, 1999.
- T. M. Devlin, "*Textbook of Biochemistry with Clinical Correlations"*, John Wiley and Sons Publications, 2005**.**

UBCE210 REPRODUCTIVE BIOLOGY

Semester :II **Credit : 2**
Category :Non Major Elective **Hours/week: 4**
Class & Major:II UG **Total Hours:52**

Objectives
To enable the students

- Gain knowledge about reproductive system
- Understand the menstrual cycle and identify the changes during menopause stage.
- Aware of the stages of pregnancy, parturition, lactation.

UNIT – MALE REPRODUCTIVE SYSTEM **10 Hrs**

Male reproductive system – primary sex organs, structure and functions of testis and prostate gland, Spermatogenesis, Semen and its composition, disorders – Hypergonadism, Hypogonadism.

UNIT – II FEMALE REPRODUCTIVE SYSTEM **10 Hrs**

Female reproductive system – primary sex organs, structure and functions of ovary, Ovulation, Oogenesis, disorder – polycystic ovarian disorder, Family planning – pills, Condoms, Intrauterine devices.

UNIT – III MENSTRUAL CYCLE **12 Hrs**

Puberty, Menstrual cycle – definition, Changes during menstrual cycle – Ovarian and Uterine. Regulation of menstrual cycle, Menopause – Causes and changes.

UNIT – IV FERTILIZATION AND PREGNANCY **10 Hrs**

Pregnancy – Definition, types, stages and metabolic changes during Pregnancy. Fertilization – Infertility in male and female.

UNIT – V PARTURITION AND LACTATION **10 Hrs**

Gestation period, Parturition stages, placenta – Introduction, function. Lactation – Milk secretion, Milk ejection**.**

Text Books

- Sembulingam. K and Prema Sembulingam, "*Essentials of Medical Physiology"*, Jaypee Brothers, New Delhi, 2nd Edition, 2009.
- Dr.H.D.Singh, "*Hand book of Human physiology"*, 1st edition, 2007.
- C.C. Chatterjea (Vol I & Vol II), "*Human Physiology"*, Medical Allied Agency, 11th edition, 2006.

Reference Books

- Guyton & Hall, "*Textbook of Medical Physiology"*, Reed Elseveir India Private Limited, New Delhi, 10th edition , 2000.
- Murray et al, "*Harper's Physiological Biochemistry"*, Tata McGraw Hill Publication. Co. Limited, New Delhi, 2000,
- RA Agarwal, Anil K.Srivastava, Kaushal Kumar, "*Animal Physiology and Biochemistry"*, 2008.

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Core I	UBCM106	Fundamentals of Biochemistry	Open book test	Group Discussion
	Core II	UBCM105	Cell Biology	Album Preparation	Assignment
II	Core III	UBCM202	Biomolecules	Model Preparation	Assignment
	Allied II	UMBA201	Microbiology	Food contamination Identification	Culture Preparation
	NME	UBCE202	Biomedical Techniques	Assignment	DPA+ Practical Test
		UBCE203	Nutrition & Health	Diet Chart Preparation	Case Study
		UBCE401/ UBCE204	Women's Health, Nutrition & Disorder	Chart Preparation	Case Study
		UBCE304/ UBCE208	Mushroom Cultivation	Assignment	Seminar
		UBCE209	Clinical Diagnostics	Case Study	DPA+ Practical Test
		UBCE210	Reproductive Biology	Poster Presentation	Assignment

COURSE PROFILE M.Sc. (Biochemistry)

PSO1: Understanding of the scientific basis of life process and orientation towards the application of knowledge acquired in solving clinical problem.

PSO2: Enhancing student's skills & employability through academic, research and internship opportunities (PG service learning).

PSO3: Exposure to basic research through the provision of PG research based project.

PSO4: Developments of analytical and Cognitive skills in Biochemistry that allow independent exploration of biological science through research methods.

PSO5: Acquiring an appreciation of impact of life science on society.

PSO6: Analysis & interpretation of investigative data in life science.

Semester	Category	Course code	Course title	Contact Hours / Week	Credit	
					Min	Max
I	Core I	PBCM101	Biomolecular Chemistry	6	4	4
	Core II	PBCM102	Cell Biology	6	4	4
	Core III	PBCM203/105	Microbiology	6	5	5
	Core IV	PBCM204/106	Molecular Biology	6	4	4
	Core practical I	PBCR201/102	Microbiology and Molecular Biology Practical	6	5	5
			TOTAL	**30**	**22**	**22**
II	Core V	PBCM201	Metabolism & Regulation	5	4	4
	Core VI	PBCM202	Human Physiology	5	4	4
	Core VII	PBCM103/205	Analytical Biochemistry	5	4	4
	Core VIII	PBCM104/206	Endocrinology	4	4	4
	Core practical II	PBCR101/202	Analytical Biochemistry Practicals	6	5	5
	Core IX	PBCX201	Mushroom cultivation (Service Learning)	-	1	1
	NME			5	4	4
			TOTAL	**30**	**26**	**26**
III	Core X	PBCM301	Enzymology and Enzyme Technology	6	5	5
	Core XI	PBCM303	Immunology	6	5	5
	Core XII	PBCM304	Research Methodology in Biochemistry	5	4	4
	Core Practical III	PBCR301	Enzymology & Clinical Diagnostics	6	5	5
	Core XVI	PBCP401	Project	2	-	-
	Core XIII	PBCI401/301	Plant Biochemistry& Pharmaceutical chemistry	5	4	4
			TOTAL	**30**	**23**	**23**
IV	Core XIV	PBCM401	Genetics & Genetic Engineering	6	5	5
	Core XV	PBCM302/402	Clinical Biochemistry	6	5	5
	Core XVI	PBCP401	Project	18	9	9
			TOTAL	**30**	**19**	**19**
			GRAND TOTAL	**120**	**90**	**90**

COURSES OFFERED TO OTHER DEPARTMENTS

NON- MAJOR ELECTIVES

Semester	Category	Course code	Course Title	Contact Hours/ Week	Credit	
					Min.	Max.
II	Non major elective	PBCE101/201	Pharmaceutical Biochemistry	5	4	4
		PBCE102/202	Reproductive Biology & Disorders			
		PBCE103/203	Modern Life style associated diseases			

PBCM101 BIOMOLECULAR CHEMISTRY

Semester :I **Credit : 4**
Category :Core I **Hours/week : 6**
Class & Major:I M.Sc. Biochemistry **Total Hours:78**

Objectives
To enable the students

- Define biomolecules, recognize classifications and structures.
- Elucidate the role of biomolecules in biological functions.

UNIT - I HOMO AND HETEROGLYCANS **15 Hrs**

Polysaccharides - occurrence, structure, isolation, properties and functions of homoglycans - starch, glycogen, cellulose, dextrin, inulin, chitins. Occurrence, structure, properties, and functions of heteroglycans - bacterial cell wall polysaccharides, glycoaminoglycans, pectins, amino sugars and deoxv sugars, blood group substances and sialic acids. Glycoprotein and their biological applications. Lectins structure and functions.

UNIT - II PROTEINS **15 Hrs**

Classification of proteins on the basis of solubility and shape, structure, and biological functions. Isolation, fractionation and purification of proteins. Denaturation and renaturation of proteins. Primary structure - determination of amino acid sequence of proteins. The peptide bond: Ramachandran plot. Secondary structure - weak interactions involved - alpha helix and beta sheet and beta turns structure. Pauling and Corey model for fibrous proteins . Collagen triple helix. Super secondary structures - helix-loop-helix. Tertiary structure - alpha and beta domains. Quaternary structure - structure of hemoglobin. Solid state synthesis of peptides.

UNIT - III NUCLEIC ACIDS **16 Hrs**

Watson - Crick model of DNA structure. A, B and Z - DNA Cruciform structure in DNA, formation and stability of cruciforms, miscellaneous alternative conformation of DNA, slipped mispaired DNA, parallel stranded, anisomorphic DNA, palindrome, secondary and tertiary structure of RNA, hnRNA, methods for nucleic acid sequence determination,

denaturation, strand separation, fractionation, isolation and purification of DNA, mRNA, rRNA and tRNA, molecular hybridization, Cot value curve, hypochromic effect, DNA-protein interactions

UNIT - IV LIPIDS **16 Hrs**

Lipids - classification - saturated and unsaturated fatty acids, phospholipids - classification, structure and functions. Ceramides and sphingomyelins. Eicosanoids, structure and functions of prostaglandins, thromboxanes, leukotrienes Types and functions of plasma lipoproteins. Amphipathic lipids - membranes, micelles, emulsions and liposomes. Steroids - cholesterol structure and biological role - bile acids, bile salts.

UNIT - V VITAMINS AND PORPHYRINS **16 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. Porphyrins the porphyrin ring system, chlorophyll, hemoglobin, myoglobin and cytochrome.

Text Books

- David L. Nelson and Michael M. Cox.Lehninger's, "*Principle of Biochemistry"*, 4th edition , W. H. Freeman, 2004.
- Thomas M. Devlin, John Wiley-Liss, *"Text Book of Biochemistry with Clinical Correlation",* 3rd edition, Hobokhen NJ publishers, 2006.

Reference Books

- L. Stryer, "*Biochemistry"*, 5th Edition, W.H. Freeman and Co,2002
- Voet & Voet, "*Fundamentals of Biochemistry"*, 2nd edition, John Wiley and sons NY, 2002.
- Zubey, "*Biochemistry"*, 3rd edition, GL WCB Publishers, 2005.

PBCM102 CELL BIOLOGY

Semester :I **Credit : 4**
Category :Core II **Hours/week: 6**
Class & Major:I M.Sc. Biochemistry **Total Hours:78**

Objectives
To enable the students

- Understand the structure and functions of prokaryotic, eukaryotic cells and their metabolic process.
- Apply the biochemical techniques for identification of morphological and functional changes in cell related to pathology.

UNIT - I CELLULAR ORGANIZATION, DIVISION AND CYTOSKELETONS 15Hrs

Cell types - organization of prokaryotic and eukaryotic cells, cell division - mitosis and meiosis, cell cycle - phases of cell cycle, and regulation of cell growth and cell cycle, cell motility - molecular motors, microtubules, structure and composition, microtubular associated proteins - role in intracellular motility.

UNIT - II CELLULAR ORGANELLES 15 Hrs

Cellular organelles - Nucleus - internal organization, traffic between the nucleus the nucleolus, and cytoplasm, endoplasmic reticulum - protein sorting and transport, golgi apparatus and lysosomes, morphology and function of mitochondria, chloroplasts and peroxisomes, glyoxysomes.

UNIT - III METHODS IN CELL BIOLOGY 16 Hrs

Methods for disrupting tissues and cells, organ and tissue slice techniques, isolation of clones, tissue culture techniques (animal and plant), cell fixation - fluid fixatives, freezing and section drying, fixation for electron microscopy - buffered osmium solutions, fixation of organic and inorganic substances, staining techniques acid and basic, fluorescent and radioactive dyes, staining of lipids, steroids, nucleic acids, proteins and enzymatic reaction products. Histopathological studies - organ specific morphohistological examination, identification of morphological changes related to pathology.

UNIT - IV CELLULAR COMMUNICATION AND TRANSPORT 16 Hrs

Differentiation of cell membrane - microvilli, tight junctions, epithelia, Bell and sqot desmosomes - mechanical function, cell-cell interaction, cell adhesion proteins, cell junctions, tight junctions, cell surface of plant cells and cancer cells. Overview of membrane protein - peripheral and integral, molecular model of cell membrane - fluid mosaic model and membrane fluidity, solute transport across membrane - passive transport, active transport by ATP powered pumps, types of transport systems.

UNIT - V CELL DEATH AND SIGNALING 16 Hrs

Cell aging and death - necrosis and apoptosis - mitochondrial and death receptor pathway. Cell signaling - signaling molecules and their receptors, functions of cell surface receptors, pathways of intracellular signal transduction, G protein coupled receptors, receptors tyrosine kinases, ras, MAP kinase pathways.

Text Books

- Harvey Lodish, "*Molecular cell Biology"*, Sol edition ,W. H. Freeman, 2007.
- Brachet J.,& Mirsky A. E., "*The Cell - Biochemistry, Physiology and Morphology"*, 3rd edition, Academic Press, 2005.

References Books

- Becker, "*The World of the cell"*, 5th edition, Kleinsmith and Harden Academic Internet Publishers, 2006.
- Geoffrey M. Cooper and Robert E. Hausman, "*The Cell: A Molecular Approac"h*, 4th Edition, 2006.
- Gerald Karp, "*Cell and Molecular Biology by concepts and experiments"*, 4th edition, John Wiley sons & Inc, 2005.

PBCM203/105 MICROBIOLOGY

Semester :II **Credit : 5**
Category :Core III **Hours/week: 6**
Class & Major:I M.Sc. Biochemistry **Total Hours:78**

Objectives
To enable the students

- Study the structure and organization of microorganisms in various fields.
- Elucidate the role of microbes in industrial, clinical and environmental domains.

UNIT - I GENERAL MICROBIOLOGY **15 Hrs**

Introduction and scope of microbiology. Brief study of structure and organization of major groups of microorganisms - archaebacteria, cyanobacteria, eubacteria, fungi, algae, protozoa and viruses. Culture of microorganisms - batch, continuous and pure cultures. Control of microorganisms - physical, chemical and chemotherapeutic agents.Preservation of microorganisms.

UNIT - II ENVIRONMENTAL MICROBIOLOGY **15 Hrs**

Microbiology of soil - soil microflora, role of soil microbes in biogeochemicalcycles (C,N,S) - Marine and fresh water microbiology. Contamination of domestic and marine waters. Water purification and sewage treatment. Microbes in waste water treatments. Microbiology of air.

UNIT - III INDUSTRIAL MICROBIOLOGY **16 Hrs**

Selection of industrially useful microbes. Fermentors and fermentation technology. Industrial production of alcohol, vinegar, lactic acid, antibiotics, enzymes and amino acids. Microbiology of food: sources of contamination, food spoilage and food preservation methods.

UNIT - IV CLINICAL MICROBIOLOGY **16 Hrs**

Epidemic, endemic, pandemic and sporadic diseases. Pathogenicity, virulence and infection. Epidemiology of infectious diseases. Bacterial diseases of human (typhoid, cholera, syphilis, gonorrhoea and pertusis). Fungal diseases of human (superficial, cutaneous, subcutaneous and systemic mycoses).Viral diseases of human (AIDS, hepatitis, polio, rabies and measles).Mycoplasmal, Chlamydial, Rickettial and protozoan diseases of human. Mycotoxins.

UNIT - V APPLIED MICROBIOLOGY **16 Hrs**

Role of microbes in the manufacture of antibiotics and vaccines. Microorganisms as biofertilizers. Microbes as foods - SCP production. Role of microbes in biogas production, petroleum industry and mining. Microbial degradation of lignin, cellulose and pesticides. Microbial immobilization. Microbes in biological warfare.

Text Books

- Pelczar et al., "*Microbiology"*, 3rd edition, Tata McGraw-Hill, New Delhi, 2004.
- Prescott et al., "*Microbiology"*, 2nd edition, WMC Brown Publishers, USA, 2003.

Reference Books

- Martin Alexander , "*Introduction to soil microbiology"*, 4th edition, WileyInternational, NY, 2004
- Gladwin & Trattler, "*Clinical Microbiology Made Ridiculously Simple"*, 6th edition, Medmaster, UK,2013

PBCM204/106 MOLECULAR BIOLOGY

Semester :I **Credit : 4**
Category :Core IV **Hours/week: 6**
Class & Major:I M.Sc. Biochemistry **Total Hours:78**

Objectives
To enable the students

- Study the molecular mechanisms of Prokaryotes and Eukaryotes.
- Assess the structure and function of genes and proteins by Genomics & Proteomics.

UNIT - 1 PROKARYOTIC TRANSCRIPTION AND REGULATION 16 Hrs

Replication of DNA: DNA in prokaryotes and eukaryotes. Enzymes involved in replication, events on the replication fork and termination, mechanism of replication. Inhibitors of DNA replication and DNA repair. Type of damages, types of mutation – point mutation and frame shift mutation. Suppressor mutations – nonsense & missense suppression. Gene mutation and chromosomal aberration. Basic principles of transcription. Transcription-initiation, elongationand termination. . Inhibitors of transcription. Post-transcriptional processing of rRNA and tRNA. Regulation of transcription in prokaryotes– the lac, trp, Arab,Gal operon.

UNIT - II EUKARYOTIC TRANSCRIPTION AND REGULATION 15 Hrs

Eukaryotic RNA polymerases- structure and functions. RNA pol I, II and IIIpromoters, transcription factors, transcription complex assembly and mechanism of transcription. Transcriptional regulation in eukaryotes- hormonal (steroid hormone receptors), phosphorylation (Stat proteins), activation of transcriptional elongation by HIV Tat protein, cell determination, homeodomain proteins. Posttranscriptional processing of mRNA, rRNA and t-RNA. Alternative splicing. Catalytic RNA (ribozymes), RNA editing, Antisense RNA and RNAi

UNIT- III GENETIC CODE, TRANSLATION 16 Hrs

The genetic code- general features. Mitochondrial genetic code. Components of protein synthesis– mRNA, ribosomes and tRNA. Mechanism of protein synthesis in bacteria and eukaryotes- amino acid activation, initiation, elongation and termination. Translational control in bacteria and eukaryotes. Regulation of protein synthesis- constitutive, and narrow domain regulation. Inhibition of protein synthesis. Co- and post-translational modifications. Protein

targeting- the signal sequence hypothesis, targeting proteins to membranes, nucleus and intracellular organelles. Protein degradation: the ubiquitine pathway. Protein folding-models, molecular chaperones.

UNIT – IV GENE EXPRESSION AND REGULATION 15 Hrs

Levels of gene expression. Principles of gene regulation, Upregulation, downregulation, induction, repression, global and narrow domain mechanisms. Genetic and epigenetic gene regulation by DNA methylation. DNA methylation in prokaryotesrestriction-

modification systems, Dam methylation, Dcm methylation. DNA methylation in eukaryotes-cytosine methylation, CpG islands. Methylation and gene regulation in mammals and plants. Epigenetic 12 gene regulation by DNA methylation in mammals- role of imprinting and Xchromosome
inactivation.

UNIT - V GENOMICS **16 Hrs**

Genomics: an overview. Genome projects: HGP Genome sequencing approaches;Structural genomics; chromosome maps– RFLP, SSLP, RAPD Physical mapping. Positional cloning. Functional genomics– study of gene interactions; Proteomics. SNPs and implications; DNAmicro arrays. Developmental genetics: overview. Drosophila development maternal effect genes and zygotic genes.

Text Books

- Alberts, "*Molecular Biology of the Cell"*, 4th ed, Garland Sci, 2002.
- Lodish et al, "*Molecular Cell Biology"*, 4th ed, Freeman, 2000.
- Pitot HC, "*Fundamentals of Oncology"*, 3rd edition, Marcel Dekker, 2002.

Reference Books

- Stansfield et al. "*Molecular Cell Biology, 2nd edition"*, Schaum's Outlines, McGraw Hill, 2002.
- Lewin. "*Genes VII"*, 2nd edition, Oxford University Press, 2000.
- Twyman. "*Advanced Molecular Biology"*, 3rd ed, Viva Publ, 2005.

PBCR201/102 MICROBIOLOGY & MOLECULAR BIOLOGY PRACTICAL

Semester :I **Credit : 5**
Category :Core Practical I **Hours/week: 6**
Class & Major:I M.Sc. Biochemistry **Total Hours:78**

Objectives
To enable the students

- Gain practical knowledge about Microbes.
- Experiment molecular biological techniques.

Microbiology:

1. Determination of microbiological techniques by sterilization, media preparation, preparation of slants and stabs, pouring of medium into plates, sub-cultureing.

2. Isolation of microorganisms from soil collected from different places by serial dilution, plating for counting colonies, single colony isolation techniques and its preservation.

3. Examination of microorganisms by simple staining, gram staining, acid fast staining, Endospore staining, staining of flagella, staining of capsule, staining of fungi, localization of root nodule bacteria by staining.

4. Determination of bacterial growth studies by haemocytometer, colony counting, bacterial growth curve and generation time.

5. Antibiotic sensitivity tests by paper disc, cup method and MIC determination.

Molecular Biology:

6. Preparation of genomic DNA from plant tissue by CTAB method.

7. Plasmid DNA isolation by alkaline lysis method.

8. Isolation of chromosomal DNA from blood samples by phenol Chloroform method.

9. Demonstration of ELISA.

PBCM201 METABOLISM AND REGULATION

Semester :II **Credit : 4**
Category :Core V **Hours/week: 5**
Class & Major:I M.Sc. Biochemistry **Total Hours:65**

Objectives
To enable the students

- Understand the reactions involved in metabolism of biomolecules.
- Coordinate and regulate the metabolic pathways .

UNIT - I BIOENERGETICS 13 Hrs

Free energy and entropy. Phosphoryl group transfers and ATP. Enzymes involved in redox reactions. The electron transport chain– organization and role in electron capture.Oxidative phosphorylation- electron transfer reactions in mitochondria. F1F0 ATPase- structure and mechanism of action. The chemiosmotic theory. Inhibitors of respiratory chain and oxidative phosphorylation- uncouplers, ionophores. Regulation of oxidative phosphorylation. Mitochondrial transport systems- ATP/ADP exchange, malate / glycerophosphate shuttle.

UNIT - II CARBOHYDRATE METABOLISM 13 Hrs

Glycolysis and gluconeogenesis– pathway, key enzymes and co-ordinate regulation. Mechanism of pyruvate dehydrogenase multienzyme complex and the regulation of this enzyme through reversible covalent modification. The citricacid cycle and regulation. The pentose phosphate pathway. Metabolism of glycogen and regulation. Glycogen storage diseases. Blood glucose homeostasis– role of tissues and hormones.

UNIT - III LIPID METABOLISM 13 Hrs

Lipogenesis- Control of acetyl CoA carboxylase - Role of hormones - Effect of diet on fatty acid biosynthesis. Regulation of biosynthesis of triacylglycerol, phospholipids and cholesterol. Metabolism of triacylglycerol during stress. α, β, γ, Oxidation of fatty acids– Role of carnitine cycle in the regulation of β- oxidation. Ketogenesis and its control. Lipoprotein metabolism exogenous and endogenus pathways.

UNIT-IV METABOLISM OF AMINO ACIDS, PURINES AND PYRIMIDINES 13 Hrs

Overview of biosynthesis of nonessential amino acids. Catabolism of amino acid nitrogen– transamination, deamination, ammonia formation, the urea cycle and regulation of ureogenesis. Importance of glutamate dehydrogenase. Catabolism of carbon skeletons of

amino acids– overview only. Disorders of amino acid metabolism– phenylketonuria, alkaptonuria and albinism only. Digestion and absorption of nucleoproteins, Metabolism of purines- de novo and salvage pathways for purine biosynthesis, regulation of biosynthesis of nucleotides. Purine catabolic pathway. Hyperuricemia. Metabolism of pyrimidinesbiosynthesis and catabolism. Orotic aciduria.

UNIT - V METABOLIC INTEGRATION AND HORMONAL REGULATION 13 Hrs

Key junctions in metabolism– glucose-6-phosphate, pyruvate and acetyl CoA. Metabolic profiles of brain, muscle, liver, kidney and adipose tissue. Metabolic inter relationships in various nutritional and hormonal states– obesity, aerobic, anaerobic endurance, exercise, pregnancy, lactation, IDDM, NIDDM and starvation.

Text Books

- Stryer, "*Biochemistry"*, 3rd ed, Freeman, 2002.
- Murray et al., "*Harper's Biochemistry"*, 2nd ed, Mc. GrawHill, 2000.

References Books

- Nelson Cox, Lehninger's, "*Principles of Biochemistry",* 3rd Edition, McMillan Worth, 2000.
- Donald Voet, J.G. Voet, John Wiley," *Biochemistry",* 4th edition, 2006.
- Davidson & Sittman, "*Biochemistry NM., 3rd edition",* Lippincott. Willams and Wilkins, 2005

PBCM202 HUMAN PHYSIOLOGY

Semester :II **Credit : 4**
Category :Core VI **Hours/week: 5**
Class & Major:I M.Sc. Biochemistry **Total Hours:65**

Objectives

To enable the students

- Understand the physiology of human body and to study the way the body functions.
- Revise the function and coordination of organs to maintain normal biological system.

UNIT - I BLOOD AND RESPIRATION 13 Hrs

Composition and functions of blood and plasma. Blood groups. Blood coagulation - mechanism, fibrinolysis, anticoagulants. Hemoglobin - structure, abnormal types, anemia. Structure of heart, cardiac cycle, heart sounds, E.C.G (elementary knowledge) vasomotor circulation, coronary circulation, blood pressure, spleen, lymph, normal composition and function of lymph - role of different lymph cells. Structure of lungs, mechanism and regulation of respiration. Transport of blood gases - O2 and CO2. Acid-base balance - role of buffers, erythrocytes, respiratory system and kidneys. Acidosis and alkalosis - metabolic and respiratory. Fluid electrolyte balance - regulation of water balance and sodium balance - role of renin-angiotensin and ADH.

UNIT-II DIGESTION AND EXCRETION 13 Hrs

Digestive secretions - composition, functions and regulation of saliva, gastric, pancreatic, intestinal and bile secretions. Digestions and absorption of carbohydrates, lipids, proteins and nucleic acids. Excretory system - structure of nephron. Formation of urine - glomerular filtration, tubular reabsorption of glucose, water and electrolytes, tubular secretion

UNIT - III REPRODUCTIVE SYSTEM 13 Hrs

Structure and function of reproductive organs, composition of semen, transport of sperm, ovulation, sexual cycle, physiology of pregnancy, parturition and lactation.

UNIT - IV NERVOUS SYSTEM 13 Hrs

Structure and function of nerves, neurons, resting and action potential, transmission of nerve impulses, synaptic transmission, compounds affecting synaptic transmission, neuromuscular junction, composition and functions of cerebrospinal fluid, brain - chemical composition and metabolic adaptation, neurotransmitters and cAMP, biochemical aspects of learning and memory, enkephalins and endorphins. Structure of muscle cells and muscle contraction, molecular organization of muscle, proteins of contractile element - their organization and role in contraction, energy for contraction.

UNIT –V MUSCULAR AND CYTOSKELETON SYSTEM 13 Hrs

Structure of muscle cells and muscle contraction, molecular organization of muscle, proteins of contractile element - their organization and role in contraction, energy for contraction. Types of tissue. Epithelium – organization and types. The basement membrane.Bone and cartilage. Major classes of cell junctions – anchoring, tight and gap junctions. Major families of cell adhesion molecules (CAMs) – the cadherins (classical and desmosomal). The integrins. The extracellular matrix of epithelial and nonepithelial tissues. ECM components – collagen, elastin, fibrilling,fibronectin, laminin and proteoglycans.

Text Books

- William. F. Ganong. "*Review of Medical Physiology"*, 22nd ed, McGraw-Hill Medical, 2008.
- M.S.Swaminathan, " *Principles of Nutrition"*, 3rd Edition, 2004.

References Books

- Guyton, *"Human Physiology and Mechanisms of Disease* ", 6th edition, Saunders Publications, 2004.
- C.C. Chatterjee "*Human physiology"*, 11th edition, 2007.
- Davidson & Passmore, "*Human Nutrition and Dietetics"*. Churchill Livingstone; 8th edition, 2004.

PBCM103/205 ANALYTICAL BIOCHEMISTRY

Semester :II **Credit : 4**
Category :Core VII **Hours/week: 5**
Class & Major:I M.Sc. Biochemistry **Total Hours:65**

Objectives:
To enable the students

- Understand the working principles of analytical instruments.
- Apply and analyze the biochemical samples using analytical instruments.

UNIT - I MICROSCOPY AND ELECTROCHEMICAL TECHNIQUES 13 Hrs

Microscopy - bright field, darkfield, fluorescence and phase contrast microscope. Scanning and transmission electron microscopy. Electrochemical techniques -principles,

electrochemical cells - pH, Henderson - Hasselbalch equation, buffer capacity, pH measurement, glass electrode. Ion-selective and gas sensing electrodes, oxygen electrode - principle and application. Biosensors.

UNIT-II ULTRACENTRIFUGATION AND RADIOACTIVITY TECHNIQUES 15Hrs

Ultracentrifugation - basic principles. Preparative ultracentrifugation - differential centrifugation and density gradient centrifugation. Analytical centrifugation -Schlieren optical system - applications - determination of molecular mass and purity of macromolecules.Nature of radioactivity - stable and radioactive isotopes - units and interaction of radioactivity with matter. Detection and measurement of radioactivity - GM counter, solid and liquid scintillation counter - tissue solubilizers, counting efficiency, primary and secondary fluors, quenching - Cerenkov counting. Autoradiography. Applications of radioisotopes in the biological sciences.

UNIT – III ELECTROPHORESIS TECHNIQUES 13 Hrs

Electrophoresis - General principles, Support media. Electrophoresis of proteins -SDS - PAGE, 2D - PAGE, native gels, gradient gels, isoelectric focusing. Cellulose acetate electrophoresis. Detection, estimation and recovery of proteins in gels. Protein blotting. Electrophoresis of nucleic acids - agarose gel electrophoresis, DNA sequencing gels, pulsed field gel electrophoresis.

UNIT - IV CHROMATOGRAPHY TECHNIQUES 11 Hrs

Chromotographic techniques - General principles of partition and adsorption chromatography. Thin layer, column, ion - exchange, molecular exclusion, gas - liquid and HPLC, normal phase, reverse phase, chromatofocusing, immunoaffinity, capillary electrochromatography.

UNIT – V SPECTROSCOPY TECHNIQUES 13 Hrs

Laws of absorption and absorption spectrum. Principles of turbidimetry and nephelometry. Principle, instrumentation and application of luminometry. Atomic spectroscopy - Principle and applications of atomic flame and flameless spectrophotometry. Use of lasers for spectroscopy.

Text Books

- Wilson K. & Walker, "*Practical Biochemistry"*, Cambridge University press, 5th edition, 2000
- David T. Plummer. "*An introduction to Practical Biochemistry",* 2005.

References Books

- David Frifelder. *Physical Biochemistry,* W. H. Freeman; 3 edition, 2005
- Galen Wood Ewing Mcgraw, *"Instrumental Methods of Chemical Analysis"* by -Hill College , Fifth edition .
- Robert D. Braun, "*Introduction to Instrumental Analysis"*, Pharma Book Syndicate,2006.

PBCM104/206 ENDOCRINOLOGY

Semester :II **Credit : 4**
Category :Core VIII **Hours/week: 4**
Class & Major:I M.Sc. Biochemistry **Total Hours:52**

Objectives
To enable the students

- Acquire in-depth knowledge about types, classification, biosynthesis, interaction, function and regulation of hormones.
- To assess the involvement of signaling pathways in response to hormones.

UNIT - I CLASSIFICATION AND MECHANISM 10 Hrs

Hormones - definition, classification based on receptors, hormone cascade system involving CNS, hypothalamus, anterior pituitary, target gland, feedback mechanisms, classification of hormones (polypeptides, glycoproteins and POMC peptides), major polypeptide hormones and their actions, genes and formation of polypeptide hormones - POMC peptides and vasopressin.

UNIT - II AMINO ACID DERIVED HORMONES 10 Hrs

Synthesis of amino acid derived hormones-epinephrine and thyroxine, inactivation and degradation of hormones, signal transduction and second messengers - adenylate cyclase system, cAMP, adrenalin and glycogen degradation. G-protein as cellular transducer, inositol triphosphate and calcium release, glycogen phosphorylase kinase, DAG and protein kinase C-pathway.

UNIT-III CYCLIC HORMONAL CASCADE SYSTEM & PROTEIN KINASES 12Hrs

Cyclic hormonal cascade system - chronotropic control, melatonin and serotonin - light and dark cycle, ovarian cycle and role of hormones, hormone - receptor interactions, multiple hormone subunits Sactchard analysis, structure beta -adrenergic receptor and insulin receptor, internalization of receptors, intracellular action - protein kinases, insulin receptor - transduction through tyrosine kinase, vasopressin - protein kinase A, GnRH-protein kinase C, atrial natriuretic factor - protein kinase G.

UNIT - IV STEROID HORMONES 10 Hrs

Structure, biosynthesis, transport of steroid hormones in blood and metabolic inactivation of steroid hormones, control of synthesis and release of steroid hormones, Hormones that directly stimulate synthesis and release of steroid hormone with reference to the second messengers and the signal pathway (cortisol, aldosterone, testosterone, 17B - estradiol, progesterone and calcitriol).

UNIT-V HORMONE RECEPTORS AND REGULATION 10 Hrs

1Steroid hormone receptors, intracellular protein receptors, structural organization of receptor protein, hormone binding domain, antigenic domain and DNA binding domain, organizations of functional elements - hormone response elements, positive and negative transcriptional effects of S.R, receptor activation - upregulation and down regulation, apoptosis - steroid hormone action at cell level, multiple endocrine neoplasia - different types.

Text Books

- Devlin, Wiley-Liss; "*Biochemistry (with clinical correlation)"*, 6th edition, 2005.

- Wilson and Foster," *Endocrinology"*, 4th edition, W.B. Saunders Co, 2005.

Reference Books

- R.K. Murray et al. "*Harper's Biochemistry"*, 27 edition, McGraw-Hill Medical, 2006.
- Austin and Short,prema Jaypee brothers, "*Mechanism of hormone action"*, 3rd edition, 2005.
- Sembulingam.K and Sembulingam, "*Essential of Medical Physiology"*, 4th Edition, *P*rema Jaypee brothers, Delhi, 2006.

PBCR101/202 ANALYTICAL BIOCHEMISTRY

Semester :II **Credit : 4**
Category :Core Practical II **Hours/week: 6**
Class & Major:I M.Sc. Biochemistry **Total Hours:78**

Objectives

To enable the students

- Carry out biochemical analysis.
- Attain technical competence in the specific discipline.

Experiments

1. Preparation of buffers and measurements of pH.
2. Titrable acidity of aminoacids.
3. Paper chromatography of sugars & aminoacids.
4. Thin layer chromatography of aminoacids and lipids.
5. Separation of plant pigments by column chromatography.
6. Paper electrophoresis.
7. SDS PAGE/Agarose gel electrophoresis.
8. Preparation of cell free homogenate, isolation of mitochondria & nuclei from liver and

   chloroplast from leaves.

PBCX201 MUSHROOM CULTIVATION

Semester :II **Credit : 1**
Category :Core IX **Total Hours:40**
Class & Major:I M.Sc. Biochemistry
Target Group :Villagers in the age group of 20-50 years

Objectives

To enable the students

- Create awareness on the nutritive value of mushroom.
- Enable mushroom cultivation in a small scale range.

UNIT – I INTRODUCTION **8 Hrs**

Definition, Edible & Poisonous mushroom, Nutritive & Medicinal value of mushroom. Composting - Importance in waste recycling.

UNIT - II GROWTH CHARACTERISTICS OF MUSHROOM **8 Hrs**

Growth & substrate for volvariella species, Pleurotus species, Agaricus species, Calcybe species & Lentinus species of mushroom.

UNIT – III CULTIVATION OF MUSHROOM **8 Hrs**

Conditions for tropical & temperate countries, isolation, spawn production, growth media, spawn running and harvesting of mushroom.

UNIT - IV DISEASE & POST HARVEST TECHNOLOGY **8 Hrs**

Insect pest, nematodes, Mites, Viruses, Fungal competitors & other important diseases. Post harvest technology, freezing, dry freezing, drying, canning etc. entrepreneurship

UNIT - V FEED BACK & RESULT FROM SOCIETY **8 Hrs**

Evaluation of results, Mushroom yield, Income through mushroom cultivation, Feedback- oral & written from villagers. Activity: Cultivation of mushroom for commercial purposes.

Text books

- Nita Bahl, "*Hand book of Mushroom"*, 4th edition,Vijay primlani for oxford Publication Co.Pvt Ltd,New Delhi, 2002.
- *"Hand Book of Mushroom Cultivation"*, 3rd edition, TNAU Publications, 2003.

Reference Books

- Chang.T.S. & Hayes. W.A, "*The biology and Cultivation of Edible Mushrooms"*, 2nd edition, Academic Press, New York, 2001.
- Nair M.C & Gokulapalan. C and Lulu das, "*Topics on Mushroom Cultivation"*, 3rd edition, Scientific Publishers, Jodhapur, India, 2001.
- Ignacimuthu.S, "*Applied Plant Biotechnology"*, 3rd edition, Oxford & IBH Publishing Co.Pvt.Ltd, New Delhi, 2002.

PBCE101/201 PHARMACEUTICAL BIOCHEMISTRY

Semester :II **Credit : 4**
Category :Non-Major Elective I **Hours/week: 5**
Class & Major:I PG **Total hours:65**

Objectives:

To enable the students

- Study the general metabolism of drugs.
- Evaluate their clinical importance and effects by bioassays.

UNIT – I ABSORPTION, DISTRIBUTION AND METABOLISM OF DRUGS 15Hrs

Sedatives, Analgesics, NSAIDS, Neuroleptics, Antidepressants, Anxiolytics, Anticonvulsants, Antihistaminics, Local anaesthetics, Cardio vascular drugs – Antianginal

agents, Vasodilators, Adrenergic & cholinergic drugs, Cardiotonic agents, Diuretics, Antihypersenstive drugs, Hypoglycemic agents, Antilipedmic agents, Coagulants, Anticoagulatns, Antiplatelet agents. Chemotherapeutic agents – Antibiotics, Antibacterials, Sulphadrugs. Antiprolizoal drugs, Antiviral, Antitubercular, Antimalarial, Anticancer, Antiamoebic drugs. Diagnostic agents.

UNIT – II BIOMEDICAL IMPORTANCE OF DRUGS 12Hrs

Biochemical role of hormones, Vitamins, Enzymes, Nucleic acids, Bioenergetics. General principles of immunology. Immunological techniques. Adverse drug interaction. Preparation and storage and uses of official Radiopharmaceuticals.

UNIT – III TOXICOLOGY 15 Hrs

Toxicology, drug interactions and pharmacology of drugs acting on central nervous system, Cardiovascular system, Autonomic nervous system, Gastro intestinal system and Respiratory system. Hormones, Chemotherapeutic agents including anticancer drugs. Their Bioassays.

UNIT – IV BIOPHARMACEUTICALS 11 Hrs

Development, manufacturing standards, labeling, packing as per the pharmacopoeal requirements, storage of different dosage forms and new drug delivery systems. Biopharmaceuticals and Pharmacokinetics and their importance in formulation.

UNIT – V PHYTOPHARMACEUTICALS 12 Hrs

Chemistry, tests, isolation, characterization and estimation of phytopharmaceuticals belonging to the group of Alkaloids, Glycosides, Terpenoids, Steroids, Bioflavanoids, Purines, Guggul lipids. Pharmacognosy of crude drugs which contain the above constituents. Standardisation of raw materials and herbal products. WHO guide lines. Quantitative microscopy including modern techniques used for evaluation. Biotechnological principles and techniques for plant development tissue culture.

Text Books

- Devin., "*Text Book of Biochemistry with clinical correlation"*, 1992
- Donald Voet., "*Biochemistry"*, 2004
- Harper's., "*Illustrated Biochemistry"*, 2006

Reference Books

- Alfred Burger., "*A guide to chemical basis of drugs design"*, John Wiley & Sons.
- Goodman and Gilman's., "*The Pharmacological Basis of Therapeutics"*, 8th edition Pergamon Press.
- John Smith and Haywel Williams., "*Introduction to the principles of drug design"*, Wright PSG.
- Manfred E Wolff., "*Burgers Medicinal chemistry – The basis of Medicinal Chemistry"*. Part – I. John Wiley & Sons.

PBCE102/202 REPRODUCTIVE BIOLOGY AND DISORDERS

Semester :II **Credit : 4**
Category :NME **Hours/week: 5**
Class & Major:I PG **Total Hours:65**

Objectives
To enable the students

- Study on biological aspects of human reproduction
- Discussion about birth control, infertility and sexually transmitted diseases

UNIT - I INTRODUCTION OF REPRODUCTIVE SYSTEM 15 Hrs

Reproduction – Definition, Structure and function of male and female reproductive system. Endocrine control of reproductive function.

UNIT – II REPRODUCTIVE CYCLE 10 Hrs

Menstrual cycle – Ovarian cycle (Follicular phase, ovulation, luteal phase), Uterine cycle (Menstruation, proliferative phase and secretory phase), Cycle abnormalities and disorders – Dysmenorrhea, Hypomenorrhea, Menorrhagia, Polymenorrhea, Oligomenorrhea, Metrorrhegia, Infertility, Abortion, Polycystic ovarian syndrome.

UNIT – III GAMETES AND FERTILIZATION 10 Hrs

Ultra structure of sperm and egg, Gametogenesis, Oogenesis. Fertilization – external, internal, artificial and in-vitro. Embryo transfer, test for sperm viability and function.

UNIT – IV FOETAL DEVELOPMENT 15 Hrs

Pregnancy and fetal development – Prenatal development of foetus, stages of fetal growth and pregnancy test, contraception, risk factors of miscarriage, pregnancy loss and still birth.

UNIT – V SEXUALLY TRANSMITTED DISEASES 15 Hrs

HIV/AIDS – definition, causes and symptoms, diagnosis, mode of transmission, prevention and treatment. Syphilis – types, causes and symptoms, diagnosis, congenital syphilis, prevention and treatment.

Text books

- Sastry K.V, *Endocrinology and Reproductive biology*, Rastogi publications.
- Sachdeva R.K, *A guide to obstetrics and gynaecology*, Jaypee brother publications.

Reference books

- Richard. E. Jones., Kristin H. Lopez. *Human reproductive biology,* Third edition.
- Taylor, J., Green N.P.O., Stout G.W. *Biological sciences 1 & 2,* Third edition.

PBCE103/203 MODERN LIFESTYLE AND ASSOCIATED DISEASES

Semester :II **Credit : 4**
Category :NME **Hours/week: 5**
Class & Major:I PG **Total Hours:65**

Objectives
To enable the students

- Obtain knowledge and understanding of health, nutrition and other lifestyle and associated diseases.
- Choose healthy life style to cope with modern life.

UNIT I - DIABETES **15 Hrs**

Definition, types, causes, prevalence, diagnosis, complications, treatment and preventive measures. The Diabetic lifestyle, gestational diabetes, diabetes and diet coping skills for diabetics.

UNIT II - HYPERTENSION **15 Hrs**

Definition, signs and symptoms, causes, types (Primary and secondary).Blood pressure (effectively and benefit of BP reduction).Retinopathy, diagnosis, treatment and prevention.

UNIT - III OBESITY AND CORONARY HEART DISEASE **15Hrs**

Definition, causes of obesity, BMI, health consequences, strategies to reduce obesity, strategies to promote health, childhood obesity, and diet, prevention.

Coronary heart disease: types, symptoms, diagnosis, prevention and management and treatment. Medication requirement, CHD, and diet, stroke prevention measures, Pharmacological management of CHD.

UNIT IV - OSTEOPOROSIS **15 Hrs**

Definition, types, symptoms, treatment, causes and prevention. Diagnosis, diet and osteoporosis and exercise. Drugs in osteoporosis, bone disease, dietary requirement for osteoporosis.

UNIT V - ANAEMIA **15 Hrs**

Definition, causes, types, symptoms, and treatment of anaemia. Iron deficiency, diet and anaemia. Anaemia and pregnancy – prevalence and consequences of anaemia in pregnancy. Anaemia treatment.

Textbooks

- *"Guide to prevention of lifestyle diseases"*. M Kumar, R Kumar. Publication: Deep and Deep Publications, 2004.

Reference books

- Tudith stern, Alexendra Kuzaks. "*Obesity: a reference handbook"*. ABC-CLIO, 2009.
- Mindori Hiramatsu, Toshikazu Toshikawa, Lister Packer. "*Molecular interventions in lifestyle related diseases"*. CRC Press, 2009,
- David L Katz, "*Diseases Proof"*. Plume, 2014.

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Core I	PBCM101	Bimolecular Chemistry	Assignment	Seminar
	Core II	PBCM102	Cell Biology	Poster Preparation	Seminar
	Core III	PBCM203/105	Microbiology	Assignment	Culture preparation
	Core IV	PBCM204/106	Molecular Biology	Assignment	Seminar
II	Core V	PBCM201	Metabolism and Regulation	Assignment	Seminar
	Core VI	PBCM202	Human physiology	Model preparation	Seminar
	Core VII	PBCM103/205	Analytical biochemistry	Model preparation	Seminar
	Core VIII	PBCM104/206	Endocrinology	Model preparation	Seminar
	NME	PBCE201	Pharmaceutical Biochemistry	Assignment	Seminar
		PBCE202	Reproductive Biology and Disorder	Seminar	Seminar
		PBCE203	Modern life Style Associated Disease	Case Study	Seminar

COURSE PROFILE M.Phil. (Biochemistry)

M.Phil BIOCHEMISTRY PROGRAMME SPECIFIC OUTCOME

PSO1 :Understand the issues of environmental contexts and sustainable development of green research in Biochemistry

PSO2 :Apply contemporary research methods to conduct independent inquiry in a chosen scientific discipline

PSO3: Develop the ability to understand and practice the ethics surrounding scientific Research.

PSO4: Realize the impact of Lifescience in society and plan to pursue research.

Semester	Category	Course code	Course Title	Hours per week	Credit	
					Min	Max
I	Core 1	MBCM101	Research Methodology	6	5	5
	Core II	MBCM102	Advanced Analytical Techniques	6	5	5
	Core III	MBCM103	Special area study	6	5	5
II	Core IV	MBCM201	Dissertation and viva voce	30	15	15
TOTAL				48	30	30
• **Paper presentation (minimum one) and / or publication of articles in journals (minimum one) are mandatory for submission of dissertation.**						

MBCM101 RESEARCH METHODOLOGY

Semester : I **Credit : 5**
Category : Core I **Hours/Week: 6**
Class & Major:M.Phil Biochemistry **Total Hours:78**

Objectives
To enable the students

- Enhance the knowledge on research and its methodologies.
- Apply and integrate the techniques and test the hypothesis using research tools.
- Compose quality control, error sources, documentation and storage of experimental data.

UNIT- I INTRODUCTION TO RESEARCH METHODOLOGY 15 Hrs

Definition of Research, Objectives of research - motivation of research, Basic and applied research, Steps in Research and its significance, Defining a research problem, Experimental design. Sampling techniques- sampling theory, types of sampling, steps in sampling-sampling and non sampling error- sample size- advantages and limitations of sampling. Data collection methods - data collection, Primary Data- Secondary data - assembly, analysis and interpretation of experimental data.

Methods versus methodology - Research in scientific methods - Research process - Criteria for good research. Problems encountered by research in India- Funding agencies and IPR.

UNIT-II DATA PRESENTATION 16 Hrs

Data types - Processing and presentation of data -Techniques of ordering data, Data presentation Tabular, graphical and diagrammatic representation of data. Use of simple, semilog & double graph paper in data representation. The uses of library and internet in research - search engines ,virtual libraries , software's for documentation and presentation. Introduction to Presentation Tools- Features and functions, Creating presentation, master page, adding animation, Customizing presentation, showing presentation, printing handouts.

UNIT- III STATISTICAL APPROACHES IN RESEARCH METHODOLOGY 16 Hrs

Statistical analysis of data - Averages, Mean Deviation & Standard deviation, - Correlation, regression, coefficient of variation. levels of significance, - Comparison of sets of data - Chi square test, students test (t), (f) test ,ANOVA and uncan's new multiple range test. Characteristics of probability distribution - Binomial, Poisson and normal distribution Measurement of errors - Types and sources of errors - Determination and control of errors, Advanced Clinical software and statistic calculations -SPSS, SAS, and R

UNIT- IV – BIOINFORMATICS TOOLS IN RESEARCH 16 Hrs

Nucleotide -Sequence submission Methods and tools (Genbank- EMBL- DDBJ, Sequin, Sakura, Bankit)- Sequence retrieval systems (Entrez & SRS)- Sequence File Formats and Conversion tools- Protein (Swiss-prot, PIR, Expasy)- Structural Databanks (PDB and NDB)- Protein Structure Classification (SCOP, CATH and FSSP)- Metabolic Pathway database (KEGG)- Specialized db (IMGT, Rebase, COG). Molecular Sequence Alignment- Pair wise Alignment- Global Alignment- Local Alignment- Visual Alignment- Dynamic Programming- Heuristic approach- Scoring Matrices and Affine Gap costs- Database Search methods.

Molecular Modeling and Drug Designing: Introduction to Protein Structure Prediction- Rational drug discovery- Recent advances in drug design methodologies- Structure-based drug design- Drugreceptor N interactions- Structure-Activity Relationships.

UNIT- V RECENT TREND IN LIFE SCINCE 15 Hrs

Overview of - Cancer Biology, Toxicology, Environmental Biochemistry, Bioinformatics, Neuroscience, Biotechnology and plant Biochemistry, Nanotechnology, Ethics and authorship Software for detection of Plagiarism.

Text Books

- Kothari.C.R, "*Research Methodology, Methods and Techniques"*, Wishwa Prakasam Publications, 2018
- Day.R.A, "*How to write and publish a scientific paper"*, Cambridge University Press, 2013
- Attwood T.K and D.J Parry, "*Introduction to Bioinformatics"*, Pearson Education Ltd., New Delhi 2014.

Reference Books

- Robert Ross," *Research: An introduction"*, Harper and Row Publications, 2010.
- Snedecor.G.W and Cocharan.W, *"Statistical methods"*, Oxford and IBH, New Delhi, 2011
- Andreas D Baxevanis and Francis Quellette B F, "*Bioinformatics- A Practical guide to the analysis of genes and proteins"*, Willey publication, New Delhi 2016.

MBCM102 ADVANCED ANALYTICAL TECHNIQUES

Semester :I **Credit : 5**
Category :Core II **Hours/ week: 6**
Class & Major:M.Phil Biochemistry **Total Hours:78**

Objectives

To enable the students

- Develop analytical skills.
- Analyze the principles and concepts of technical systems involved in scientific research.
- Perform research experiments to assess the biological samples.

UNIT- I BIOSAFETY AND LABORATORY PRACTICES 15 Hrs

General Biosafety: Biosafety - guidelines, Biosafety levels, regulations - Biosafety and Bioethics committees for the Institutions. Safety and containment equipments –Shipment and containment procedures for GMOs, DNA, vectors. –Handling guidelines for the usage of antibiotics in research labs -Facility design considerations, Protective Equipments –Types and purpose, Documentation and work culture in Research labs -Ethics in Research and Medical labs –Data Audit -Good lab practices .

UNIT- II CHROMATOGRAPHY AND ELECTROPHOROSIS TECHNIQUES 16Hrs

Fundamentals of Chromatography - Principle and Classification, Types of Chromatography - Adsorbtion, Partition, TLC, Ion – exchange chromatpography, Gel filteration chromatography HPLC, GLC,GC, LC. Detectors and Types . Scientific and Industrial Applications.

Fundamentals of Electrophoresis - Principle and Classification, Types of Electrophorosis- Horizontal and Vertical Gel Electrophoresis Systems, Agarose Gel Electrophoresis, Polyacrylamide Gels, Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis, Capillary Electrophoresis, Cellulose Acetate Electrophoresis, Isoelectric Focusing and Two-Dimensional Gel Electrophoresis and Microchip Electrophoresis. Scientific and Industrial Applications.

UNIT- III SPECTROSCOPIC TECHNIQUES 16 Hrs

Introduction to spectroscopy- Beer lamberts Law, scattering of light, reflection and refraction. Flurimetry, CDS,UV-Vis spectroscopy, Atomic spectroscopy, Fluroscence spectroscopy, X-Ray spectroscopy, Mass spectroscopy, Raman, spectroscopy IR spectroscopy, NMR spectroscopy, FT-IR, ICPMS, MALDI- TOF- principle and applications.

UNIT-VI RADIOISOTOPIC MANOMETRIC TECHNIQUES AND MICROBIAL ASSAY TECHNIQUE 16Hrs

Radioisotopes- definition and uses, Radioactivity and units of measurement. Nature detection and measurements of radioactivity. GM counter, scintillation counter ,pulse height analyserisotope dilution analysis, autoradiography- principle and applications.

Introduction and types of manometry, Warburg constant volume, Oxygen electrode, Warburg manometer and its applications.

Microbial Assay Technique for Vitamins: Thiamin, Niacin, Riboflavin, Mutant methodology and its application.

UNIT- V MOLECULAR BIOLOGY AND IMMUNOLOGY TECHNIQUES 15 Hrs

Introduction, Recombinant DNA techniques, PCR, Microarrays, Gene markers, FACS-Cell cycle analysis, FISH, CISH, RFLP, SSLP, Clonning, Analysis of Ancient DNA, DNA fingerprinting- Applications.

Introduction, production of antisera and precipitation reaction, RIA, ELISA- types, Immunofluroscence, Immunoelectrophoresis, Blotting techniques, Immunohistochemistry- Applications.

Text Books

- Keith Wilson and John Walker, "*Principles and techniques of practical Biochemistry"*. Cambridge University Press, Cambridge, 2010
- Sateesh.M. K, "*Bioethics and Biosafety"*, I. K International Pvt Limited, Publishers, India. 2009.
- Sambrook.J & Russell.D.W , "*Molecular cloning*: *a laboratory manual Vol 1, 2 & 3*", CSHL Press 2012.

Reference Books

- Douglas Skoog, Donald West, James Holler, Stanley Crouch, "*Fundamentals of Analytical Chemistry"*. Saunders College Pub. Prentice Hall, New Jersey, USA, 2014.
- Darnell, Lodish and Baltimore. "*Molecular Cell Biology"*, Scientific American Publishing Inc, 2016.
- Kuby *"Immunology"*. 6th ed., W. H. Freeman & Company, 2013.

DEPARTMENT OF CHEMISTRY

PREAMBLE

UG: Course profile, list of courses offered to other departments and the syllabi of courses offered in the first two semesters along with evaluation components III and IV (with effect from 2018-2019 batch onwards) and

PG: Course profile, list of courses offered to other departments and the syllabi of courses along with evaluation components III and IV **(**with effect from 2018-2019 batch onwards) are presented in this booklet

COURSE PROFILE B.Sc. CHEMISTRY

PSO1: Development of the skills in handling various chemicals, apparatus and instruments.

PSO2: Application of the principles of thermodynamics and chemical kinetics in chemical reactions

PSO3: Acquiring the knowledge on heterocyclic compounds and natural products

PSO4: Ability to apply the basic principles of various spectroscopic, electro and thermo analytical methods to characterize the compounds

PSO5: Industrial insights on polymers, textile dyes, fibre and medicinal chemistry.

Semester	Part	Category	Course code	Course Title	Contact Hrs/ Week	Credits	
						Min	Max
I	I	Tamil/Hindi/French	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil-I/ Advanced Tamil-I/ Hindi-I/ French-I	4	2	3
	II	English	UENL107/ UENL108	General English-I/ Advanced English-I	5	3	4
	III	Core I	UCHM104	Fundamentals of Chemistry	2	1	1
		Core II	UCHM105	General Chemistry –I	4	4	4
		Core III	UCHM106/UCHM107	Analytical Chemistry	4	4	4
		Core Practical I	UCHR204/UCHR205	Volumetric Analysis	3	-	-
		Allied I	UPHA101	Allied Physics - I	3	3	3
		Allied Practical I	UPHR102	Allied Physics Practical-I	3	2	2
	IV	Value Education			2	1	1
				Total	**30**	**20**	**22**
II	I	Tamil/Hindi/French	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil-II/ Advanced Tamil-II/ Hindi-II/ French-II	4	2	3
	II	English	UENL207/ UENL208	General English-II/ Advanced English-II	5	3	4
	III	Core IV	UCHM202	General Chemistry –II	6	6	6
		Core Practical I	UCHR204/UCHR205	Volumetric Analysis	3	4	4
		Allied II	UPHA201	Allied Physics II	3	3	3
		Allied Practical I	UPHR202	Allied Physics Practical-II	3	2	2
	IV	NME			4	2	2
		Soft skill			2	1	1
	V	Extension Programme/ Physical Education/NCC			-	1	2
				Total	**30**	**24**	**27**
III	I	Tamil/Hindi/French	UTAL305/ UTAL306/ UHIL301/ UFRL301	Basic Tamil-III/ Advanced Tamil-III/ Hindi-III/ French-III	4	2	3

	II	English	UENL307/ UENL308	General English-III/ Advanced English-III	5	3	4
	III	Core V	UCHM303	General Chemistry –III	5	5	5
		Core Practical II	UCHR404/UCHR405	Semimicro Qualitative Inorganic Analysis	3	-	-
		Core VI	UCHM304	Separation & Purification Techniques	3	3	3
		Core VII		Online Course (NPTEL/ST)	3	1	2
	IV	Allied	UMAA306	Algebra, Differential Calculus and Trignometry	5	5	5
		Value Education			2	1	1
				Total	**30**	**20**	**22**
IV	I	Tamil/Hindi/French	UTAL405/ UTAL406/ UHIL401/ UFRL401	Basic Tamil-IV/Advanced Tamil-IV/ Hindi-IV/ French-IV	4	2	3
	II	English	UENL407/ UENL408	General English/ Advanced English	5	3	4
	III	Core VIII	UCHM403	General Chemistry –IV	5	5	5
		Core Practical II	UCHR404/UCHR405	Semimicro Qualitative Inorganic Analysis	3	4	4
		Core IX	UCHM404	Instrumental Method of Analysis	4	4	4
		Allied	UMAA406	Integral Calculus, Laplace Transform & Ordinary Differential Equation	5	5	5
		Core X Project/ paper	UCHP501/UCHM604	Project/Dairy Chemistry	2	-	-
	IV	Soft skill	USKS401		2	1	1
	V	Extension Programme/ Physical Education/NCC			-	-	2
				Total	**30**	**24**	**28**
V	III	Core XI	UCHM504	Inorganic Chemistry – I	5	4	4
		Core XII	UCHM505	Organic Chemistry –I	6	5	5
		Core XIII	UCHM506	Physical Chemistry –I	5	4	4
		Core Practical III	UCHR501	Gravimetric Analysis	4	4	4
		Core Practical IV	UCHR605	Physical Chemistry Practical	4	-	-
		Core X Project/ paper	UCHP501/ UCHM604	Project/Dairy Chemistry	4	4	4
	IV	Value education			2	1	1
				Total	**30**	**22**	**22**
VI	III	Core XIV	UCHM607	Inorganic Chemistry II	4	4	4
		Core XV	UCHM608	Organic Chemistry II	4	4	4
		Core XVI	UCHM609	Physical Chemistry II	4	4	4
		Core XVII	UIDM610	Physical Chemistry III	4	4	4
		Major elective	UCHO602 UCHO603 UCHO604 UCHO605	Polymer Chemistry Medicinal Chemistry Forensic Chemistry Chemistry of Dye	4	4	4
		Core Practical IV	UCHR605	Physical Chemistry Practical	4	4	4
		Core Practical IV	UCHR606	Organic Analysis and Preparation	4	4	4
		Viva –Voce	UCHM605	Comprehensive Viva-Voce	-	1	1
	IV	Soft Skill	USKS601		2	1	1
	V	Extension Programme/ Physical Education			-	-	2
				Total	**30**	**30**	**32**
				Grand Total	**180**	**140**	**154**

LIST OF COURSES OFFERED TO OTHER DEPARTMENTS

ALLIED COURSES

Semester	Part	Category	Course code	Course title	Contact hrs per week	Credits	
						Min	Max
I	III	Allied- I	UCHA102	Allied Chemistry I	5	4	4
IV	III	Allied- II	UCHA402	Allied Chemistry II	3	3	3
I/IV	III	Allied Practical	UCHR103/ UCHR403	Volumetric and Organic Analysis	3	2	2

NON- MAJOR ELECTIVE COURSES

Semester	Part	Category	Course code	Course title	Contact hrs per week	Credits	
						Min	Max
II	IV	Non major elective	UCHE206	Cosmetics and Detergents	4	2	2
			UCHE207	Green Chemistry	4	2	2
			UCHE204	Food Chemistry	4	2	2
			UCHE205	Health and Hygiene	4	2	2
			UCHE208	Health Chemistry	4	2	2

EXTRA CREDIT EARNING PROVISION

Semester	Category	Course code	Course title	Hrs per week	Credits	
					Min	Max
II	Core	UCHI201	Internship	-	-	1
IV	Core	UCHI401	Internship	-	-	1
V	Core	UCHM507	Green Chemistry (Self Study Paper)	2	-	1
				-	-	1

UCHM104 FUNDAMENTALS OF CHEMISTRY

Semester : I **Credit : 1**
Category : Core I **Hours/Week : 2**
Class & Major : I B. Sc Chemistry **Total Hours : 26**

Objectives
To enable the students

- Acquire knowledge and calculate the equivalent weight of the molecules
- Classify acid, base and chemical bonding
- Formulate the organic reactions and solutions

UNIT-I ATOMS AND MOLECULES **6 Hrs**

Mass and radius of an electron. Properties of an electron, proton and neutron. Atom, molecule. Atomic number, atomic weight. Oxidation, reduction, oxidation state of the ion, oxidizing and reducing agent. Equivalent weight. Calculation of equivalent weight. Molecular weight, mole concept- stoichiometry.

UNIT-II ACIDS AND BASES **5 Hrs**

Arrhenius concept, proton transfer theory- conjugate acids and bases, Lewis concept. Dissociation of a weak acid. Dissociation of a weak base, ionic product of water- the pH scale. pH of the solution. Buffer solution, Common ion effect.

UNIT-III CHEMICAL BONDING **6 Hrs**

Types of bonds-ionic, covalent, co-ordinate bond and metallic bond. Hydrogen bond, Vander Walls interaction. Hybridization, VSEPR Theory- Shapes of H_2O, NH_3.

UNIT-IV BASIC CONCEPTS OF ORGANIC MOLECULES **4 Hrs**

Electrophile, nucleophile, free radical. Types of organic reactions addition substitution, elimination, rearrangement reactions. Carbocation, carbanion , nitrene.

UNIT-V SOLUTIONS **5 Hrs**

Electrode, anode, cathode, electrolyte, electrolysis. Solid, liquid, gas, Solution-saturated, unsaturated solution. Homogeneous and heterogeneous solution. Phase, component. Intensive and extensive properties. Process-reversible and irreversible, System, Surrounding.

Text Books

- Bahl.S and Arunbahl, *Advanced Organic Chemistry*, Revised Edition, S.Chand and Company Ltd,Ram Nagar,New Delhi,2010.
- Madan.R.D, *Modern Inorganic Chemistry* ,3rd edition, Chand.S & Company Limited, New Delhi,2011
- Puri.B.R, Shaema.L.R & Pathania.M.S, *Principles of Physical Chemistry*, Millennium Edition, Vishal Publishing & Co, Jalandhar, 2011.

Reference Books

- Soni.P.L, *Text Book of Physical Chemistry*, 22nd revisied edition, Sultan Chand, New Delhi, 2011
- Puri.B.R, Sharma.L.R and K.C.KALLIA, *Inorganic Chemistry*, MilstonePublisher, New Delhi,2006
- Soni.P.L, *Text Book of Organic Chemistry*, 25th revised edition, Sultan Chand, New Delhi, 2011.

UCHM105 GENERAL CHEMISTRY-I

Semester	**: I**	**Credit**	**: 4**
Category	**: Core II**	**Hours/ week**	**: 4**
Class & Major	**: I B.Sc Chemistry**	**Total Hours**	**: 52**

Objectives

To enable the students

- Recognize the modern periodic classification of element & states of matter
- Predict the Nomenclature of the organic compounds
- Evaluate the gaseous and thermo chemical equations

UNIT –I ATOMIC STRUCTURE **10 Hrs**

Bohr's model of atom- limitations of Bohr's model, Sommerfield's model , photoelectric effect, Compton effect, de-Broglie equation. Davisson and Germer experiment- Heisenberg's Uncertainty principle – Schrodinger's wave equation (statement only) Significance of wave functions. ψ and ψ^2 - probability distribution of electrons-radial probability distribution curves- concept and shapes of orbitals.

UNIT-II MODERN PERIODIC TABLE & ELECTRONIC CONFIGURATION 11 Hrs

Modern Periodic Table & Electronic Configuration of atoms- Aufbau Principle, Hund's rule of maximum multiplicity, stability of half-filled and completely filled orbitals. Shapes of s, p ,d& f block elements. Classification & characteristic properties of s, p d & f block elements. Periodicity of Properties- Definition and periodicity of Atomic radii, Ionization potential, Electron affinity, and Electro negativity

UNIT-III STRUCTURE AND BONDING **12 Hrs**

Basics Concepts of Bonding in Organic Chemistry- Hybridization and geometry of molecules-Methane, ethane, ethylene, acetylene and benzene. Electron displacement effects-inductive, inductomeric, electromeric, mesomeric, resonance, hyperconjugative and steric effects. Cleavage of Bonds-Homolytic and heterolytic fission of carbon-carbon bond, reaction intermediates, carbocation, carbanion and free radicals – their stability .Classification and Nomenclature of organic compounds. Functional groups-homologous series- IUPAC recommendations for naming simple aliphatic, alicyclic and aromatic compounds-polyfunctional compounds and heterocyclic compounds.

UNIT-IV GASEOUS STATE **10 Hrs**

Gas laws from the kinetic theory of gases – kinetic gas equation – derivation- kinds of velocities-mean, rms, most probable velocity. Calculation of molecular velocity .Maxwell's distribution of molecular velocity (no derivation). Experimental verification of velocity distribution- effect of temperature on velocity distribution –equipartition of energy – Virial equation of state - Boyle's temperature. Liquid State- Surface tension- effect of temperature on surface tension.Parachor- definitions and applications only- coefficient of viscosity- effect of temperature- effect of pressure.

UNIT-V BASIC CONCEPTS OF THERMOCHEMISTRY **9 Hrs**

State function, path function. Extensive and intensive properties. Energy, Enthalpy, Entropy. System, surroundings. state variables. Thermodynamic process , first law of thermodynamics, Heat capacity. Expansion of an ideal gas and changes in thermodynamic properties, joule Thomson effect joule Thomson co-efficient.

Text Books

- Bahl.S and ArunBahl, *Advanced Organic Chemistry*, Revised Edition, S. Chand and Company Ltd, Ram Nagar,New Delhi,2010.
- Puri.B.R, Sharma.L.R & Pathania.M.S, *Principles of Physical Chemistry*, Millennium Edition, Vishal publishing & Co, Jalandhar,2006.
- Puri.B.R, Sharma.L.R and Kallia.K.C, *Inorganic Chemistry*, Milstone Publisher, New Delhi, 2006.

Reference Books

- Malik.W.U, Tuli.G.D and Madan.R.D, *Selected topics in inorganic chemistry*, 7th Edition, S.Chand Publications, New Delhi,2012.
- Morrison.R.T and Boyd, *Organic Chemistry*, VI Edition, Prentice Hall of India, New Delhi, 2006.
- Soni.P. L, *Text book of physical chemistry*, 22ndRevised Edition, Sultan Chand, New Delhi,2010.
- Soni.P. L, *Inorganic chemistry*, 20th Revised Edition, Sultan Chand, New Delhi, 2010.

UCHM107 ANALYTICAL CHEMISTRY

Semester	**: I**	**Credit**	**: 4**
Category	**: Core III**	**Hours/ week**	**: 4**
Class & Major	**: I B.Sc Chemistry**	**Total Hours**	**: 52**

Objectives

To enable the students

- Understand the manipulating skills in handling apparatus & instruments
- Employ the first aid techniques in laboratory
- Formulate the theoretical aspects of qualitative, volumetric analysis & analytical techniques in chemistry

UNIT-I WORKING IN CHEMISTRY LAB 8 Hrs

Introduction –personal protection – nature of chemicals- toxic, corrosive, explosive, inflammable, carcinogenic , other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes, glassware – handling of glassware – handling of different types of equipments like Bunsen burner, centrifuge, Kipp's apparatus etc – ventilation facilities – philosophy of lab safety- first aid techniques – general work culture inside the chemistry lab- importance of wearing lab coat. Indian and International standards.

UNIT-II DATA ANALYSIS 10 Hrs

Types of errors – idea of significant figures and its importance with examples-precision- accuracy-methods of expressing accuracy – error analysis – minimizing errors-methods of expressing precision – average deviation- standard deviation and confident limit. T-test and Q-test

UNIT-III THEORY OF INORGANIC QUALITATIVE ANALYSIS 8Hrs

Principles of acid –base equilibrium, common ion effect and solubility product and their applications in qualitative analysis. Reaction involved in the separation and identification of cations and anions in the analysis-spot test reagents- aluminon, cupferon-DMG, thiourea, magneson, alizarin & Nessler's, reagent ,semi micro techniques.

UNIT-IV PRINCIPLES OF VOLUMETRIC ANALYSIS 15Hrs

Definitions of molarity, molality, normality & mole fraction. Definitions & examples for primary & secondary standards. Theories of acid-base, redox, complexometric, iodometric & iodimetric titrations. Calculations of equivalent weights. Theories of acid-base, redox, metal ion & adsorption indicators, choice of indicators.

UNIT-V PRINCIPLES OF GRAVIMETRIC ANALYSIS 11 Hrs

Characteristics of precipitating agents, choice of Precipitants & conditions of precipitation-specific & selective precipitants-DMG, Cupferon, salicylaldehyde ,ethylene diammine, sequestering agents, precipitation from homogenous medium, co-precipitation ,post precipitation, peptisation-differences.

Text Books

- Gopalan.R, Subramanian.P.S & Rengarajan.K, *Elements of Analytical chemistry*, 3rd Revised Edition, Sultan Chand & Sons, New Delhi, 2007.
- Sharma.B.K, *Instrumental methods of chemical analysis*, 12th Edition, Krishna Prakashan Media (P) Ltd, 2007.
- Gurdeep.R, Chatwal Sham.K., Anandh, *Instrumental methods of chemical analysis*, Himalaya Publishing House, 2005.

Reference Books

- Janarthanam.P.B, *Physical - Chemical techniques of analysis*, Vol-I and II, Asian Publications,Mumbai, 2007.
- Skoog.A,West.M & Holler, *Fundamentals of Analytical chemistry*, 8thEdition, Saunders publication, Tokyo,2009.
- Skoog.A, *Instrumental methods of analysis*,7th sub Edition, Wadsworth publishing company,2008 .
- Vogel's, *Hand book of quantitative Inorganic Analysis*, 3rdEdition,Longman Publications, London, 2009.

UCHA102 ALLIED CHEMISTRY - I

Semester	**: I**	**Credit**	**: 4**
Category	**: Allied**	**Hours/ week**	**: 5**
Class & Major	**: I B.Sc Biochemistry**	**Total Hours**	**: 65**

Objectives

To enable the students

- Acquire the basic concepts in structure and bonding in the molecular structure.
- Interpolate the concepts in co-ordination chemistry and Stereochemistry .
- Validate the thermodynamic derivations and biomolecular properties.

UNIT-I CHEMICAL BONDING **10 Hrs**

Types of bonds-ionic, covalent,co-ordinate bond and metallic bond. Hydrogen bond, vander Walls interaction.VSEPR Theory- Shapes of H_2O, NH_3.

UNIT-II CO-ORDINATION CHEMISTRY **10 Hrs**

Nomenclature. Of co-ordination compounds-werner theory –chelation –Functions and structure of Haemoglobin and Chlorophyll. Stereo isomerism- Elements of symmetry, optical activity- Isomerism of lactic acid and tartaric acid. Racemisation, Resolution, Geometrical isomerism of maleic acid and fumaric acid.

UNIT-III KINETICS AND ELECTRO CHEMISTRY **15 Hrs**

Chemical Kinetics- order and molecularity. First order rate equation–determination of rate constant of hydrolysis of ester. Catalysis- Catalyst- auto catalyst- enzyme catalyst – promoters- catalytic poisoning- active center-distinction between homogeneous and heterogeneous catalysis-industrial application of catalysts. Electro chemistry-Specific and equivalent conductivity- their determination effect of dilution of conductance.

UNIT-IV SOLUTIONS **15 Hrs**

Solutions: solute-solvent-types of solutions with one example each. - Strengths of solutions- Calculation of Equivalent weights- normality, molality, molarity, molefraction, percentage by weight & ppm. Preparation of standard solutions . First law of Thermodynamics- concept of internal energy, enthalpy. Thermochemistry- as applied to biochemical reactions-second law of thermodynamics- concept of entropy, free energy, criteria for spontaneity**.** Water and its effect on biomolecules– Introduction-water as solvent-proton mobility-ionic product of water-PH scale-buffering against PH changes in biological system- Henderson equation – biological buffers.

UNIT –V BIOMOLECULES **15 Hrs**

Polymer- types of polymerization- addition and condensation- thermosetting and thermoplastics- rubber-natural and synthetic fibers-nylon-6 and 66, polyesters, PE, PVC, polyvinyl acetate. Amino acids- Classification and sources of amino acids, preparation and properties of Glycine, Zwitter ion structure, isoelectric point.

Text Books

- Bahl B.S and ArunBahl, *Advanced Organic Chemistry,* 14th Edition, S. Chand, New Delhi,2010 .
- Madan R.D, *Modern Inorganic Chemistry*, 5th Edition, S.Chand& Company Limited, New Delhi, 2012.
- Puri B.R, Sharma L.R & Pathania M.S, *Principles of Physical Chemistry*, Millennium Edition, Vishal publishing & Co, Jalandhar, 2011.

Reference Books

- Malik W.U, Tuli G.D and Madan R.D, *Selected Topics in Inorganic Chemistry*, 7th Edition, S.Chand Publications, 2012.
- Morrison R.T and Boyd, *Organic Chemistry,* VI Edition, Prentice Hall of India, New Delhi, 2011.
- Soni P.L, *Text book of physical chemistry,* 25th Revised Edition, Sultan Chand, New Delhi, 2011.

UCHR103/UCHR403 VOLUMETRIC AND ORGANIC ANALYSIS

Semester	**: I**	**Credit**	**: 2**
Category	**: Allied Practical**	**Hours/ week**	**: 3**
Class &Major	**: I B.Sc Biochemistry**	**Total Hours**	**: 39**

Objectives

To enable the students

- Identify the analyzing skills of Organic functional groups
- Standardize the volumetric analysis

Volumetric Analysis

1. Estimation of sodium hydroxide standard sodium carbonate
2. Estimation of HCl . using standard oxalic acid
3. Estimation of oxalic acid by $KMnO_4$ using standard oxalic acid
4. Estimation of borax- std sodium carbonate
5. Estimation of Ferrous sulphate – Std – Mohrs salt solution

Organic Analysis

Reaction of the following functional group

Aldehyde (Aromatic), ketone (Aliphatic & Aromatic), Carboxylic acid (mono & di), carbohydrate (reducing) & phenol, Aromatic primary amine, Amide &diamide. Systematic analysis of organic compound containing one functional group & characterization by confirmatory tests or derivative.

Reference Books

- Dr. Ramanujam V.V, *Inorganic Semi Micro Qualitative Analysis,* the National Publishing Company, 2009.
- Thomas A.O, *Practical chemistry,* 2nd edition, Scientific Book Center, Cannanore, 2006.
- Venkateswaran V, Veerasawamy R & Kulandaivelu A.R, *Basic Principles of practical Chemistry,* 2nd edition, Chand S & Sons Publications, New Delhi, 2005.

UCHM202 GENERAL CHEMISTRY-II

Semester : II	**Credit : 6**
Category : Core IV	**Hours/ week : 6**
Class & Major : I B.Sc Chemistry	**Total Hours : 78**

Objectives

To enable the students

- Acquire the basics in acids& bases, solid state, s-block element and metallurgy.
- Developing the structure determination skills in conformational analysis
- Validate the properties of acids& bases, solid state, s-block element and metallurgy

UNIT –I SOLUTIONS OF LIQUIDS IN LIQUIDS 16 Hrs

Raoult's law-Ideal solutions-deviations in ideal behaviors vapour pressure – composition and vapour pressure – temperature curves- fractional distillation of binary liquid solutions

,azeotropicmixtures. Distillation immiscible liquids , solubility of phenol-water system, aniline –hexane system, triethylamine-water system, nicotine- water system. **Solutions of gases in liquids**: Factors influencing solubility of a gas-Henry 'slaw.

UNIT-II STEREO ISOMERISM 16 Hrs

Definition –classification into optical and geometric isomerism. Optical isomerism: optical activity – optical and specific rotations–conditions for optical activity-asymmetric center-chirality- achiral molecules – meaning of (+) and (-) and D and L notations – Elements of symmetry. Conformational Analysis: Introduction of terms –conformers – configuration-dihedral angle-torsional strain-conformational analysis of ethane and n- butane including energy diagrams .conforms of cyclo hexane(axial and equatorial) mono and di substituted cyclo hexanes-1,2 and 1,3 interactions.

UNIT-III ALKANES & CYCLOALKANES 15 Hrs

Methods of preparation of alkanes-chemicalproperties-Mechanism of free radical substitution in alkanes.Preparation of cycloakanes using wurtz's reaction.Dieckman's ring closure & reduction of aromatic hydrocarbons. Substitution and ring opening reactions.

UNIT-IV METALLURGY **15 Hrs**

Extraction of metals- minerals-and ore difference-ore.dressing or concentration of ore- types of ore dressing-froth floatation- and magnetic separation refining of metals-types of refining electrolytic, Van Arkel and zone refining. Solid state: Crystal lattices-laws of crystallography-elements of symmetry-crystal systems-unit cell-space lattice-Bravais lattices-structure of NaCl-structure of CsCl-Miller's indices.

UNIT-V PROPERTIES OF S – BLOCK ELEMENTS **16Hrs**

Periodic Properties of Alkali metals: Li, Na, K, Rb, Cs. Occurrence, comparative study of elements- oxides, halides, hydroxides and carbonates. Exceptional property of Li. Diagonal relationship of Li with Mg. Periodic Properties of Alkaline earth metals: Be, Mg, Ca, Sr, &Ba. Occurrence and comparative study of the elements.- oxides, hydroxides, halides, sulphates& carbonates. Exceptional properties of Be.Diagonal relationship of Be with Al.

Text Books

- Bahl.S and ArunBahl, *Advanced Organic Chemistry*, Revised Edition, S. Chand and Company Ltd, Ram Nagar,New Delhi, 2010.
- Madan.R.D, *Modern Inorganic Chemistry*, 3nd Edition, S.Chand& Company Limited, New Delhi, 2011.
- Puri.B.R, Sharma.L.R & Pathania M.S, *Principles of Physical Chemistry,* Millennium

  Edition, Vishal publishing & Co, Jalandhar, 2011.

Reference Books

- Malik W.U, Tuli G.D and Madan R.D, *Selected topics in inorganic chemistry*, 7th Edition, S.Chand Publications, New Delhi, 2012.
- Puri B.R, Sharma L.R, and Kallia K.C, *Inorganic Chemistry,* Milstone Publisher, New Delhi, 2006.
- Morrison R.T and Boyd, *Organic Chemistry,* VI Edition, Prentice Hall of India, New Delhi, 2006.
- Soni P.L, *Text book of physical chemistry*, 22ndRevised Edition, Sultan Chand, New Delhi, 2011.

UCHR204/UCHR205 VOLUMETRIC ANALYSIS

Semester	**: I & II**	**Credit**	**: 4**
Category	**: Core practical I**	**Hours/Week**	**: 3+3**
Class & Major	**: I B.Sc Chemistry**	**Total hours**	**: 78**

Objectives

To enable the students

- Estimate the presence of chemical substances using Volumetric analysis.

Acidimetry

1. Estimation of sodium hydroxide – standard sodium carbonate.
2. Estimation of borax – std. sodium carbonate.
3 Estimation of bicarbonate and carbonate in a mixture.

Permanganometry

1. Estimation of oxalic acid – standard – Mohr's salt or ferrous sulphate.
2. Estimation of ferric ion.

Iodimetry

1. Estimation of iodine Vs ascorbic acid.

Iodometry

1. Estimation of copper.

Complexometry

1. Estimation of zinc or magnesium using EDTA.
2. Estimation of Zinc using potassium ferrocyanide.
3. Estimation of Total hardness of water.

Dichrometry

1. Estimation of ferrous ion using diphenylamine I N or Phenyl anthranlic acid as indicator.

Self-designing experiments:

1. Estimation of acids from various tablets
2. Estimation of calcium and Magnesium in water from different areas.
3. Estimation of carbonic acid from soft drinks

Reference Books

- Vogel's, *"Text book of Quantitative Chemical Analysis"*,6th Edition, Pearson Education Ltd,New Delhi,2008.
- Thomas A.O, "*Practical chemistry"*, 2nd Edition, ScientificBook Center, Cannanore, 2004.
- Venkateswaran.V, Veerasawamy.R & Kulandaivelu.A.R, "*Basic Principles of practical Chemistry",* 2nd Edition, S. Chand & Sons Publications, New Delhi,2004.

UCHE204 FOOD CHEMISTRY

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4**
Class & Major : I-UG **Total Hours : 52**

Objectives

To enable the students

- Acquire the knowledge in Chemistry involved in Foods
- Recognize the nutritional values of food
- Analyze the causes of food spoilage and adulteration

UNIT-I FOOD **8 Hrs**

Sources and types of food- Advantages and disadvantages - food preservation and storage. Calorific value of food.

UNIT-II ANALYSIS OF FOOD **10 Hrs**

Specification of drinking water- purification of water- zeolites, reverse osmosis – activated charcoal – chlorination – ozone – UV light disinfection – water borne- source and detection. Composition of Milk – fat content in Milk whole & skimmed – Pasturation – Dairy products – cheese, butter – ghee and kova.

UNIT-III CARBOHYDRATE **15 Hrs**

Carbohydrate: classification. Sources & properties of glucose, fructose & sucrose - Manufacture of refining of sugar- Role of insulin. Storage of carbohydrate in body – photosynthesis – Digestion of cellulose by animals. Fats and oil :Source of oil – production and refining of vegitable oils – saturated and unsaturated fatty acids- Iodine value – Role of MUFA and PUFA in preventing heart diseases. Food additives: Definition – artificial sweetners – saccharin – food flavours – esters, aldehydes, heterocycles, compounds, - food colors – restricted uses. Emulsifying agents – baking powder – yeast – taste enhancer – MSG – Vinegar.

UNIT- IV FAST FOOD AND BEVERAGES **10 Hrs**

Modern foods: Ingredients – and disadvantages of snack food – fast food – instant food – dehydrated food. Beverages: Soft drinks – soda – fruit juices and alcoholic beverages (types and content of alcohol) e.g. carbonation and addiction to alcohol composition and health hazards of soft drink. PAF, FPO, FDA, Drug licenses, WHO, standard, ISI, Specification, Packing and label requirements.

UNIT-V FOOD ADULTTERATION **9 Hrs**

Definition, classification – Common adulteration in food and their ill effects – Packing hazards-food additives. Food laws and standards- Bureau of Indian Standards-AGMARK- Consumer protection act.

Text Books

- Alex V. Ramani, *Food Chemistry*, MJP Publisher, 2009.
- Dr. Swaminathan M, *Handbook of food and Nutrition*, 5th Ed., Bangalore Printing and Publishing Co Ltd., Bangalore, 2007.
- Raheena Begum M, *A Text Book of Foods, Nutrition and Dietetics*, Sterling Publishers, Delhi, 2010.

Reference Books

- Jayashree Ghose, *Fundamental Concepts of Applied Chemistry*, 1st Ed., CBS Publishers and Distributors, New Delhi, 2006.
- Chopra H.K and Panesar P.S, *Food Chemistry*, Narosa Publisher, 2010.

UCHE205 HEALTH & HYGIENE

Semester :II **Credit : 2**
Category : NME **Hours/ week : 4**
Class & Major : I UG **Total Hours : 52**

Objectives
To enable the students

- To give in-depth knowledge related to nutrition and health.
- To provide information about the storage and preservation of food.
- To help the students to reach out to the community and create awareness about nutritional problems and their possible solutions.

UNIT -I **10 Hrs**

Food, Nutrition and Health- Food and its function, Meaning of Nutrition, Concept of Health, Meaning of Nutritional status, Inter relationship between Nutrition & Health. **Macro Nutrients** – Digestion, absorption & utilization

UNIT-II **10 Hrs**

Vitamins & Minerals – Fat soluble and water soluble vitamins. Minerals required in larger amount and minerals required in smaller amount.
Concept of Balanced Diet -Planning Balanced Diets, Guidelines for planning balanced Diet.

UNIT-III **8 Hrs**

Food-selection – Selection of Energy Giving Foods, Selection of Body Building Foods, Selection of Protective/Regulatory Foods, Selection of Food Accessories, Selection of Beverages, Role of Grades, Brands and Labels in Food selection.

UNIT-IV **12 Hrs**

Food Storage - Food spoilage – classification of Food Based on perish ability, Food storage. **Food preservation** – Principles and methods of Food preservation, Home scale Food preservation, maximization of Nutritional Benefits at low cost.

UNIT-V **12 Hrs**

Common Food Borne Diseases- Diarrhoea, Dysentery, Cholera and Typhoid – Causes, Symptoms, Complications, Prevention and Management. **Common Infectious Diseases** – Measles, Tuberculosis, Whooping cough, Diphtheria, Tetanus, Poliomyelitis and Malaria – Causes, Symptoms, Complications, Prevention and Management

Text Books

- Srilakshmi "*Food and Nutrition*" (2002)

Reference Books

- M.Swaminathan -"*Advanced text book on Food and Nutrition* " Vol II – Applied aspects,(2003)
- L.H. Mayer - "*Food Chemistry*" - Affiliated East West Pvt.Ltd. 1973.
- Lillian Hoagland Meyer, "*Food Chemistry*", CBS publishers & Distributor, New Delhi(1987).

UCHE206 COSMETICS&DETERGENTS

Semester :II **Credit : 2**
Category : NME **Hours/ week : 4**
Class & Major: I UG **Total Hours : 52**

Objectives

To enable the students

- Develop the basic knowledge about commercial products
- Gain the practical training in commercial product analysis
- Be aware of the quality of the commercial product.

UNIT – I **10 Hrs**

House hold products- soaps – saponification of oils and fat. Manufacture of soaps .Formulation of toilet soaps. Different ingredients used. Their functions Medicated soaps . Herbal soaps. Mechanism of action of soaps .soft soap. shaving soaps& creams . ISI Specification . Testing procedure / limits

Detergents - Anionic detergent – miniature of LAB(linear alkyl benzene sulponatationon LAB – preparation of acid slurry . different ingredients in the formulation of detergent powder & soaps. Liquid detergents.foam boosters.AOS(alpha olefin sulphonates).,cleaning powder.

UNIT-II **12Hrs**

Cationic detergents-Examples. manufacture and applications. Non-ionic detergents-Examples manufacture of ethylene oxide condensater.Mechanism of action of detergents.Comparison of soaps and detergents.Biodegradiation-environmental effects.ISI specifications/limits.

UNIT-III **15hrs theory + practical 8Hrs**

Preparations of cosmetics-manufacture of SLS and SLES. Ingradients. Functions Different kinds of shampoos-anti-dandruff, anti-lice,herbal and baby shampoos. Hair dye. Manufacture of conditions.Coco beraines or coco diethanolamides-ISI specifications. Testing procedures and limits.Face and skin powders-ingredients, functions. Differents types. Snows and face creams. Chemicalingredients used.Antirespriants. Sun screen preparations.UV absorbers. Skin bleaching agents.Depilatories. Turmeric and neem preparations.

vitamin oil.nail polishes-nail polish removers.Article removers.lipstick,ronghes,eye brow pencils.ingredients and functions-hazards.ISI specifications.

UNIT-IV **7Hrs**

Leading firms,brand names,choosing the right product. Packing regulations.Marketing.Licensing-drug license-legal aspects.GMP-ISO 9000/12000-consumer education.Evaluation of theproduct-advertisement.

Text Books

- Bhatia.S.C,*Perfumes,soaps,Detergents and cosmetics*,Vol.2,CBSPublishers and Distributors, 2001.
- Peter.H.Rossi,Lipsy.W,Howard.E.freeman,*evaluation: ASystamaticApproach*,7th Edition, Sage publications, Inc, 2003.

Reference books

- *Hand books on soaps,Detergents and Slurry*,NIIR,2nd Edition,2008.
- Mithal,BM,saha,RN,VallabhPrakashan,*Handbook of Cosmetics*, New Delhi 2000.

Milady,*Text Book of Cosmetology*, Milady publishing, 1994.

UCHE207 GREEN CHEMISTRY

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4**
Class & Major: I UG **Total Hours : 52**

Objectives
To enable the students

- Focus on the principles of green chemistry..
- Enhance to aware of green chemistry by evaluating with examples.
- Apply the Principles about the future trends in green chemistry.

UNIT-I **10 Hrs**

Introduction- The current status of chemistry and the environment-Evolution of the environmental movement-The role of chemists. **Green chemistry-** Definition- goals- The root of innovation-Limitations/obstacles.

UNIT-II **12 Hrs**

Principles of green chemistry - prevent waste-synthetic methods to design - awareness of toxicity-chemical products- use of auxiliary system-energy requirements-a raw material or feedstock-unnecessary derivation-catalytic reagents- chemical products-analytical methodologies-minimize chemical accidents.

UNIT-III **10 Hrs**

Evaluating the effects of chemistry-Evaluating feedstock's and starting materials-Evaluation of methods to design safer chemicals.

UNIT –IV **10 Hrs**

Examples of green chemistry- green reactions-green reagents- green solvents and reaction conditions-green chemical products.

UNIT – V **10 Hrs**

Future trends in green chemistry-Oxidation reagents and catalysts- biomimetic-multifunctional reagents- combinatorial green chemistry-current pollution problems- energy focus-Non-covalent derivation

Text Book

- Kidwai, "*Green Chemistry theory & practice*", Boston, December 1997.

Reference Books

- Collins .T.J. " *Green Chemistry*" in Mac millan encyclopedia of chemistry, Mac Millan Inc., New York.
- Anastas .P.T. & Williamson .T.C. "*Green Chemistry*" 1996.
- Breslow.R, "*Chemistry Today and Tomorrow*", American Chemical Society, Washington, DC.

UCHE208 HEALTH CHEMISTRY

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4**
Class & Major: I UG **Total Hours : 52**

Objectives
To enable the students

- Plan and apply the balanced diet for good health.
- Acquire knowledge on action of drugs and functions of enzymes and hormones present in the human body..
- know about the composition and pasteurization of milk.

UNIT-I Food, Nutrition and Health **8 Hrs**

Food and its function, Meaning of Nutrition, Concept of Health, Meaning of Nutritional status, Inter relationship between Nutrition & Health.

UNIT -II **10Hrs**

Vitamins & Minerals – Fat soluble and water soluble vitamins. Minerals required in larger amount and minerals required in smaller amount. **Concept of Balanced Diet -**Planning Balanced Diets, Guidelines for planning balanced Diet.

UNIT-III **10 Hrs**

Chemistry of drugs - Administration of Drug - Absorption of drugs - Elimination of drug by Kidney - Some important drugs - Antibiotics, Anti malarials, anti asthmatic drugs - Anti bacterial drugs, anti septics, anesthetics, analgestics and anti pyretic drugs. (Role and examples in each type) - Misuse of drugs.

UNIT-IV **12 Hrs**

Biological Chemistry - Elementary treatment of digestion and absorption of carbohydrates, proteins and fats. Elementary treatment of enzymes, coenzymes, Co-factors, prosthetic groups and theory of enzymes action. Physiological functions of adrenaline, thyroxin oxytocin, and insulin and sex hormones.

UNIT-V **12 Hrs**

Chemistry of milk- Milk definition, general composition – physico – chemical changes taking place in milk due to boiling, pasteurization, sterilization and homogenization – explanation. Components of milk – lipids, proteins, carbohydrates, vitamins, ash and mineral maters – names and functions.

Text Books

- Srilakshmi "*Food and Nutrition*" (2002)

Reference Books

- J. Awapapa - "Introduction to biological chemistry" – prentice hall.(2003)
- Robert Jenness - "Principles of dairy chemistry"(2001)

- M.Swaminathan -"*Advanced text book on Food and Nutrition* " Vol II – Applied aspects,(2003)

III and IV Evaluation Component Of CIA

UG

Semester	Course Code	Course Title	Component-III	Component-IV
I	UCHM103	General Chemistry –I	Poster presentation	Open Book Quiz
	UCHM102	Analytical chemistry-I	Chart Preparation	You tube Presentation
	UCHF101	Fundamentals of Chemistry	Molecular Model Preparation	Fun with Chemistry Experiments
	UCHA102	Chemistry for bio-chemistry	Poster presentation	Open Book Quiz
II	UCHM201	General Chemistry –II	Poster presentation	Open Book Quiz
	UCHE204	Food Chemistry	Food Adulteration testing experiments	Case study
	UCHE205	Health and Hygiene	Assignment	Seminar
	UCHE206	Cosmetics and Detergents	Assignment	Seminar
	UCHE207	Green Chemistry	Assignment	Seminar
	UCHE208	Health Chemistry	Assignment	Seminar

COURSE PROFILE M.Sc. Chemistry

Semester	Category	Course Code	Course Title	Contact Hrs/Week	Credits	
					Min	Max
I	Core-I	PCHM107/PCHM111	Organic Chemistry-I	5	4	4
	Core-II	PCHM108/PCHM112	Inorganic Chemistry-I	5	4	4
	Core-III	PCHM109	Physical Chemistry-I	5	4	4
	Core-IV	PCHM110	Nano Science and Nano Materials	5	4	4
	Core Practical-I	PCHR203	Organic Practical	5	-	-
	Core Practical-1I	PCHR204	Inorganic Practical	5	-	-
			Total	**30**	**16**	**16**
II	Core-V	PCHM204	Organic Chemistry-II	5	4	4
	Core-VI	PCHM205	Inorganic Chemistry-II	5	4	4
	Core-VII	PCHM206	Physical Chemistry-II	5	4	4
	Core Practical-I	PCHR203	Organic Practical	5	5	5
	Core Practical-II	PCHR204	Inorganic Practical	5	5	5
	Non-Major Elective			5	4	4
	Service Learning	PCHX201	Vermicomposting	-	1	1
			Total	**30**	**27**	**27**
III	Core-VIII	PCHM301	Organic Chemistry-III	6	5	5
	Core-IX	PCHM302	Inorganic Chemistry-III	5	4	4
	Core –X	PCHM303	Physical Chemistry-III	6	4	4
	Core-XI	PCHI301	Sustainable Materials and Technologies	6	5	5
	Core Practical – III	PCHR401	Physical Chemistry Practical	5	-	-
	Core XII	PCHP401	Project	2	-	-
			Total	**30**	**18**	**18**
IV	Core-XIII	PCHM404	Organic Chemistry-IV	6	5	5
	Core-XIV	PCHM402	Inorganic Chemistry-IV	5	4	4
	Core-XV	PCHM405	Physical Chemistry-IV	5	4	4
	Core-XVI	PCHM305/PCHM407	Research Methodology	5	4	4
	Core Practical – III	PCHR401	Physical Chemistry Practical	5	6	6
	Core XVII	PCHP401	Project	4	6	6
			Total	**30**	**29**	**29**
			Total	**120**	**90**	**90**

EXTRA CREDIT EARNING PROVISION

Semester	Category	Course code	Course Title	Hrs/per week	Credits	
					Min	Max
III	Self Study	PCHS306	Textile Chemistry	--	--	1

PCHM107/PCHM111 ORGANIC CHEMISTRY- I

Semester : I **Credits : 4**
Category : Core I **Hours/Week : 5**
Class &Major : I M.Sc. Chemistry **Total Hours : 65**

Objectives
To enable the students

- Understand the structure and reactivity in organic reaction mechanisms.
- Develop the skill in writing reaction mechanism of aliphatic compounds.
- Deduce the structures of organic compounds in stereochemical aspects

UNIT-I REACTIVE INTERMEDIATES 14 Hrs

Nucleophiles and Electrophiles – Formation, structure and stability of free radical, carbocation, carbanion, carbenes and nitrenes - Types of organic reactions: Substitutions, addition, elimination and rearrangements - Methods used to determine reaction mechanisms: Product analysis, Isolation of intermediates, isotope labelling and stereochemical analysis

UNIT- II STEREOCHEMISTRY-I 15 Hrs

Definition: Stereoisomerism - Optical activity - Concept of chirality–Isomerism of biphenyls, allenes and spiranes – Properties of Enantiomers and Diastereomers – Enantiomeric excess –Fischer projections - R and S notations. E–Z notation of olefins containing one double bond - Stereospecific and stereoselective synthesis - Racemisation - Resolution

UNIT–III ALIPHATIC NUCLEOPHILIC SUBSTUTION REACTION 14 Hrs

S_N1, S_N2 and S_Ni reaction mechanisms- Nucleophilic substitution at an allylic carbon, vinylic carbon - Transesterifications, acyloxy-dehalogenation, alkylation of amines, transamination, amination of alkanes. Darkin reaction, Etard reaction, Stark Enamine reaction, Mannich reaction

UNIT–IV ELIMINATION REACTIONS 12 Hrs

E_1,E_2 and E_1CB reaction mechanism, reactivity- substrate, attacking base, leaving group and medium. Mechanism and orientation of the pyrolytic and conjugate elimination. dehydrohalogenation, dehydrogenation, cleavage of ethers, quaternary ammonium hydroxide, elimination of boranes.

UNIT-V CARBOHYDRATES **10 Hrs**

Classification of carbohydrates – Preparation, properties and reactions of glucose and fructose – Structure of Glucose and Fructose – Mutarotation – Preparation, Properties, Structure and reactions of Starch and Celloulose

Text Books

- M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., 2018
- Bhupinder Mehta and Manju Mehta, Organic Chemistry, Second Edition, PHI learning Pvt. Ltd., 2013
- Finar. I.L, *Organic Chemistry Volume I & II*, 5th edition, ELBS Publication, 2009.
- Michael B. Smith and Jerry March., Wiley-Interscience A John Wiley & Sons, Inc., Publication (2007)

Reference Books

- Peter Sykes, *a guide book to mechanism in organic chemistry*, 6th edition, Orient Longman, London, 2003.
- Kalsi. P.S, *Stereochemistry-Conformation & mechanism*,7th Edn,Newage Interanational publishers,Newyork,2012.
- Nasi Puri.D, *Stereochemistry of Organic Compounds: Principles and Applications*, New Age International, 3rd Edition, 2004.

PCHM108/PCHM112 INORGANIC CHEMISTRY– I

Semester	**: I**	**Credit**	**: 4**
Category	**: Core II**	**Hours/ week**	**: 5**
Class&Major	**: I M.Sc Chemistry**	**Total Hours**	**: 65**

Objectives

To enable the students

- Concepts of ionic bonding and covalent bonding are learnt
- Interpolate the properties in bonding nature of the compounds.
- Assess the various types of coordination compounds using p- block element

UNIT- I IONIC BONDING **15 Hrs**

Effective nuclear charge –shielding -Slater's rule –Born-Lande equation –Born Haber cycle and its applications –Radius ratio –polarization-Fajan's rule –results of polarization. Electronegativity –determination – methods of estimating charges, electronegativity equalization –Types of chemical forces – effects of chemical forces -melting and boiling points, solubility and hardness

UNIT–II COORDINATION CHEMISTRY-I **12 Hrs**

Werner's Theory, EAN rule, VBT, Crystal Field Theory, crystal field splitting, application of d-orbital splitings to explain magnetic properties, low spin and high spin complexes, crystal field stabilization energy, spectrochemical series, thermodynamic and related aspects of crystal fields, ionic radii, lattice energies, site preference energies.

UNIT–IIICOORDINATIONCHEMISTRY-II 13Hrs

MO theory of complexes (quantitative principles involved in complexes with no pi and with pi bonding) and ligand filed theories and molecular symmetry, angular overlap model, John Teller effect.

Electronic absorption spectroscopy: derivation of term symbols, micro states and spectra of Oh and Td complexes of d^n metal ions, Orgel and Tanabe-Sugano diagrams. charge transfer and d-d transitions, nephelauxetic series.

UNIT–IV COORDINATION CHEMISTRY-III 12 Hrs

Substitution reactions in square planar and octahedral complexes - the rate law for nucleophilic substitution in a square planar and octahedral complex, inert and labile compounds. The trans effect - theories of trans effect- mechanisms of redox reactions - outer sphere mechanisms - inner sphere mechanisms - mixed valance complexes. Stepwise and overall stability constant, irving William series, factors affecting the stability, determination of stability constant – spectrophotometric, solubility, electrochemical, polorograpic and job's method.

UNIT–V STRUCTURE AND PROPERTIES OF SOME COMPOUNDS OF P-BLOCK ELEMENTS 13 Hrs

Synthesis, properties and structures of Boron hydrides (small boranes and their anions, B_1-B_4), boron nitride, borazines, carboranes, metalloboranes, metallocarboranes; silicates, silicones, diamond, graphite, zeolites. Nitrogen, Phosphorous, Sulphur and noble gas compounds- Hydrides, oxides and oxy acids of Nitrogen, Phosphorous, Sulphur and halogens. Phosphazines, Sulphur-Nitrogen (S_4,N_4)compounds, inter halogen compounds, pseudo halogens, noble gas compounds of Xenon.

Text Books

- Lee .J.D, *A New Concise Inorganic chemistry*, 5th Edition, ELBS, New Delhi, 2012**.**
- James .E. Huheey, *Advanced InOrganic Chemistry*, Harper& Collins, New York, Fourth Edition, 2005.
- R. S. Drago, PhysicaI Methods in Chemistry; Saunders: Philadelphia, 1977.

Reference Books

- Purcell. K.F & Kotz. J.C**,** *Inorganic Chemistry***,** W.B.Saunders Co, USA, 2012.
- Shriver .D.F, Atkins P.W, Langford C. H., *Inorganic Chemistry*, ELBS, New Delhi, 2009.
- Cotton .F.A. & Wilkinson.G, *Advanced Inorganic Chemistry, A Comprehensive Textbook*, Fifth Edition, John Wiley & Sons, 2011.
- A. B. P. Lever, Inorganic Electronic Spectroscopy, 2nd ed.; Elsevier: Amsterdam, 1984.

PCHM109 PHYSICAL CHEMISTRY – I

Semester : I **Credit : 4**
Category : Core–III **Hours/ week : 5**
Class & Major : I-M. Sc Chemistry **Total Hours : 65**

Objectives
To enable the students

- Acquire the knowledge of thermodynamics, quantum and photochemical reactions.
- Deduce the Quantum mechanics & photo chemical reactions.
- Assess the properties of kinetic and photochemical reactions.

UNIT-I QUANTUM CHEMISTRY–I **13 Hrs**

Inadequacy of classical mechanics, Black body radiation, Planck's quantum concept, Photoelectric effect. Bohr's theory of hydrogen atom :Hydrogen spectra, Wave-particle dualism, Uncertainty principle, Inadequacy of old quantum theory. Schrödinger equation, Postulates of quantum mechanics. Operator algebra: operator, linear and hermitian, eigen functions and eigen values, angular momentum operator, commutation relations, related theorems.

UNIT-II CLASSICAL THERMODYNAMICS **14 Hrs**

Thermodynamics of systems of variable composition – partial molar properties – chemical potential, relationship between partial molar quantities - Gibb's Duhum equation– Calculation of partial molar quantities from experimental data. Thermodynamic properties of real gases, Fugacity concept – calculation of fugacity of real gas – activity and activity coefficient concept – definition – standard states and experimental determination of activity and activity coefficient of non-electrolyte Phase rule : Phase rule -three component system, systems of three liquids – solid, liquid systems(eutectic systems and two salts and water)

UNIT-III STATISTICAL THERMODYNAMICS **13 Hrs**

Bohr-Einstein, Fermi-Dirac, Maxwell-Boltzmann statistics and distribution, ensembles, partition functions and molecular partition functions, mean energy, residual entropy, heat capacity of mono and diatomic gases, chemical equilibrium, Einstein and Debye theories of heat capacity of solids. Non-equilibrium thermodynamics- Postulates and methodologies, linear laws, Gibbs equation, Onsager reciprocal theory.

UNIT-IVCHEMICAL KINETICS **13 Hrs**

ARRT, Potential energy surface – Partition function and activated complex – Eyring equation – calculation of free energy, enthalpy and entropy of activation and their significance. Kinetic isotopic effects – linear free energy relationship – Hammet and Taft equation. Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reaction, chain reactions, general treatment of chain reactions – chain length – Rice Herzfeld mechanism – Super fast reactions, relaxation method , stopped flow and flash photolysis.

UNIT-V PHOTOCHEMISTRY **12 Hrs**

Absorption & Emission of Radiation – Frank condum principle – Decay of electronically excited phosphorescence – Spin Forbidden radiative transition – Internal conversion & Intersystem crossing (ISC) – Energy transfer process – Excimers & exciplexes – Static & Dynamic quenching – Stern-Volmer Equation. Quantum Effeciency and life time measurements – steady state principle – Quantum yield and chemical actinometry- kinetics of

photochemical reactions – hydrogen and halogen reactions, photo redox , photo substitution, photo isomerization and photo sensitizied reactions.

Text Books

- Rajaram .J & Kuriacose .J.C, *Thermodynamics for Students of Chemistry*, LalNagin Chand, NewDelhi, 2005.
- Atkins P.W, *Physical chemistry*, Ninth Edition,Oxford University Press, 2010.
- Rohatgi.K.K, Mukerherjee, *Fundamentals of Photochemistry***,** Wiley Eastern Ltd,New York, 2006.

Reference Books

- Moore .W.J, *Physical Chemistry*, Orient Long man,London,2009.
- McClelland. B.C**,** *Statistical Thermodynamics*, Chapman& Hall,London,2006.
- P.W.Atkins., *Quantum Chemistry*,Oxford Chemistry Series,2004

PCHM110 NANO SCIENCE AND NANO MATERIALS

Semester	**: I**	**Credit**	**: 4**
Category	**: Core IV**	**Hours/ week**	**: 5**
Class & Major	**: I M.Sc Chemistry**	**Total Hours**	**: 65**

Objectives

To enable the students

- To understand the fundamentals of Nanotechnology
- To give a general introduction to different classes of Nano materials
- To impart basic knowledge on various synthesis and characterization techniques involved in Nanotechnology

UNIT I - BASICS OF NANOTECHNOLOGY 12 Hrs

Introduction – Scientific revolutions –Time and length scale in structures – Definition of a nanosystem –Dimensionality and size dependent phenomena – Surface to volume ratio - Surface energy and surface stress- surface defects-Properties at nanoscale (optical, mechanical, electronic,and magnetic).

UNIT II - SYNTHESIS OF NANOMATERIALS 14 Hrs

Chemical Methods: Sol gel method - Solvo thermal Synthesis-Photochemical Synthesis - Sonochemical Routes- Chemical Vapor Deposition (CVD) – Metal Oxide - Chemical Vapor Deposition (MOCVD).Physical Methods:Ball Milling – Electrodeposition - Spray Pyrolysis - Flame Pyrolysis -DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE).

UNIT III - DIFFERENT CLASSES OF NANOMATERIALS 13 Hrs

Classification based on dimensionality-Quantum Dots,Wells and Wires- Carbon-based nano materials (buckyballs, nano tubes, graphene)– Metal based nano materials (nano

gold, nano silver and metal oxides) -Nano composites-Nano polymers – Nano glasses –Nano ceramics -Biological nano materials.

UNIT IV – CHARACTERIZATION OF NANOMATERIALS 13 Hrs

Characterization: Field Emission Scanning Electron Microscopy (FESEM) – High resolution Transmission Electron Microscope(HRTEM) –Scanning Tunneling Microscope (STM)–Atomic Force microscopy (AFM) - Surface enhanced Raman spectroscopy (SERS)- X-ray Photoelectron Spectroscopy (XPS.

UNIT V – APPLICATIONS OF NANOMATERIALS 13 Hrs

Solar energy conversion and catalysis - Molecular electronics and printed electronics - Nanoelectronics–Sensors – Ferro electric materials - Polymers with aspecial architecture - Liquid crystalline systems - Nanomedicine and Nanobiotechnology – Nanotoxicology.

Text Books

- Pradeep T., "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill
- Education Pvt. Ltd., 2012.
- Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2002.

References

- Nabok A., "Organic and Inorganic Nanostructures", Artech House, 2005
- Dupas C., Houdy P., Lahmani M., "Nanoscience: Nanotechnologies and Nanophysics",
- Springer-Verlag Berlin Heidelberg, 2007.

PCHR203 ORGANIC PRACTICAL

Semester : I & II **Credit : 5**
Category : Core Practical –I **Hours/Week : 5+5**
Class & Major : I-M.Sc Chemistry **Total Hours : 130**

Objectives

To enable the students

- Acquire the skills in the Estimation & Preparation of organic compounds.
- Analyze the various isolation techniques

I. Extraction

1. Isolation of lactose from milk(Demo)
2. Isolation of caffine from tea dust (Demo)
3. Isolation of citric acid from lemon.

II. Qualitative Analysis

Identification of components in a two component mixture and preparation of the derivative.

III. Functional group inter conversion

a)Single stage

1. Hydrolysis.
2. Oxidation.
3. Reduction.
4. Nitration.
5. Acetylation

b) Double stage

1. Hydrolysis
2. Nitration

IV.Estimation

1. Estimation of Phenol.
2. Estimation of Aniline.
3. Estimation of Glucose.
4. Estimation of Ketone.
5. Estimation of Iodine, Saponification & Acetyl value of oil. (Demo)

V. Chromatographic Separations (demo)

1. Column Chromatography- Separation of Anthracene and Picric acid from anthrancene picrate.
2. TLC Separation of green leaf pigments

VI. Determination of physical constants (Melting Point)

Note: Two sets of Questions can be given for End Semester Examination as the following lot system

1. Qualitative Analysis and preparation.
2. Estimation and preparation.

Text Books

- Dr.Gnanaprgasam.N.S and Ramamoorthy.G, *Organic Chemistry Lab Manual*, S.Viswanathan printers & Publishers Pvt.Ltd., 2008.
- Glasstone.S, *Statistical Thermodynamics***,** Affliated EastWest Press, NewDelhi, 2010.

Reference Books

- Thomas .A.O, P*ractical Chemistry,* Scientific Book Center, Cannanore,2005.
- Vogel's, *Text Book of Practical Organic Chemistry,* Longman, London,2009.

PCHR204 INORGANIC PRACTICAL

Semester	**: I & II**	**Credit**	**: 5**
Category	**: Core Practical -II**	**Hours/Week**	**: 5 +5**
Class&Major	**: I M.Sc Chemistry**	**Total Hours**	**: 130**

Objectives

To enable the students

- Formulate the preparation of inorganic complexes.
- Develop the skills to separate and analyze the inorganic compounds.
- Analyze the metal or ions present in the compound or substance by volumetrically or gravimetrically.

I. Semi Micro Qualitative analysis of mixture containing two common and two rare cations.

The following are the rare cations to be included. W, Ti, Mo, Te, Se, U,Th, Ce, Zr, V, Li, & Be.

II. Preparation of the following Complexes:

1. Potassium tris(oxalato) Chromate(III)
2. Bis(acetyl acetanato)copper (II)
3. SodiumBis (Thiosulphato)Cuprate(II)
4. Tris (thiourea) Copper(I)chloride

III. Estimation of metal ions by Volumetric and Gravimetrical analysis.

1. Estimation of copper and sulphate ion.
2. Estimation of Manganese and Nickel
3. Estimation of copper and Zinc.
4. Estimation of Calcium and Magnesium.

IV. Spectro photometry (only for demonstration)

1. Estimation of Iron.
2. Estimation of Nickel.
3. Estimation of Copper.
4. Estimation of Manganese.

Note: Two sets of Questions can be given for End Semester Examination as the following lot system

1. Semi micro qualitative analysis and preparation.
2. Estimation of metals by Volumetry & Gravimetry and preparation.

Text Book

- Ramanujam. V, *Inorganic Semi Micro Qualitative Analysis*, The National publishing Company, New Delhi, 2009.

Reference Books

- Thomas A.O, *Practical Chemistry*, Second Edition, Scientific Book Center, Cannanore,
  2005.
- Venkateswaran. V, Veerasawamy & Kulandaivelu.A. R, *Basic principles of Practical Chemistry*, S. Chand & Sons publications, New Delhi, 2010.

PCHM204 ORGANIC CHEMISTRY- II

Semester : II **Credits : 4**
Category : Core IV **Hours/Week : 5**
Class&Major : I-M.Sc Chemistry **Total Hours : 65**

Objectives

To enable the students

- Analyze the advanced reaction mechanism in aromatic compounds.
- Predict the chemistry of Hormones.
- Synthesize to extract terpenoids from natural products.

UNIT–I AROMATICITY 12 Hrs

Huckel's and Craigs rule. Aromaticity of benzenoid, heterocyclic and non-benzenoid compounds, aromatic systems with pi electron compounds- other than six pi electrons, non–aromatic and anti aromatic systems, systems with more than 10 pi electrons-annulenes.

UNIT-II AROMATIC NUCLEOPHILIC SUBSTITUTION REACTION 13 Hrs

Introduction – S_NAR, Benzyne mechanism –Reactivity – Effect of substrate, structure, leaving group, attacking nucleophile and solvent. Reactions of hydroxy deamination, oxido-desulphanate substitution, alkoxy dehalogenation, amino dehydroxylation, Rosenmund ,Vonbrown reaction, amination by hydroxylamine, hydroxy deazotisation - Scheiman reaction, Bucherer reaction Goldberg reaction, Nencki reaction, Ullmann reaction and Chichibabin reaction.

UNIT–III AROMATIC ELECTROPHILIC SUBSTITUTION REACTION 13 Hrs

The arenium ion mechanism. Orientation and reactivity (ortho, para and meta directing groups). Typical reactions-Sulphnation,Nitration, Halogenations,Fridel Craft Acylation and Alkylation, diazocoupling, Reimer- Tieman reaction, Vilmesyer – Hack, Gattermann – Koch and Kolbe reaction.

UNIT–IV STEREOCHEMISTRY-II 14 Hrs

Conformation analysis of simple cyclic(chair and boat cyclohexanes) and acyclic(n-butane) systems, strain theories, conformation of simple1,2-disubstituted derivatives–ethylene chlorohydrins and ethylene glycol, Conformational analysis and stereochemical aspects of mono and disubstituted cyclohexanes(1,2;1,3;1,4-dialkylcyclohexanes), conformation and stereochemistry of cis and trans decaline, effects of conformation on reactivity in acyclic and cyclohexanes. Optical rotatory dispersion and Circular Dichroism, Octant rule, Cotton effect.

UNIT-V TERPENES AND STEROID **13 Hrs**

Occurrence, Nomenclature, classification and isolation of terpenes, Isoprene rule, Gem dialkyl rule, General methods of structural elucidation. Structural elucidation of limonene, fenchone, Zingiberene. Nomenclature and classification of steroids and Hormones. Structural elucidation of Cholesterol (synthesis not required), ergosterol, stigmasterol.

Text Books

- Ernest L.Eliel, *Stereochemistry of Carbon Compounds,* T.M.H Edition, TataMcGraw-Hill Publishing Company,NewDelhi,2011.
- Jerry March, *Advanced Organic Chemistry,* 7th edition, John Wiley & Sons, NewYork, 2012.
- Finar .I.L, *Organic Chemistry, Volume I & II*, 5th edition, ELBS Publication, 2007.

Reference Books

- Kalsi P.S, *Stereochemistry-Conformation & mechanism*, 7th Edn, Newage Interanational publishers,Newyork,2012.
- Mukerjee .S.M and Singh .S.P, *Organic reaction mechanism*, McMillan India Ltd., Chennai, 2010.
- Ahluwalia .V.K., *Organic Reaction Mechanism*, 4th edition, Narosa Publishers, 2011.

PCHM205 INORGANIC CHEMISTRY – II

Semester : II **Credit : 4**
Category : Core-V **Hours/ week : 5**
Class & Major: I M.Sc Chemistry **Total Hours : 65**

Objectives

To enable the students

- Recognize the bonding of inorganic & organo- metallic compounds.
- Interpret the arrangements of ions in the structure from various solid substances.
- Deduce the photochemistry of inorganic compound and function of bio-inorganic compounds.

UNIT- I CHEMICAL BONDING **13 Hrs**

Hard and Soft acids and bases- classifications. Acid-base strength, hardness, symbiosis. Theoretical basis of Hardness and Softness, applications of HSAB. Polyacids, Isopolyacids of V,Cr,Mo and W. Heteropolyacids of Mo and W(only structural aspects). Chelate effects and factors affecting. Macrocyclic complexes and template effect.

UNIT – II ORGANOMETALLIC COMPOUNDS **13 Hrs**

Compounds with transition metal to carbon bonds: classification of ligands, nomenclature, 18 electron rule, transition metal carbonyls. Structure, bonding, preparation, reactions of organometallics(Fe, Zn, Cr, V, Mo). Metal alkyls, metal alkylidenes and metal alkylidynes - Structure and bonding.

UNIT-III SOLID- STATE CHEMISTRY **12 Hrs**

Defects in solids- Point defects, line defects and surface defects, Dislocations-Non-stoichiometric compounds. Solid state reactions – Types & examples. Magnetic properties of solids (low and high temperature), high temperature superconductors, use of X-ray powder data in identifying inorganic crystalline solids. Details for cubic systems. Structures of NiAs, CdI_2, Pervoskite, rutile, fluorite and antifluorite, zinc blende and wurtzite.

UNIT –IV PHOTOCHEMISTRY OF INORGANIC SYSTEMS **15 Hrs**

Electronic transitions in metal complexes, Jablonski diagram, metal-centered and charge-transfer transitions – Various photophysical and photochemical processes of coordination compounds – Unimolecular charge-transfer photochemistry of cobalt (III) complexes.Mechanism of CTTM photoreduction. Ligand-field photochemistry of chromium(III) Complexes. Adamson's rules, photoactive excited states, V-C model – photophysics and photochemistry of ruthenium-polypyridine complexes, emission and redox properties – photochemistry of organometallic compounds, metal carbonyl compounds, compounds with metal-metal bonding Reinecke's salt chemical actinometer.

UNIT-V BIOINORGANIC CHEMISTRY **12 Hrs**

Transport proteins: Oxygen carriers, metalloenzymes, carbonyl peptidase, carbonic anhydrase, redox process, iron-sulphur proteins, chlorophyll, salient features of the photo synthetic process, vitamin B_{12} role of sodium, potassium, calcium, zinc and copper; fixation of nitrogen cycle. Anti- cancer drugs and their mechanism of action,

Text Books

- James Huhey, *Inorganic Chemistry*, Fourth Edition, Harper & Collins, NewYork, 2005.
- Cotton .F.A. & Wilkinson.G, *Advanced Inorganic Chemistry, A Comprehensive Textbook,* Fifth Edition, John Wiley & Sons, 2011.

Reference Books

- Purcell. K.F & Kotz. J.C**,** *Inorganic Chemistry***,** W.B.Saunders Co, USA, 2012.
- Powell. P, *Principles of Organometallic Chemistry,* Chappman & Hall, 2006.
- Manku.G.S, *Theoretical principles of Inorganic Chemistry***,** McGraw Hill, Education, 2005.
- Shriver D.F, Atkins .P.W, Langford .C. H, *Inorganic Chemistry,* ELBS,New Delhi, 2009.

PCHM206 PHYSICAL CHEMISTRY - II

Semester	**: II**	**Credit**	**: 4**
Category	**: Core-VI**	**Hours/ week**	**: 5**
Class & Major	**: I M.Sc Chemistry**	**Total Hours**	**: 65**

Objectives

To enable the students

- Understand the fundamentals of group theory and identify the point group in the molecules.

- Analyze different chemical reaction occurring in electrode and electrochemistry.
- Apply the wave mechanics to simple system..

UNIT-I QUANTUM CHEMISTRY II **13 Hrs**

Approximation methods – Perturbation and variation methods – application to hydrogen and helium atom- spin orbit interaction – LS coupling and JJ coupling- Term symbols and spectroscopic states. Ground state term symbols for simple atoms. Applications of wave mechanics to simple systems – particle in a box, one and three-dimensional box.

UNIT–II ELECTROCHEMISTRY **13 Hrs**

Introduction to electrochemistry- Mean ionic activity & Mean ionic activity co-efficient - determination of activity co-efficient. Debye- Huckel limiting law- verification and limitation of Debye –Huckel limiting law - Debye- Huckel- Bronsted equations. electrolyte interface-- electrical double layer – electro capillary phenomenon – Lippmann equation- structure of Helmholtz double layer – Guoy, Chapman & stern model of electrical double layers. Diffusion – Fick's law of diffusion – effect of ionic association on conductance – electro kinetic phenomena – membrane potential.

UNIT-III KINECTICS OF ELECTRODE PROCESSES **13 Hrs**

Essential of electrode reactions – current density – over potential, Tafel equation, Butler-Volmer equation. Standard rate constant (Ko) and Transfer Co-efficient(a),exchange current. Irreversible Electrode process- criteria for irreversibility, Information from irreversibile wave. Determination of kinetic parameters by koutchey and Geling's method.

UNIT- IV GROUP THEORY -I **13 Hrs**

Elements of group theory-Definition- symmetry elements and operations conjugate classes- conjugate and normal sub groups- -point group- group multiplication tables - assignment of point groups to molecules. Matrix representation of geomentric transformation and point groups. Reducible & Irreducible representations- properties of irreducible representation-direct product-symmetry adapted linear combinations-projection formula.

UNIT-V GROUP THEORY –II **13 Hrs**

Orthogonality theorem and its consequences-construction of character table for C_{2v} & C_{3v} hybrid orbitals in non-linear molecules (CH_4,XeF_4,BF_3,SF_6 & NH_3)Determination of representations of vibrational modes of non linear molecules (H_2O, and NH_3). Symmetry selection rules of infra red and Raman spectra. Application of group theory in predicting the structure of the molecule.

Text Books

- Glasstone.S, *Introduction to Electrochemistry***,** Affliated EastWest Press, NewDelhi,2010.
- Chandra.A.K, *Fundamentals of Quantam chemistry*, Kluwer Academic publishers, 2011.Cotton. F**.**A, *Chemical Applications of Group theory***,** John Wiley, NewYork,2011.

Reference Books

- Thinham.N., *Group Theory & Quantum Mechanics*, McGrawHill Book Company, NewYork, 2005**.**

- row D.R, *Principles & Applications to Electrochemistry***,** Chappman& Hall,2008.
- Laidler .R.J, *Chemical Kinetics***,** Harber & Row, NewYork, 2005.
- P.W.Atkins., *Quantum Chemistry*, Oxford Chemistry Series,2004

PCHX201 VERMICOMPOSTING

Semester : II **Credit : 01**
Category : Service Learning **Total Hours : 40**
Class &Major : I- M.Sc Chemistry
Target Group : Villagers in the age Group of 20-50yrs

Objectives
To enable the students

- Create awareness about utilization of Natural fertilisers to the society.
- Implement Vermicomposting at a small scale.

UNIT – I INTRODUCTION **8 Hrs**

Definition – Usage – Advantage of Over Artificial Fertilisers,Ingredients **Activity:** Spreading awareness on Vermicomposting

UNIT–II BIO-DEGRADABLE & NON BIODEGRADABLE **8 Hrs**

Introduction,Organic waste , Difference in Biodegradable & non-biodegradableCommon items suitable for Biocomposting: Clean Paper, Dried net, Egg Shell, Leaves Garden Trimming, Fruits & vegetables wastes, Coffee & Tea extract. **Activity:** Separation & Collection of Biodegradable & non-Biodegradable.

UNIT–III VERMI GROWTH **8 Hrs**

Earthworm – Introduction-Nature of Soil required – Easily usable waste – Factors affecting growth of the Vermi.**Activity:** Vermi Growth in Soil-Earthworm

UNIT-IV VERMICOMPOSTING METHOD **8 Hrs**

Grub composting – Compost Tea – Humanure – Vermicompost – Bokashi composting Common. Activity: Carrying out the Methods & Identifying the most effective method to be used

UNIT–V FEEDBACK & RESULT FROM SOCIETY **8Hrs**

Evaluation of Results & difference in Plant growth with Vermicompost oral & written feedback from Villagers. **Activity:** Measurement of Plant Growth Assessment of utilization of household waste.

Reference Books

- Thompson. P.M, Das .S.A, K.C, *Bioresource Technology*, 2005.
- Nancarrow, Loren and Janet Hogan Taylor, *The Worm Book*, Ten Speed Press, 2007.
- Logsdon, Gene. *Worldwide Progress in Vermicomposting* Biocycle, October, 2009.

III and IV Evaluation Component of CIA

Semester	Course Code	Course Title	Component-III	Component-IV
I	PCHM104	Organic Chemistry-I	Mechanism Writing	Power Point Presentation
	PCHM105	Inorganic Chemistry-I	Problem solving	Preparation of Question bank
	PCHM106	Physical Chemistry-I	Problem solving	Power Point Presentation
	PCHM110	Nano Science and Nano Materials	Assignment	Seminar
II	PCHM204	Organic Chemistry-II	Mechanism Writing	Paper presentation
	PCHM205	Inorganic Chemistry-II	Problem solving	Power Point Presentation
	PCHM206	Physical Chemistry-II	Problem solving	Power Point Presentation

DEPARTMENT OF MATHEMATICS

PREAMBLE

UG : Course Profile, list of courses offered to the other departments & the syllabi of courses offered in the III and IV semesters (With effect from 2018-2021 batch onwards)

PG : Course Profile, list of courses offered to the other departments & the syllabi of coursesoffered in the III and IV semesters (With effect from 2018-2020 batch onwards)

COURSE PROFILE B.Sc. (Mathematics)

PSO 1 : Interpretation of effective use of mathematical skills to solve quantitative problems from a wide array of authentic contexts.

PSO 2 : Ability to apply rigorous mathematical arguments in axiomatic and non-axiomatic systems.

PSO 3 : Demonstration of effective written communication of mathematical concepts.

PSO 4 : Capacity to formulate and develop mathematical arguments in a logical manner

Semester	Part	Category	Course code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
I	I	Language	UTAL105/UTAL106/ UHIL101/UFRL101	Basic Tamil-I/Advanced Tamil-I/Hindi-I / French-I	4	2	3
	II	English	UENL107/ UENL108	General English-I/ Advanced English-I	5	3	4
	III	Core I	UMAM107	Fundamentals of Mathematics	2	1	1
	III	Core II	UMAM104	Differential calculus	5	4	4
	III	Core III	UMAM106	Analytical Solid Geometry	6	5	5
	III	Allied	UMAA111	Mathematical Statistics	6	5	5
	IV	Value Education			2	1	1
TOTAL					**30**	**21**	**23**
II	I	Language	UTAL205/UTAL206/ UHIL201/UFRL201	Basic Tamil II/ Advanced Tamil-II/ Hindi-II /French-II	4	2	3
	II	English	UENL207/UENL208	General English II/ Advanced English II	5	3	4
	III	Core IV	UMAM204	Integral Calculus	5	5	5
	III	Core V	UMAM402 / UMAM205	Graph Theory	5	4	4
	III	Core VI	UMAM606/ UMAM206	Discrete Mathematics	5	4	4
	IV	Non Major Elective			4	2	2
	IV	Soft Skill			2	1	1
	V	Extension Programme/ Physical Education			-	1	2
TOTAL					**30**	**22**	**25**
III	I	Language	UTAL305/UTAL306/ UHIL301/UFRL301	Basic Tamil III/ Advanced Tamil-III/ Hindi-III /French-III	4	2	3
	II	English	UENL307/UENL308	Basic English III/ Advanced English III	5	3	4

	III	Core VII	UMAM306	Differential Equation	5	4	4
	III	Core VIII	UMAM307	Introduction to Probability Theory	5	5	5
	III	Allied	UCSA303	Mathematical Programming in C	3	3	3
	III	Allied Practical	UCSR305	Mathematical Programming in C Practical	3	2	2
	IV	Online Course		NPTEL/Spoken Tutorial	3	1	2
	IV	Value Education			2	1	1
				TOTAL	**30**	**21**	**24**
IV	I	Language	UTAL405/UTAL406/ UHIL401/UFRL401	Basic Tamil IV/ Advanced Tamil-IV/ Hindi-IV/French-IV	4	2	3
	II	English	UENL407/UENL408	Basic English IV/ Advanced English IV	5	3	4
	III	Core IX	UMAM405	Applications of Transforms	4	3	3
	III	Core X	UMAM406	Mechanics	4	4	4
	III	Core XI	UMAM404	Mathematical modeling	4	4	4
	III	Core XII	UMAP408/ UMAR409	Project / R Programming	**2**	--	-
	III	Allied	UPHA402	Electronics for Mathematics	3	3	3
		Allied Practical	UPHR404	Electronics for Mathematics Practical	2	2	2
	IV	Soft Skill			2	1	1
	V	Extension programme/ Physical Education			-	-	2
				TOTAL	**30**	**22**	**26**
V	III	Core XIII	UMAM501	Modern Algebra	6	6	5
	III	Core XIV	UMAM505	Real Analysis I	6	5	5
	III	Core XV	UMAM510	Number Theory	6	5	5
	III	Core XVI	UMAM510	Numerical Methods	3	3	3
		Core XVII	UMAR501	Numerical Methods Using R Programming	3	2	2
	III	Core XVIII	UMAP501/ UMAM511	Project/ R Programming	**4**	**4**	**5**
	IV	Value Education			2	1	1
				TOTAL	**30**	**25**	**26**
VI	III	Core XIX	UMAM610	Linear Algebra	5	5	5
	III	Core XX	UMAM611	Real Analysis II	6	6	6
	III	Core XXI	UMAM602/ UMAM507	Complex Analysis	6	6	6
	III	Core XXII	UMAM613	Operations Research	6	6	6
	III	Major Elective	UMAM614	Mathematics in Space Science	5	4	4
			UMAO606	Mathematics for construction craft	5	4	4
	III	Comprehensive Viva	UMAC601				
	IV	Soft Skill					
	V	Extension programme/ Physical Education			-	-	2
				TOTAL	**30**	**29**	**31**
				GRAND TOTAL	**180**	**140**	**156**

COURSES OFFERED TO OTHER DEPARTMENTS-UG ALLIED

Class & Major	Semester	Category	Course Code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
I B Com & I BCom (CA)		Allied	UMAA112	Business Mathematics	5	4	4
I B.SC PHY			UMAA104	Mathematics for Physics-I	5	5	5
I BCA			UMAA110	Mathematical Methods I	5	4	4
I B.Sc (CS) & I B.Sc ISM			UMAA113	Statistical Methods	6	4	4
I B.Sc (CS)	II		UMAA218	Mathematics for computer Science	6	4	4
I B.A (C.E)			UMAA105/ UMAA213	Statistics-I	5	4	4
II BCA			UMAA216	Mathematical Methods II	5	4	4
I B.SC PHY			UMAA212	Mathematics for Physics-II	5	5	5
II B.ScChem	III		UMAA304	Algebra, Differential Calculus and Trigonometry	5	5	5
II B.Sc BIO			UMAA305	Bio-Statistics	5	4	4
II B.A(CE)			UMAA205/ UMAA303	Statistics-II	5	5	5
II BBA/ II B.COM/ II B.COM CA			UMAA211/UMAA403/UMAA107/ UMAA301	Business Statistics	5	4	4
II B.ScChem	IV		UMAA406	Integral Calculus, Laplace Transform And Ordinary Differential Equations	5	5	5
II BBA			UMAA505/ UMAA410	Quantitative techniques for Business	5	4	4

NON-MAJOR ELECTIVE

Semester	Part	Category	Course Code	Course Title	Contact Hrs/ week	Credit
II	IV	Non Major Elective	UMAE204	Basic Mathematics for Science	4	2
			UMAE202	Mathematics for Business and Decision Making	4	2
			UIDE302/ UMAE302/ UMAE206	Numerical Methods using C++	4	2
			UMAE402/UMAE306	Operations Research for Managers	4	2
			UMAA501/UMAE305 UMAE207	Statistical Data Analysis through SPSS	4	2
			UMAE309/ UMAE208	Applied Mathematics	4	4

EXTRA CREDIT EARNING PROVISION

Semester	Part	Category	Course code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
II	III	Core	UMAI201	Summer Internship	-	-	1
IV	III	Core	UMAI401	Summer Internship	-	-	1
VI	III	Core	UMAP601 UMAS601 UMAS602 UMAS603	Project Fourier Transforms Simulation Number Theory	2	-	2

UMAM104 DIFFERENTIAL CALCULUS

Semester : I **Credit : 4**
Category : Core II **Hours/Week : 5**
Class &Major : I- B.Sc Mathematics **Total Hours : 65**

Objectives

To enable the students

- Understand functions, limits, derivative, continuous and inverse trigonometrically functions.
- Solve problems that deal with continuous change in quantities.
- Determine the limit existing, continuous, differentiable functions.

UNIT- I FUNCTIONS **10 Hrs**

Functions – Shifting Graphs – Trigonometric functions

UNIT- II LIMITS AND CONTINUITY **12 Hrs**

Rules for finding the limits - Definition of limits and its Extension – Continuity.

UNIT- III DERIVATIVES **14 Hrs**

The Derivative of a function – Differentiation Rules – Rates of change – Derivatives of Trigonometric functions - The Chain Rule.

UNIT- IV APPLICATIONS OF DERIVATIVES **15 Hrs**

Extreme values of Functions – Mean value theorem – The first Derivative test for Local Extreme Value – Graphing with y' and y" – Limits as $x \to \pm\infty$, Asymptotes, and Dominant Terms.

UNIT-V TRANSCENDENTAL FUNCTIONS **14 Hrs**

Inverse Trigonometric Functions – Derivatives of Inverse Trigonometric Functions; Integrals – Hyperbolic Functions – First order Differential Equations.

Text Book

- Thomas / Finney,"*Calculus and Analytic Geometry",* Addison –Wesley, 13th Edition, 2014.

Reference Book

- Tom.M.Apostol,"*CalCulus Volume –I"* , Second Edition,1966.

UMAM106 ANALYTICAL SOLID GEOMETRY

Semester : I	**Credit : 5**
Category :Core III	**Hours/Week: 6**
Class &Major: I B.SC Mathematics	**Total Hours : 78**

Objectives

To enable the Students

- Identify the fundamentals aspects of conics, Straight lines, Sphere and cone.
- Apply the geometrical problems of curves, straight lines, cone and sphere.

UNIT-I CONICS **16Hrs**

Polar coordinates equation of a conic -directrix -chord tangent-normal-simple problems -only in deriving equation of a conic.

UNIT-II STRAIGHT LINES **16Hrs**

Straight lines -co planarity of straight-line-shortest distance (S.D) and equation of Shortest distance between two lines-simple problems.

UNIT- III SPHERE **16Hrs**

Standard equation of sphere-results based on the properties of a sphere-tangent plane to a sphere-equation of a circle.

UNIT- IV CONE AND CYLINDER **16Hrs**

Cone whose vertex is at the origin-envelope cone of a sphere-right circular cone-equation of a cylinder-right circular cylinder.

UNIT- VCONICOIDES **16Hrs**

Nature of a conicoide -standard equation of central conicoid–enveloping cone tangent plane-condition for tangency–director Sphere-director plane

Text Books

- ManickavachagamPillai ,T.K. and Natarajan,T. "*Analytical geometry (part II)"*, Viswanathan.S printers and publishers, 2010.

Reference Book

- Sharma S. Singhal.K, Gupta D.B,"*Text book of Analytical Geometry",* Krishna prakashamMandir, Meerat,1995.

UMAM107 FUNDAMENTALS OF MATHEMATICS

Semester : I **Credit : 1**
Category : Core I **Hours/Week : 2**
Class & Major : I B.SC Mathematics **Total Hours : 36**

Objectives

To Enable the Students

- Acquire in depth knowledge in theory of equation, Algebra and Discrete Mathematics.
- Use Problem solving skill in theory of equation, Function and Discrete mathematics.
- Apply the principle of induction method for proving the theorems.

UNIT - I THEORY OF EQUATION **6 Hrs**

Polynomial equation - Irrational roots - Complex roots-Reciprocal equations

UNIT - II FUNCTIONS **4 Hrs**

Functions and Operators - one-one function - onto functions - Special type of functions - Invertible functions - Composition of functions.

UNIT- III ALGEBRA **4 Hrs**

Binomial - Exponential and Logarithmic Series.

UNIT - IV DISCRETE MATHEMATICS **4 Hrs**

Propositional logic - Logical operators – Conjunction – Disjunction - Conditional and Bi-conditional operators - logically equivalent – Tautology.

UNIT – V BASIC DIFFERENTIATION AND INTEGRATION **8 Hrs**

Differentiation: Definition- Standard forms (no proof) - sum, difference, product, Quotient rule_ function of function rule-inverse functions-Hyperbolic functions-inverse hyperbolic functions-Logarithmic function.

Integration: Basic integration formula-integration by parts- Trigonometric substitution

Text Books

- Dr.Venkatraman.M .K," *Discrete Mathematic*", National Publishing Company, Chennai, 2003.
- Narayanan and Manicavachagom Pillay.T.K, "*Algebra"*, Viswanathan. K Printers & Publishers Pvt, Ltd., Chennai, 2004.

UMAA111 MATHEMATICAL STATISTICS

Semester : I **Credit : 5**
Category : Allied **Hours/Week : 6**
Class &Major : I B.Sc Mathematics **Total Hours : 78**

Objectives

To enable the students

- Discuss some Statistical Characteristics, Discrete and Continuous Distributions and their properties.
- Classify sampling theory significance tests and testing of hypothesis.
- Discuss Correlation and Regression.

UNIT-I DISCRETE AND CONTINUOUS PROBABILITY DISTRIBUTION 15Hrs

Random variable – Probability distributions – Discrete and Continuous-Mathematical expectation- moments, moment generating function-characteristic function.

UNIT-II SPECIAL DISCRETE AND CONTINUOUS DISTRIBUTIONS 15Hrs

Introduction – Binomial, Poisson Distributions – Normal Distributions.

UNIT-III CORRELATION AND REGRESSION 12Hrs

Correlation co-efficient, linear regression – equations of lines of regression.

UNIT-IV TEST OF SIGNIFICANCE – LARGE SAMPLE 18Hrs

Introduction- Types of sampling – Large samples – Testing the significance for a single proportion - Testing of significance for difference of proportions – Sampling of values of a variable – Sampling distribution of the mean – confidence limits – Testing the significance of difference between standard deviations of two large sample.

UNIT-V TESTS OF SIGNIFICANCE - SMALL SAMPLES 18Hrs

Introduction – Chi- square distribution – Student's *t*- distribution – Snedecor's*F* distribution(Definitions only) – Properties(Statements only) – Test of Significance based on *t*, *F*- distributions, χ^2 test of goodness of fit, χ^2 test of independence.

Text Book

- *"Mathematical Statistics"*, Kapur J. N. and H.C. Saxena, 20-th Edition, S. Chand & Co. Ltd., New Delhi, 2010.

Reference Books

- Gupta S.C. &V.K.Kapoor, "*Fundamentals of Mathematical Statistics"*, 9-th Edition, Sultan Chand & Sons, New Delhi, 1994.
- Vittal P.R., "*Mathematical Statistics"*, Margham Publications, Chennai, 2002.

UMAM204 INTEGRAL CALCULUS

Semester : II **Credit : 5**
Category : Core IV **Hours/Week: 5**
Class &Major : I- B.Sc Mathematics **Total Hours :65**

Objectives

To enable the students

- Acquire knowledge of Integration, techniques of Integration, Multiple and line integrals.
- Determine the Area, volume, length of a curve.

UNIT- I INTEGRATION 14Hrs

Indefinite Integrals – Differential Equations, Initial value problem, and Mathematical modeling- Integration by substitution – Running the Chain Rule Backward – Properties, Area, and the Mean value Theorem – The fundamental Theorem – Substitution in Definite Integrals.

UNIT- II APPLICATION OF INTEGRALS 13Hrs

Areas between curves- Finding Volumes by slicing -Volumes of solids of revolution- Cylindrical shells- Lengths of plane curves – Area of Surface of Revolutions.

UNIT- III TECHNIQUES OF INTEGRATIONS 13Hrs

Basic integrations formulas- Integration by Parts- Partial Fractions- Trigonometric Substitution.

UNIT- IV MULTIPLE INTEGRALS 12Hrs

Double Integrals – Areas, Moments and center of mass – Double integrals in polar forms- Triple integrals in rectangular co-ordinates- masses and moments in three dimensions – Triple integrals in cylindrical and spherical co-ordinates.

UNIT-V INTEGRATION IN VECTOR FIELD 13Hrs

Line Integrals – Vector fields, Work, Circulation and Flux – Path independence, Potential Functions and Conservative Fields – Green's Theorem in Plane – Surface area and Surface integrals.

Text Book

- Thomas/ Finney, *Calculus and Analytic Geometry*, Addison –Wesley, 13-th Edition, 2014.

UMAM402/UMAM205 GRAPH THEORY

Semester : II **Credit : 4**
Category : Core V **Hours/Week : 5**
Class &Major : I B.Sc Mathematics **Total Hours : 65**

Objectives

To enable the students

- Understand the fundamentals of graph theory
- Relate the basic concepts of graph theory with the real life problems.
- Apply the concepts of colorings, matching in real life challenges like scheduling, map coloring etc.

UNIT-I GRAPHS & SUB GRAPHS **10Hrs**

Graphs and simple graphs – Graph Isomorphism – The incidence and Adjacency Matrices – Sub graphs – Vertex Degrees – Simple exercise problems.

UNIT-II PATHS & CYCLES **10Hrs**

Path and Connections – Cycles – Shortest path problem _ Simple exercise problems.

UNIT-III TREES **10Hrs**

Trees – Cut edges and Bonds – Cut vertices – The connector problem.

UNIT-IV CONNECTIVITY **17Hrs**

Connectivity – Blocks – Euler tours – Hamiltonian Cycles –The ChinesePostman Problem.

UNIT-V MATCHINGS & COLORINGS **18Hrs**

Matchings – Matchings and Coverings in Bipartite Graphs – Edge Chromatic number – The Timetabling problem.

Text Book

- J.A. Bondy and U.S.R Murty "*Graph Theory with Applications"* The Macmillan Press Ltd, Associated company in Madras.

Reference Book

- Douglas B. West"*Introduction to Graph theory"* Second edition, Prentice Hall in India, 2000.

UMAM606/UMAM206 DISCRETE MATHEMATICS

Semester : II **Credit : 4**
Category : Core VI **Hours/Week : 5**
Class &Major :I B.Sc. Mathematics **Total Hours : 65**

Objective

To enable the students

- Discuss the concept of automation and Boolean algebra.
- Apply Automata formal Languages in compiling and complexity theory.
- Apply Boolean algebra in Logic circuits

UNIT –I LOGIC **10Hrs**

Logic- Introduction- TF Statements- Connectives- Atomic and Compound statements- well formed (statement) formulae-Truth table of a formula- Tautology-Tautological Implications and Equivalence of Formulae.

UNIT – II NORMAL FORMS **10Hrs**

Normal forms – Disjunctive Normal forms- conjunctive Normal Forms- Principal Normal Forms – Principal Disjunctive Normal Forms- Principal Conjunctive Normal Forms.

UNIT – III LATTICES **12Hrs**

Lattices- Some Properties of Lattices- New Lattices-Modular and Distributive Lattices.

UNIT – IV BOOLEAN ALGEBRA **15Hrs**

Boolean algebra- Boolean Polynomials- Karnaugh Map- Switching Circuits.

UNIT – V AUTOMATA THEORY **18Hrs**

Automata- Introduction- Finite Automation-Definition- Representation of finite Automation-Acceptability of a string by a Finite Automation- Languages accepted by a Finite automation- Non-Deterministic Finite automata- Acceptability of a String by Non-Deterministic Finite Automata- Equivalence of FA and NFA- Procedure for finding an FA equivalent to a given NFA.

Text Book

- Dr.Venkatraman.M.K, Sridharan.N, Chandrasekaran.N, " *Discrete Mathematics*", The National Publishing Company, Chennai. 2006

Reference Books

- Sundaresan.V, GanapathySubramanian.K.S & Ganesan.K" *Discrete Mathematics*", A.R.Publications, 1996.

UMAA112 BUSINESS MATHEMATICS

Semester : II **Credit : 4**
Category : Allied **Hours/Week: 5**
Class & Major : I B.Com/B.Com(CA) **Total Hours:65**

Objectives
To enable the students

- Define basic in mathematics which are applicable in business.
- Discuss the analytical skills .
- Express the computational skills.

UNIT-I OPTIMIZATION **10Hrs**

Basic Calculus – Rules for Differentiation – Maxima and Minima and their Applications to Business.

UNIT-II COMMERCIAL ARITHMETICS **13Hrs**

Commercial Arithmetic –Simple and Compound Interest –Annuties-Sinking Funds-Discount and Present Values of Perpetuity.

UNIT-III DETERMINISTIC BUSINESS MODELS **15Hrs**

Simple Marketing Models-A Simple Advertising Budget Model-A Simple Inventory Model-determination of optimum warehouse torritories.

UNIT-IV MATRICES **15Hrs**

Matrix – Operations on Matrices– Inverse of a Square Matrix (not more than 3^{rd} order).

UNIT-V INTEGRATION **12Hrs**

Solving simultaneous equations using matrix method- Integration and their applications to business.

Text Book

- Sundaresan.V & Jeyaseelan.S.D, "*An Introduction to Business Mathematics",* S.Chand and Co, Pvt.Ltd, New Delhi, 2003.

Reference Book

- Aggarwal B.M, "*Business Mathematics and Statistics Fundamentals",* Sultan Chand and Sons Pvt.Ltd, New Delhi, 2003.

UMAA104 MATHEMATICS FOR PHYSICS-I

Semester : II **Credit : 5**
Category : Allied **Hours/Week: 5**
Class & Major : I B.Sc Physics **Total Hours : 65**

Objectives
To enable the students

- Discuss knowledge in Mathematics.
- Apply the techniques of various branches of mathematics.
- Practice the students to apply the techniques in their respective major subjects.

UNIT-I ALGEBRA **15Hrs**

Binomial theorem for rational index-exponential and logarithmic series – summation and simple approximations related to binomial, exponential and logarithmic series.

UNIT-II MATRICS **13Hrs**

Cayley Hamilton theorem – verification – finding inverse of a matrix using Cayley Hamilton theorem-Eigen values and Eigen vectors (simple problems only for matrices of order upto3 X 3).

UNIT-III DIFFERENTIAL CALCULUS **10Hrs**

Successive differentiation-Leibentiz theorem and its applications- Jacobian- Concept of polar coordinates radius of curvature in Cartesian coordinates.

UNIT-IV TRIGONOMETRIC SERIES **12Hrs**

Complex numbers-Applications of De-Movire's theorem-Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$,- Expansions of $\sin^n\theta$, $\cos^n\theta$-Expansion of $\sin\theta$, $\cos\theta$, $\tan\theta$ in powers of θ.

UNIT-V HYPERBOLIC FUNCTIONS **15Hrs**

Hyperbolic Functions-Inverse Hyperbolic Functions -relation between circular and hyperbolic functions-logarithm of complex numbers.

Text Books

- Narayanan and Manichavaschagam Pillay,*Algebra Volume I,* Viswanathan.S (Publishers & Printers) Pvt. Ltd., 1996.
- Narayanan and Manichavachagam Pillay,*Calculus*, Volume I Viswanathan.S (Publishers & Printers) Pvt. Ltd., 1994.
- Narayanan.S & Manicavachan Pillay.T.K, *Trignometry,* Chennai. Vishwanathan.S Printers & Publishers pvt ltd., 9th edition, 1994.

UMAA110 MATHEMATICAL METHODS – I

Semester : II **Credit : 5**
Category : Allied **Hours/Week : 6**
Class & Major : I BCA **Total Hours : 78**

Objectives
To enable the students

- Discuss the basic concepts of set theory and relations.
- Express themselves to the fundamentals of differentiation.
- Apply binary operators in automation.

UNIT-I SYMBOLIC LOGIC **16Hrs**

Proposition- Logical operators- conjunction- disjunction- negation- conditional and bi-conditional operators- converse- Inverse- Contra Positive- logically equivalent- tautology and contradiction-Arguments and validity of arguments.

UNIT-II SET THEORY **10Hrs**

Sets- set operations- venndiagram- Properties of sets- number of elements in a set Cartesian product.

UNIT-III RELATIONS **16Hrs**

Equivalence relation- Equivalence clas- Partially and Totally Ordered sets- Functions- Types of Functions- Composition of Functions.

UNIT-IV BINARY OPERATORS AND AUTOMATA THEORY **16Hrs**

Types of Binary Operations- Commutative- Associative- Distributive and Identity Boolean algebra- Simple Properties.Finite state machine.

UNIT-V DIFFERENTIATION **20Hrs**

Derivation-Differential coefficient of a sum (or difference) – Product rule-Quotient rule Successive differentiation- partial differentiation- Applications of differentiation- Tangent and Norma- angle between two curves- Maximum and Minimum values[Second derivatives test].

Text Books

- Venkataraman.M.K,*Discrete Mathematics*, National Publishing Company.Chennai,2003.
- Narayanan.S & Manicavacham pillay.T.K ,Differential Calculus,Volume I, Viswanathan.S(Publishers and Printers)Pvt.Ltd,Chennai,2003.

Reference Books

- Balaji.G, *Discrete Mathematics*,G.Balaji Publishers,Chennai, 2006.
- Kandasamy.P,Thilagavathi.K,Gunavathi.K,*Engineering Mathematics-I*,S.Chand & Company Ltd.Chennai,2003.

UMAA113 STATISTICAL METHODS

Semester : II **Credit : 4**
Category : Allied **Hours/Week:5T+1P**
Class & Major : I BCA **Total Hours :78**

Objectives
To enable the Students

- Get adequate knowledge in the distributions involving univariate and bivariate.
- Understand the Significance of Statistical techniques.
- Develop sound statistical techniques for handling, analyzing, and interpreting numerical data.

UNIT – I PRESENTATION OF DATA (12+2)Hrs

Diagrammatic and graphical representation of Statistical data-Significance of diagrams and graphs-types of diagrams-one dimensional diagrams, two dimensional diagrams-pictograms and cartograms. Graphs of frequency distribution-Histogram, frequency polygon, frequency curve-Ogive curves.

UNIT - II MEASURES OF CENTRAL TENDENCY (13+3)Hrs

Measures of central tendency-Requisites of a good average-types of averages-Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean and their merits and demerits-Graphical determination of Median, Quartiles, Deciles, Percentiles and Mode.

UNIT - III MEASURES OF DISPERSION (13+3)Hrs

Measures of Dispersion-Range, Quartile deviation, Mean deviation, Standard deviation, and their relative measures, Combined Standard deviation, Coefficient of Variation-Merits and demerits of these methods-Lorenz curve. Skewness-Measures of Skewness-Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness, Kelly's co-efficient of Skewness-moments-Measures of skewness based on moments and Measure of Kurtosis.

UNIT - IV CORRELATION (15+3)Hrs

Correlation Analysis-Significance or the study of correlation- types of correlation-Methods studying Correlation-Scatter diagram method, Graphical methods, Karl Pearson's co-efficient of correlation, Spearman's Rank correlation coefficient, Concurrent Deviation method-Properties of Coefficient of Correlation.

UNIT - V REGRESSION (12+2)Hrs

Regression Analysis-Uses of Regression analysis-Regression lines-Regression equations-Properties of regression coefficient.

Practical

- Presentation of data-Diagrams &Graphs
- Calculation of Measures of central tendency-Mean, Median, Mode, Geometric mean,

- Harmonic Mean
- Calculation of Measures of Dispersion-Range, Quartile deviation, Mean deviation,
- Standard deviation and its relative measures and Skewness
- Karl Pearson's correlation coefficient
- Regression equation of X on Y &Y on X

Text Book

- GuptaS.P.,*Statistical Methods",*Sultan Chand and Sons,2011.

Reference Books

- Gupta.S.C.and Kapoor.V.K,*Elements of Mathematical Statistics",*Sultan Chand and Sons,2006.
- SnedecorG.W and Cochran W.G.,*Statistical Methods*,Oxford Press and IBH.1967.

UMAA 218 MATHEMATICS FOR COMPUTER SCIENCE

Semester : II **Credit : 4**
Category : Allied **Hours/Week : 6**
Class & Major: I B.SC computer science /I B.SC ISM **Total Hours : 78**

Objectives
To enable the Students

- Acquire knowledge in Mathematics.
- Apply the techniques of various branches of mathematics.
- Discuss the students to apply the techniques in their respective major subjects.

UNIT-I ALGEBRA **15 Hrs**

Binomial Series – Statement of binomial theorem for any index – A few important expansions – application of the binomial theorem to the summation of Series. Exponential series – summation of series using exponential series – the Logarithamic series.

UNIT-II DIFFERENTIAL CALCULUS **16 Hrs**

Higher derivative – n^{th} derivative – Formation of equation involving derivative – Leibnitz formula for the n^{th} derivative of a product (statement only). Radius of curvature (Cartesian formula only) Jacobian

UNIT-III TRIGNOMETRY **15 Hrs**

Expansion of Cos $n\theta$ and Sin $n\theta$- Powers of sines and cosines of θ in terms of function of multiple of θ - Expansion of $\cos^n\theta$ when n is the positive integer – Expansion of $\sin^n\theta$ when positive integer. Logarithm of complex number .

UNIT-IV INTEGRATION **16 Hrs**

Definite integral – properties of definite integrals – Integration by parts using Bernouli's formula – double integral.

UNIT-V LAPLACE TRANSFORM **16 Hrs**

Definition – Inverse Laplace transform – Solving second order differential equations using Laplace transform.

Text Books

- Narayanan.S, Hanumantha Rao.R, Manicavachagom Pillay "*Ancillary Mathematics Volume –I"***,** S.Viswanathan (Printers & Publishers) Pvt .Ltd, Chennai, 2008.
- Narayanan.S, Hanumantha Rao.R, Manicavachagom Pillay, "Ancillary Mathematics Volume –II", S.Viswanathan (Printers & Publishers) Pvt .Ltd, Chennai, 2008.

Reference Books

- Narayanan.S & Manickavachagom Pillay, T.K "*Algebra Volume I*"**,** Vishwanathan.S (Printers & Publishers) pvt ltd., Chennai, 1996.
- Narayanan.S & Manickavachagom Pillay, T.K "*Calculus Volume I*"**,** Vishwanathan.S (Printers & Publishers) pvt ltd., Chennai, 1994.
- Narayanan.S & Manickavachagom Pillay, T.K "*Trignometry*"**,** Vishwanathan.S (Printers & Publishers) pvt ltd., Chennai, 9th Edition 1994.

UMAA105/UMAA213 STATISTICS -I

Semester : II **Credit : 4**
Category : Allied **Hours/Week: 4T+1P**
Class & Major : I B.A. Corporate Economics **Total Hours : 65**

Objectives
To enable the Students

- Discuss various Statistical measures applicable in Business and Economic analysis.
- Apply Statistical tools to business problems.

UNIT-I NATURE SCOPE AND SIGNIFICANCE **10 Hrs**

Nature and Scope of Statistics-Significance and Limitation of Statistics- Collection, Classification and tabulation of data.

UNIT-II PRESENTATION OF DATA **(10+5) Hrs**

Diagrammatic and Graphic representation –Bar diagrams-Pie diagrams-Histogram-Cartograms- Frequency distribution- Frequency curve- Graphs- Ogives- Lorenz curve.

UNIT-III MEASURE OF CENTRAL TENDENCY (12+3) Hrs

Arithmetic mean- Median- Quartiles- Percentiles and Deciles- Mode- Geometric mean and Harmonic mean

UNIT-IV MEASURE OF DISPERSION (10+3)Hrs

Range- Quartile Deviation- Mean Deviation- Standard Deviation- Co-efficient of variation.

UNIT-V SKEWNESS AND KURTOSIS (10+2) Hrs

Karl Pearson,s and Bowley,s co-efficient of Skewness- moments

Practical

- Presentation of data- Diagrams and Graphs**.**
- Calculation of Measures of central tendency- Mean, Median, Mode, Geometric mean, Harmonic mean
- Calculation of measures of Dispersion – Range, Quartile deviation, Mean deviation, standard deviation and its relative measures and skewness.

Text Books

- Gupta S.P., *Statistical Methods,* Sultan Chand and Sons, 2011.

Reference Books

- Agarwal B.L.,*Basic Statistics,* Wiley Eastern, 2002.

UMAA216 MATHEMATICAL METHODS – II

Semester : II **Credit : 5**
Category : Allied **Hours/Week: 6**
Class & Major : I BCA **Total Hours :78**

Objectives
To enable the students

- Understand the basic concepts of matrices.
- Explore themselves to the fundamentals of integration.
- Apply the technique of differentiation in vectors.

UNIT-I MATRICES 13 Hrs

Multiplication of matrices- Singular and Non-Singular matrices- Adjoint of a Matrix-Inverse of a Matrix Symmetric and Skew –Symmetric-Hermitian and Skew-Hermitian-Orthogonal and Unitary matrices-Rank of a matrix.

UNIT-II SOLVING LINEAR EQUATIONS 15 Hrs

Solution of Simultaneous Linear equations by Matrix Inversion Method- Test for Consistency and Inconsistency of Linear equations(Rank Method) Characteristic roots and Charactetristic Vectors-Cayley – Hamilton Theorem.

UNIT-III INTEGRATION **15 Hrs**

Integration by Substitution- Integration of rational and irrational function of the form

$$\frac{1}{ax^2+bx+c}, \frac{1}{\sqrt{ax^2+bx+c}}, \sqrt{ax^2+bx+c}, \quad \frac{px+q}{ax^2+bx+c}, \frac{px+q}{\sqrt{ax^2+bx+c}}.$$

UNIT-IV DEFINITE INTEGRAL **17 Hrs**

Definition and Properties of definite Integrals- Reduction formulae for

$$\int x^n e^{ax} dx, \int sin^n x dx, \int \cos^n x dx, \int x^m (1-x)^n dx,$$

UNIT-V DIFFERENTIATION OF VECTORS **18Hrs**

Vector functions-derivatives of vectors-Gradient-Divergence and Curl, Properties of Curl,Properties of a Gradient functions-Directional Derivative-Solenoidal and Irrotationals.

Text Book

- Manicavachagom pillay & Natarajan,Ganapathy, *Vector Analysis,* S.Viswanathan Printers and publishers **Pvt.Ltd** , 2003.

Reference Book

- Duraipandian.P, Dr.Udayabaskaran.S, *Allied Mathematics – Volume I,* Muhil Publishers, Chennai, 1997.

UMAA212 MATHEMATICS FOR PHYSICS-II

Semester : II **Credit : 5**
Category : Allied **Hours/Week: 5**
Class & Major : I B.Sc Physics **Total Hours: 65**

Objectives
To enable the students

- Discuss knowledge in Mathematics
- Apply the techniques of various branches of Mathematics.

UNIT-I INTEGRATION **12Hrs**

Standard Integrals-Properties of definite integrals.

UNIT-II INTEGRATION BY PARTS **15Hrs**

Integration by parts – Double integrals – Applications of double integrals to find areas.

UNIT-III SEQUENCE AND SERIES 15Hrs

Sequence and series- functions of a complex variable- Analytic functions- Cauchy Riemanns Equations- Harmonic Functions- Construction of analytic functions.

UNIT-IV LAPLACE TRANSFORM 10Hrs

Laplace transform of functions – Inverse Laplace transforms – Application of Laplace transforms in solving differential equations.

UNIT-V DIFFERENTIAL EQUATIONS 13Hrs

Formation of Partial Differential Equation – Second order differential equations with constant co-efficients –Homogeneous linear differential equations of the second order with variable co-efficients.

Text Books

- Manicavachagom pillai, T.K, *Ancillary Mathematics Integral calculus*, Viswanathan.S Publishers & Printers Pvt.Ltd., Chennai, 2010.
- Narayanan.S & Manicavachagom Pillay.T.K, *Complex Analysis*, Vishwanathan.S Printers & Publishers, Pvt.Ltd., Chennai, 1994.

UMAE204 BASIC MATHEMATICS FOR SCIENCE

Semester : II **Credit : 2**
Category : Non Major Elective **Hours/Week : 4**
Class & Major : I UG **Total Hours : 52**

Objectives

To enable the students

- Understand the basic concepts of Matrices and Trigonometry.
- Explore themselves to the fundamentals of differentiation and integration.

UNIT-I MATRICES 10Hrs

Multiplication of matrices-Singular and Non-Singular matrices-Adjoint of a matrices-Inverse of a matrices-Symmetric and skew Symmetric-Hermitian and Skew Hermitian-Orthogonal and unitary rank of a matrix.

UNIT-II SOLVING LINEAR EQUATIONS 10Hrs

Solution of Simultaneous Linear Equations by Matrix Inversion Method-Test for consistency and Inconsistency of Linear equations(Rank Method).

UNIT-III DIFFERENTIATION 11Hrs

Derivation-Differential coefficient of a sum (or difference)-Product rule-Quotient rule, Function of Function Rule.

UNIT-IV INTEGRATION **11Hrs**

Definition-Standard formulae.

UNIT-V INTEGRATION BY PARTS **10Hrs**

Integration by parts.Simple problems.

Text Books

- S.Narayanan Manicavachagom Pillay & Natarajan, Ganapathy,*Vector Analysis*, Vishwanathan.S Printers & Publishers Pvt,Lltd., Chennai, 1991.
- Kandhasami Thilagavathy, *Allied Mathematics Volume-II*,S.Chand & Co Pvt. Ltd.,New Delhi,2004.
- Dr.Venkatraman.M.K,Manorama Sridhar,*Allied Mathematics*,Agasthiar Publications Pvt.Ltd.,Trichy,2005.

UMAE202 MATHEMATICS FOR BUSINESS AND DECISION MAKING

Semester : II **Credit : 2**
Category : Non Major Elective **Hours/Week : 4**
Class & Major : I UG **Total Hours : 52**

Objectives

To enable the students

- Discuss a scientific basis to the decision-makers for obtaining optimal solution.
- Introduce a few basic concepts of mathematics, their application in business.
- Analyze decision problem, with effective application to real life in optimization of objectives.

UNIT-I SET THEORY **10 Hrs**

Set and set operation – Venn diagrams- elements of co-ordinate systems – the slope intercept form of equation of the straight line.

UNIT-II MATRICES **10 Hrs**

Matrices; Fundamental ideas about matrices and their operational rules – Matrix multiplication – inverse of square matrices of not more than 3 ×3 order-basic of calculus-rules of differention-intergration and their applications to business.

UNIT-III MATHEMATICS FOR FINANCE **10 Hrs**

Simple and Compound interest – Annuities – Sinking funds – Discounts and present Values.

UNIT-IV DECISION THEORY **10 Hrs**

Introduction – Decision making environment – the maximin or minimax criterion – the savage criterion – the Hurwitz criterion.

UNIT-V THEORY OF GAMES **12 Hrs**

Pure Strategy (Saddle point) – Dominance property – Mixed Strategies (2×2 Games,2×n Games or m×2 Games, 3×3 Games) – Two-Person Zero Sum Games.

Text Books

- Gupta,P.K, Hira,D.S, *Operations Research*, S.Chand &Company Ltd.
- T Kanthi Swarup,P.K.Gupta, Manmohan, *Operation Research*, S.Chand & Co, Pvt Ltd, New Delhi,2006.
- Sundharesan and Jayaseelan, *An Introduction to Business Mathematics*, S.Chand and Co Pvt.Ltd, New Delhi, 2003.

UMAE302/UMAE206 NUMERICAL METHODS USING C++

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4**
Class & Major : II UG **Total Hours : 52**

Objectives

To enable the students

- Understand the various tools in solving numerical problems.
- Apply these methods in a computer environment.

UNIT-I INTRODUCTION TO C++ **10 Hrs**

Variables-input and output—If statement-Logical operators-Nested If and Switch statements – For statement – While statement –Arrays – Pointers – Library functions – user defined function.

UNIT-II SYSTEM OF LINEAR EQUATIONS **10 Hrs**

Gauss – Elimination method – Pivoting – Gauss –Jordan Elimination method – Gauss – Seidal Iteration method

UNIT-III NON-LINEAR EQUATIONS AND INTERPOLATION **10 Hrs**

Bisection - method – Newton's method – Interpolation – Newton's dived difference formula – Lagrange's interpolation – Newton's forward and backward difference formula. (Application of C++ Programming is included for Units III & IV)

UNIT-IV NUMERICAL DIFFERENTIATION **10 Hrs**

Numerical Differentiation – Numerical Integration – Newton's cotes method – Trapezoidal rule – Simpson's rule.

UNIT-V NUMERICAL DIFFERENTIAL EQUATIONS **12Hrs**

Initial value problem – Euler's method – Runge – Kutta method – Boundary value problem.

Text Books

- James M.Ortega Andrew S.Grimshaw., *An Introduction to c++ and Numerical Method*, Oxford University Press, New York, 1999.
- Jain M.K, Iyengar S R K and Jain R K.,*Numerical Methods for Scientific and Engineering Computation*, Wiley Eastern Ltd. New Delhi,1999.

Reference Books

- Balagurusamy E., *Object Oriented Programming with C++*, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1996
- Froberg C.E, "*Introduction to Numerical Analysis*", Addison-Wesely Publishing Company, 1972.

UMAE 402/UMAE306 OPERATIONS RESEARCH FOR MANAGERS

Semester : IV **Credit : 2**
Category : NME **Hours/Week : 4**
Class & Major: II UG **Total Hours : 52**

Objectives

To enable the students

- Understand the various techniques of research.
- Solve real life problems in Business and Management.
- Enlighten on applications in management techniques.

UNIT-I LINEAR PROGRAMMING PROBLEM 12Hrs

Mathematical Formulation of the Problem- Graphical Solution Method- General Linear Programming Problem- The Computational Procedure- Simple problems.

UNIT-II TRANSPORTATION PROBLEM 10Hrs

General Transportation Problem-The Transportation Table-Loops in Transportation Tables-Solution of a Transportation Problem-Finding an Initial Basic Feasible Solution-Test for Optimality-Degeneracy in Transportation Problem-Transportation Algorithm(MODI Method). Simple problems.

UNIT-III ASSIGNMENT PROBLEM 10Hrs

Mathematical Formulation of the problem- the Assignment method- Special Cases in Assignment Problem. Simple problems.

UNIT-IV GAME THEORY 10Hrs

Two-person Zero-sum Games- Some Basic Terms- The Maximin- Minimax Principle- Games Without Saddle Points-Mixed Strategies- Graphic Solution of 2x n and m x 2 Games- Dominance Property. Simple problems.

UNIT-V NETWORK SCHEDULING BY PERT/CPM 10Hrs

Network and Basic Components- Logical Sequencing- Rules of Network Construction- Critical Path Analysis- Simple problems.

Text Book

- Kanti Swaroop,Gupta P.K.and Manmohan, "*Operation Research*", Sultan Chand & Sons,Delhi, 2003.

Reference Books

- Kapoor .V.K, "*Introduction to Operation Research*" Sulthan Chand & Sons 1996.
- Sharma S.D, "*Operation Research*" Kedar Nath Ram Nath & Co 1995
- Taha.A Hamdy, "*Operation Research-An Introduction*", Prentice hall of India pvt ltd,New Delhi, 6th edition, 2000.

UMAA501/UMAE 305/UMAE207 STATISTICAL DATA ANALYSIS THROUGH SPSS

Semester : III **Credit : 2**
Category : NME **Hours/Week: 3T+1P**
Class & Major : II UG **Total Hours : 52**

Objectives
To enable the students

- Understand the techniques of statistical data analysis.
- Analyse data using various statistical techniques to evaluate research results through SPSS.

UNIT-I INTRODUCTION TO SPSS (8+2)Hrs

Essential terminology for all SPSS users – getting to SPSS for windows – the components of window – SPSS for windows screens – crucial preliminaries – entering data into SPSS – editing data – saving data file – retrieving data file.

UNIT-II ANALYSIS USING SPSS (7+2)Hrs

Merging data files – adding scores to existing cases – add variables – running a simple analysis and obtaining the output.

UNIT-III DIAGRAMS AND GRAPHS (7+3)Hrs

Checking the data – Box plots of score distributions – listing of the data using case summarizes – graphs – bar, line, pie chart, scatter plots and histograms.

UNIT-IV PARAMETRIC AND NON PARAMETRIC TEST (9+3)Hrs

Frequency distributions – measures of frequency distributions – cross tabulations – obtaining two sample chi-square tests – log linear analysis – parametric statistical tests – comparing means – paired and unpaired t-test.

UNIT-V CORRELATION AND REGRESSION ANALYSIS (8+3)Hrs

Correlation and multiple regression – analyzing nominal and ordinal data – nonparametric analysis – Wilcoxon, Mann-Whitney and Kruskal Wallis tests – the concept of test reliability – assessing test reliability.

Text Book

- Rajathi.A and Chandran.P, SPSS for you, MJP Publishers, 2010.

Reference Books

- Clifford E. Lunenburg., "*Data analysis by resampling: concepts and applications*" Dusbury Thomson learning, Australia, (2000).
- Everitt, B.S and Dunn.G "*Applied multivariate data analysis*". Amold London, (2001).
- Jeremy J. Foster., "*Data analysis using SPSS for windows*.", New edition version 8-10, Sage publications, London, (2001).

PRACTICALS

- Entering data, labels, values.
- Presentation of data – Diagrams & Graphs
- Measures of location
- Measures of Dispersion
- Karl Pearson's correlation coefficient
- Spearman's rank correlation
- Regression equation of X on Y
- Regression equation of Y on X
- Cross tabulation
- Test for single mean
- Test for difference between two sample means – Independent samples
- Test for difference between two sample means – dependent samples
- Test for difference between two sample variances.

Non-parametric Test

- Chi- square test of goodness of fit.
- Chi-square test for independence of attributes.

UMAE309/UMAE208 APPLIED MATHEMATICS

Semester : III **Credit : 2**
Category : NME **Hours/Week: 4**
Class & Major : II UG **Total Hours : 52**

Objectives
To enable the Students

- Understand the properties of Matrix and Partial differential equations, and graphs.
- Apply the concept of linear algebra and graph theory for scientific computing
- Analyze numerical problems in science applications.

UNIT - I LINEAR ALGEBRA **10 Hrs**

Linear system of equations – Gauss Elimination - Rank of matrix – inverse of a matrix – Gauss Jordan Elimination- applications.

Chapter 7: Sec 7.2 -7.3,7.8

UNIT - II LINEAR ALGEBRA (CONTD.) **10 Hrs**

The matrix Eigen value problem – Eigen value and Eigen vectors- some applications of Eigen value problems.

Chapter 8: Sec 8.1 -8.2

UNIT- III NUMERICAL APPLICATIONS **10 Hrs**

Solution of equations by iterations – Newton Rapson Method- Interpolation – Lagrange's interpolation – Spline interpolation

Chapter 19: Sec 19.2 -19.4

UNIT – IV MEASURE THE RATE OF RETURN OF AN INVESTMENT **10 Hrs**

Basic Concepts of PDE –Modeling – Wave equation –Heat equation -Applications

Chapter 12: Sec 12.1 -12.2, 12.5

UNIT – V APPLICATIONS OF GRAPHS **12 Hrs**

Graphs and Digraphs- Computer representation of graphs – shortest paths problems- Spanning tree-Applications

Chapter 23: Sec 23.1, 23.2, 23.4

Text Books

- Erwin Kreyszig, *"Advanced Engineering Mathematics",*Wiley publications, Tenth edition, 2016.

Reference Books

- Grewal.B.S, "*Higher Engineering Mathematics"* Khanna Publications,43rd edition, 2015.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core III	UMAM106	Analytical Geometry	Assignment	Assignment
	Core I	UMAM107	Fundamentals of Mathematics	Assignment	Assignment
	Core II	UMAM104	Differential Calculus	Assignment	Assignment
	Allied	UMAA111	Mathematical statistics	Assignment	Assignment
II	Core IV	UMAM204	Integral calculus	Assignment	Assignment
	Core V	UMAM402/ UMAM205	Graph theory	Assignment	Assignment
	Core VI	UMAM606/ UMAM206	Discrete Mathematics	Assignment	Assignment

III and IV EVALUATION COMPONENTS OF CIA-ALLIED

Semester	Category	Course code	Course Title	Component III	Component IV
I	ALLIED	UMAA112	Business Mathematics	Assignment	Assignment
		UMAA104	Mathematics for Physics-I	Assignment	Assignment
		UMAA110	Mathematical Methods I	Assignment	Assignment
		UMAA113	Statistical Methods	Assignment	Assignment
II		UMAA218	Mathematics for computer Science	Assignment	Assignment
		UMAA105/ UMAA213	Statistics-I	Assignment	Assignment
		UMAA216	Mathematical Methods II	Assignment	Assignment
		UMAA212	Mathematics for Physics-II	Assignment	Assignment

III and IV EVALUATION COMPONENTS OF CIA-NME

Semester	Category	Course code	Course Title	Component III	Component IV
II	Non Major Elective	UMAE204	Basic Mathematics for Science	Assignment	Assignment
		UMAE202	Mathematics for Business and Decision Making	Assignment	Assignment
		UIDE302/ UMAE302/ UMAE206	Numerical Methods using C++	Assignment	Assignment
		UMAA501/UMAE305 UMAE207	Statistical Data Analysis through SPSS	Assignment	Assignment
		UMAE309/ UMAE208	Applied Mathematics	Assignment	Assignment

COURSE PROFILE M.Sc. (Mathematics)

PSO 1: Understanding of advanced concepts, principles and techniques from Pure & Applied topics in mathematics and application of problem-solving skills.
PSO 2: Development of abstract mathematical thinking and mathematical intuition.
PSO 3: Assimilation and communication of detailed technical arguments
PSO 4: Proficiently to construct and formulate logical arguments, conjectures and construction of rigorous proof by abstracting principles.
PSO 5: Ability to carry out extended investigation of mathematical work as various projects independently.

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Mini	Max
I	Core I	PMAM107	Abstract Algebra	6	4	4
	Core II	PMAM102	Real Analysis	6	4	4
	Core III	PMAM103	Ordinary Differential Equations	6	4	4
	Core IV	PMAM105	Calculus Of Variations And Integral Equations	6	4	4
	Core V	PMAM106/ PMAM407	Fuzzy Analysis	6	4	4
			TOTAL	**30**	**20**	**20**
II	Core VI	PMAM209	Linear Algebra	5	4	4
	Core VII	PMAM202	Measure and Integration	5	4	4
	Core VIII	PMAM206	Partial Differential Equations	5	4	4
	Core IX	PMAM204	Classical Mechanics	**5**	**4**	**4**
	Core X	PMAM208	Operations Research	5	4	4
	Non Major Elective			5	4	4
	Service Learning	PMAX201/ PMAX202	Mathematics for High School Students \Elementary Mathematics for Higher Secondary Students	-	1	1
			TOTAL	**30**	**25**	**25**
III	Core XI	PMAM305	Complex Analysis	6	4	4
	Core XII	PMAM310	Fluid Dynamics	6	4	4
	Core XIII	PMAM311	Topology	6	4	4
	Core XIV	PMAM309	Stochastic process	5	4	4
	Core XV	PMAM312	Data Analytics using SAS	5	4	4
	Core XX	PMAP401	Project	2	-	-
			TOTAL	**30**	**20**	**20**
IV	Core XVI	PMAM405	Functional Analysis	6	5	5
	Core XVII	PMAM406	Mathematical Statistics	6	5	5
	Core XVIII	PMAM407	Numerical Analysis using MaT Lab	7	5	5
	Core XIX	PMAM403	Differential Geometry	6	5	5
	Core XX	PMAP401	Project	4	5	5
			Library	1	-	-
			TOTAL	**30**	**25**	**25**
			GRAND TOTAL	**120**	**90**	**90**

COURSES OFFERED TO OTHER DEPARTMENTS – PG

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Min	Max
II	Core III	PCAM103/ PCAM207	Mathematical Foundations	4	3	3
		PCSM108/ PCSM208	Theoretical foundations for computers	6	4	4
		PCAM509	Operations Research	4	4	4
	Non Major Elective	PMAE101/ PMAE209	LaTeX and MAT Lab			
	Practical					
	Non Major Elective	PMAE102/ PMAE208	Operations Research	5	4	4
	Core VI	PCAM206	Applied statistics	5	4	4
		PMAE203	Discrete mathematics	5	4	4

EXTRA CREDIT EARNING PROVISION

Semester	Category	Course code	Course Title	Hrs/ week	Credit	
					Min	Max
III	Self study paper	PMAS301/ PMAS302	Difference Equation Combinatorial Analysis	2	-	1

PMAM107 ABSTRACT ALGEBRA

Semester : I **Credit : 4**
Category : Core I **Hours/Week : 6**
Class & Major : I M.SC Mathematics **Total Hours : 78**

Objectives

To enable the students

- Analyze the basis in algebraic structures.
- Create computational skill in abstract algebra.
- Determine working knowledge on Galois theory.

UNIT-I SYLOW'S THEOREM AND FINITE ABELIAN GROUPS 16 Hrs

Another Counting principle- class equation for finite groups and its applications- Sylow's theorem- Direct products- Solvability by radicals.

UNIT-II LINEAR TRANSFORMATIONS 15 Hrs

Linear Transformations: Canonical forms – Triangular form- Nilpotent transformations- Jordan form.

UNIT-III TRACE AND TRANSPOSE **15 Hrs**

Trace and transpose – Hermitian, Unitary, normal transformations, and real quadratic form.

UNIT-IV EXTENSION FIELD **20 Hrs**

Extension fields – Transcendence of e-Roots of Polynomials – More about roots.

UNIT-V GALOIS THEORY **12 Hrs**

Elements of Galois Theory - Finite fields – Wedderburn's Theorem on finite division rings.

Text Book

- Herstein.N. "*Topics in Algebra* ",Wiley Eastern Limited, New Delhi, 2000.

Reference Books

- Bhattacharya P.B., Jain S.K., & Nagpaul S.R., "*Basic Abstract Algebra* " Cambridge University press, New York, 1997.
- Jacobson.N & W.H. Freeman, "*Basic Algebra, Vol. I&II "*, Hindustan publishing Company, New Delhi, 1980.
- Malik D.S., Mordeson J.N. & Sen M.K., "*Fundamental of Abstract Algebra"*, Mc Graw Hill, New York, 1997.
- Artin.M, "*Algebra"*, Prentice Hall of India, New Delhi, 1991.

PMAM105 CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

Semester : II **Credit : 4**
Category : Core VII **H ours/Week: 6**
Class & Major: II M.SC Mathematics **Total Hours : 78**

Objectives
To enable the Students

- Analyze the problem solving skill.
- Determine Variational problems and integral equation

UNIT-I ARIATIONAL PROBLEMS **16 Hrs**

Variational problems with fixed boundaries: The concept of variation and its properties – Euler's equation- Variational problems for Functionals – Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of Mechanics. **Text Book: 1**(Chapter 1: Sections 1.1 to 1.7)

UNIT-II MOVABLE BOUNDARY **12Hrs**

Variational problems with moving boundaries: Movable boundary for a functional dependent on two functions – one-side variations. **Text Book: 1** (Chapter 2: Sections 2.1 to 2.3)

UNIT- III INTEGRAL EQUATION **17Hrs**

Integral Equation: Introduction – Types of Kernels – Eigen Values and Eigen functions – Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems. **Text Book: 2** (Chapter 1: Section 1.1 to 1.3 and 1.5 to 1.8) 25

UNIT-IV SOLUTION OF FREDHOLM INTEGRAL EQUATION **17Hrs**

Solution of Fredholm integral equation: Second kind with separable kernel – Orthogonality and reality eigen function – Fredholm Integral equation with separable kernel – Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra Integral equation – Solution by successive substitution.

Text Book: 2 (Chapter0 2: Sections 2.1 to 2.3 and Chapter 4 Sections 4.1 to 4.5)

UNIT-V HILBERT – SCHMIDT THEORY **16 Hrs**

Hilbert – Schmidt Theory: Complex Hilbert space – Orthogonal system of functions-Gram Schmitorthogonlization process – Hilbert – Schmit theorems – Solutions of Fredholm integral equation of first kind. **Text Book: 2** (Chapter 3: Section 3.1 to 3.4 and 3.8 to 3.9)

Text Books

- GuptaA.S, "*Calculus of Variations with Application"*, Prentice Hall of India, New Delhi, 2005.
- SudirK.Pundir and RimplePundir, "*Integral Equations and Boundary Value Problems"*, PragatiPrakasam, Meerut, 2005.

References Books

- Hildebrand.F.B,"*Methods of Applied Mathematics"*, Prentice – Hall of India Pvt. New Delhi,1968.
- Kanwal.R.P, "*Linear Integral Equations, Theory and Techniques"*, Academic Press, New York, 1971.
- Elsgolts.L, "*Differential Equations and Calculus of Variations"*, Mir Publishers, Moscow, 1973.

PMAM102 REAL ANALYSIS

Semester : I **Credit : 4**
Category : Core II **Hours/Wee : 6**
Class &Major: I M.SC Mathematics **Total Hours : 78**

Objectives

To enable the students

- Discuss functions of bounded variation, Riemann- Stieltjes Integration, Convergence and its interplay between various limiting operations.
- Apply functions of bounded variation, Riemann- Stieltjes Integration, Convergence and its interplay between various limiting operations.

UNIT-I SEQUENCES AND SERIES **16Hrs**

Double sequences – Double series – Rearrangement theorem for double series- A sufficient condition for equality of iterated series – Multiplication of series – Cesarosummability – Infinite products. Power series – Multiplication of power series – The Taylor's series generated by a function – Bernstein's theorem - Able'slimit theorem – Tauber's theorem.

UNIT-II CONVERGENCE SEQUENCE **16Hrs**

Point wise convergence of sequences of functions – Examples of sequences of real Valued functions – Definitions of uniform convergence – Uniform convergence and continuity _ The Cauchy condition for uniform convergence – Uniform convergence of infinite series of functions– Uniform convergence and Riemann – Stieltjes integration – Non uniform onvergence and Term -by- term Integration – Uniform convergence differentiation – Sufficient condition for uniform convergence of a series – Mean convergence.

UNIT-III ORTHOGONAL SYSTEM OF FUNCTIONS **16Hrs**

Introduction – Orthogonal system of functions – the theorem on best approximation – The Fourier Series of a function relative to an orthonormal system – Properties of Fourier Coefficients – The Riesz-Fischer Theorem – The Convergence and representation problem in trigonometric series – The Riemann – Lebesgue Lemma – The Dirichlet Integrals – An Integral representation for the partial sums of Fourier series – Riemann's localization theorem – Sufficient condition for convergence of a Fourier series – Consequence of Fejes theorem – The Weierstrass approximation theorem.

UNIT-IV DIRECTIONAL DERIVATIVE **15Hrs**

Introduction – The Directional derivative – Directional derivative and continuity – The total derivative - The total derivative expressed in terms of partial derivatives – The Matrix of linear function – The Jacobian Matrix – The Chain rule – Matrix form of chain rule – The mean – value theorem for differentiable functions – A sufficient condition for differentiability condition for equality of mixed partial derivatives – Taylor's theorem forfunctions of R^n to R^1.

UNIT-V IMPLICIT FUNCTION THEOREM **15 Hrs**

Functions with non zeroJacobian determinants – The inverse function theorem – The Implicit function theorem – Exterma real valued function of severable variables – Extremum problems with side conditions.

Text Books

- Barra G. de., "*Measure Theory and Integration"*, Wiley Eastern Ltd, New Delhi, 1981.
- TomM.Apostol, "*Mathematical Analysis"*, Addison – Wesley Publishing Company Inc, New York, 1974.

Reference Books

- Burkill, J.C. "*The Lebesgue Integral"*, Cambridge University Press, New York, 1951.
- Gelbaum, B.R. and J. Olmsted," *Counter Examples in Analysis"*, Holden day, San Francisco , 1964.

PMAM103 ORDINARY DIFFERENTIAL EQUATIONS

Semester : I **Credit : 4**
Category : Core II **Hours/Week : 6**
Class &Major: I M.SC Mathematics **Total Hours : 78**

Objectives
To enable the students

- Develop a strong background on finding solutions to liner differential equations with constant and variable coefficients and also with singular points.
- Apply the existence and uniqueness of the solutions of first order differential equations.
- Understand and develop analytical skills.

UNIT-I SECOND ORDER HOMOGENEOUS EQUATIONS 16Hrs

Second order homogeneous equations-Initial value problems-Linear dependence and independence - Wronskian and a formula for Wronskian – Non-homogeneous equation of order two.

UNIT-II HOMOGENEOUS AND NON-HOMOGENEOUS EQUATION 15Hrs

Homogeneous and non-homogeneous equation of order n – Initial value problems-Annihilator method to solve non-homogeneous equation- Algebra of constant coefficient operators.

UNIT-III INITIAL VALUE PROBLEMS 16Hrs

Initial value problems – Existence and uniqueness theorems – Solutions to solve a non-homogeneous equation – Wronskian and linear dependence – reduction of the order of a homogeneous equation – homogeneous equation with analysis coefficients – The Legendre equation.

UNIT-IV EULER EQUATION 15Hrs

Euler equation – Second order equations with regular singular points – Exceptional cases – Bessel Function.

UNIT-V EXACT EQUATION 16Hrs

Equation with variable separated – Exact equation – method of successive approximations – the Lipschitz condition – convergence of the successive approximations and the existence theorem.

Text Book

- Coddington E.A., *"An Introduction to Ordinary Differential Equations"*, Prentice-Hall of India Ltd., New Delhi, 1987.

Reference Books

- Lebedev. N.N, *"Special functions and their applications"*, Prentice Hall of India, New Delhi, 1965.
- Reid W.T., *"Ordinary Differential Equations"*, John Wiley and Sons, New York, 1971

- Raisinghania M.D.*," Advanced Differential Equations"*, S. Chand & Company Pvt.Ltd ,New Delhi, 2001.

PMAM106 FUZZY ANALYSIS

Semester : I **Credit : 4**
Category :Core V **Hours/Week: 6**
Class & Major : I M.Sc. Mathematics **Total Hours: 78**

Objectives

To enable the students

- Discuss fuzzy set, fuzzy subset and fuzzy logic.
- Distinguish fuzzy logic from classical logic.
- Apply fuzzy logic whenever uncertainty arises

UNIT-I FUZZY SETS **16 Hrs**

Crisp sets – Fuzzy sets – Additional properties of Alpha cut – Representations of fuzzy sets – Extensions principle for fuzzy sets

chapter 1 : Section 1.2- 1.4

chapter 3 : Section 2.1 - 2.3

UNIT-II OPERATIONS ON FUZZY SETS **16 Hrs**

Types of operations – Fuzzy complements – Fuzzy intersections – Fuzzy unions – Combinations of operations – Aggregation operations.

chapter 3: Section 3.1- 3.6

UNIT-III ARITHMETIC **16 Hrs**

Fuzzy numbers – Linguistic variables – Arithmetic operations on intervals – Arithmetic operations on fuzzy numbers – Lattice of fuzzy numbers – Fuzzy equations.

chapter 4 : Section 4.1- 4.6

UNIT-IV FUZZY RELATIONS **16 Hrs**

Crisp versus fuzzy relations – Binary fuzzy relations-binary relations on a single set – Fuzzy equivalence relations – sup-i-compositions of fuzzy relations-inf-ω_I compositions of fuzzy relations

chapter 5 : Section 5.1, 5.3, 5.4, 5.5, 5.9, 5.10

UNIT-V FUZZY LOGIC **14 Hrs**

Classical logic-multi valued logics-fuzzy Propositions-fuzzy quantifiers.

Chapter 8 :Section 8.1 - 8.4

Text Book

- George J.Klir and Bo Yuan, "*Fuzzy sets and Fuzzy logic-Theory and applications"* Prentice

Reference Books

- Timothy J.Ross, "*Fuzzy Logic with Engineering Applications",* John Wiley & Sons Pvt. Ltd, The Atrium, Southern Gate Chichester, West Sussex PO198SQ, England, 2004.
- Kaufman.A, "*Introduction to the theory of Fuzzy subsets*" Volume - I, Academic Press, New York, 1975.
- Zimmermann.H.J, "*Fuzzy set theory and its Application",* Allied Publishers, Chennai, 1996.

PMAM209 LINEAR ALGEBRA

Semester : II **Credit : 4**
Category : Core VI **H ours/Week : 6**
Class & Major: II M.SC Mathematics **Total Hours : 78**

Objectives

To enable the Students

- Classify various algebraic structures.
- Estimate computational skill in linear algebra.

UNIT-I LINEAR TRANSFORMATION **16 Hrs**

Algebra of Linear transformations, Minimal polynomials, Regular and singular transformation, Range and rank of a transformation and its properties, characteristic roots and characteristic vectors.

UNIT-II DUAL SPACE **15 Hrs**

The matrix representation of a linear transformation, Composition of a linear transformation and matrix multiplication, The change of coordinate matrix, transition matrix, The dual space.

UNIT-III POLYNOMIAL EQUATION **16 Hrs**

Characteristic polynomials, Diagonalizability, Invariant subspaces, Cayley-Hamilton theorem. Canonical Forms-Triangular canonical form, Nilpotent transformations, Jordan canonicalform, The rational canonical form.

UNIT-IVINNER PRODUCT SPACES **15 Hrs**

Inner Product Spaces, Orthogonal complements, Gram-Schmidt Orthonormalization process-Positive Definite Matrices, Maxima, minima and saddle points, Tests for positive definiteness, Singular value Decomposition and its applications

UNIT-V QUADRATIC EQUATION **16 Hrs**

Bilinear forms, symmetric and skew-symmetric bilinear forms, real quadratic forms, rank and signature, Sylvester's law of inertia.

Text books

- Hoffman.K and Kunze.R, "*Linear Algebra"*, Pearson Education (India), 2003. Prentice-Hall of India, 1991.

Reference books

- Herstein.I.N, "*Topics in Algebra"*, 2nd Ed., John Wiley & Sons, 2006
- Freidberg.SInsel A, and Spence L: "*Linear Algebra"*,Fourth Edition, PHI, 2009.
- Gilbert J and Gilbert L, "*Linear Algebra and Matrix theory"*, Academic Press, 1995.
- Lang.S, "*Linear Algebra"*, Springer-Verlag, New York, 1989
- Artin.M, "*Algebra"*, Prentice Hall of India, 1994.
- Strang.G: "*Linear Algebra and its Applications"*, Brooks/Cole Ltd., New Delhi, Third Edition,2003.

PMAM202 MEASURE AND INTEGRATION

Semester : II **Credit : 4**
Category : Core VI **Hours/Week : 5**
Class &Major : I M.SC **Total Hours : 65**

Objectives

To enable the students

- Understand basics of knowledge in Lebesgue Measure.
- Acquire indepth knowledge in Multivariabledifferential calculus.

UNIT-I MEASURE ON THE REAL LINE 13Hrs

Lebesgue Outer Measure – Measurable Sets – Regularity – Measurable Functions – Borel and Lebesgue Measurability.

UNIT-II INTEGRATION OF FUNCTIONS OF A REAL VARIABLE 13Hrs

Integration of Non negative functions – The General Integral – Riemann and Lebesgue Integrals.

UNIT-III ABSTRACT MEASURE SPACES 13Hrs

Measures and outer measures- Completion of a measure- Measure Spaces- Integration with respect to measure.L^pSpaces- Completeness of L^p.

UNIT-IV MEASURABLE DECOMPOSITION SPACE 13Hrs

Signes Measures- Hahn, Jordan Decompositions- TheRandonNikodym theorem- some applications of the Nikodym Theorem.

UNIT-V PRODUCT MEASURE SPACE 13Hrs

Measurability in a product space- The Product measure and Fubini's theorem- Lebegue measure in Euclidean space.

Text Book

- Barra G. de.,*"Measure Theory and Integration"*, Wiley Eastern Ltd., New Delhi, 1981.

Reference Books

- Natanson.I.P. *"Theory of functions of a Real Variable Vol.I& II"*, Cambridge University Press, New York, 1960.

- Royden.H.L, *"Real Analysis"*, Prentice- Hall of India private Limited, New Delhi, 2003.
- GanapathyIyer.v, *"Mathematical Analysis"*, Tata McGraw Hill Publishing Company Ltd,New Delhi,1977.

PMAM206 PARTIAL DIFFERENTIAL EQUATIONS

Semester : II **Credit : 4**
Category : Core VII **Hours/Week : 5**
Class &Major : I M.Sc Mathematics **Total Hours : 65**

Objectives
To enable the students

- Understand the physical behavior of the mathematical model.
- Discuss the solution of higher order partial differential equations.

UNIT - I LINEAR PARTIAL DIFFERENTIAL EQUATIONS 16Hrs

Formation of PDE -solution of PDE First order – Integral surfaces – Cauchy Problem order equation – Orthogonal surfaces – First order non- linear – Characteristics – Compatible system – Charpit's method. Fundamentals classifications and canonical forms of PDE.

UNIT - II NON-LINEAR FIRST ORDER PDE 13Hrs

First order non- linear – Characteristics – Compatible system – Charpit's method.

UNIT - III SECOND ORDER PDE 10Hrs

Introduction- classification of second order PDE-Canonical forms - Adjoint operators.

UNIT - IV HYPERBOLIC PDE 13Hrs

Derivation of one- dimensional wave equation -Solution of one- dimensional wave equation by Canonical reduction – IVP – D' Almembert's solution – Vibrating string – Forced Vibration – IVP and BVP for two dimensional wave equation.

UNIT - V ELLIPTIC AND PARABOLIC PDE 13Hrs

Derivation of Laplace and Poission equation – BVP – Separation of Variables - Dirichlet's Problem and Newmann Problem for a rectangle – Elementary solution of Diffusion equation – Dirac-Delta function – Separation of variables method.

Text Book

- Shankar Rao S., *"Introduction to Partial Differential Equations"*, 2nd Edition, New Delhi, Prentice Hall of India, 2005.

Reference Books

- Dennemeyer.R, *"Introduction to Partial Differential Equationsand Boundary* McOwen.R.C, *"Partial Differential Equations*, 2ndEdn, New Delhi. Pearson Education,2005.

- Raisinghania.M.D, *"Advanced Differential Equations"*, New Delhi, S.Chand& Company Ltd., 2001.
- Sneddon. I.N, *"Elements of Partial Differential Equations"*, New Delhi, McGraw hill,1983.

PMAM207 CLASSICAL MECHANICS

Semester : II **Credit : 4**
Category : Core VIII **Hours/Week : 5**
Class&Major : I M.Sc Mathematics **Total Hours : 65**

Objectives

To enable the students

- Discuss the structure of classical mechanics and to outline some of its applications in physics .
- Acquire Knowledeg of Lagrange's and Hamilton's Principle.

UNIT - I MECHANICAL SYSTEMS **16Hrs**

Mechanics of a Particle - Mechanics of a System of Particle-Constraints-D'Alembert's Principle and Lagrange's Equations-Simple Applications of the Lagrangian Formulation.

UNIT - II VARATIONAL PRINCIPLES AND LAGRANGE'S EQUATION **10Hrs**

Hamilton's Principle-Some Techniques of the Calculus of Variations-Derivation of Lagrange's Equations from Hamilton's Principle-Extension of Hamilton's Principle to Nonholonomic Systems.

UNIT - III VARATIONAL PRINCIPLES AND LAGRANGE'S EQUATION (CONTD) **13Hrs**

Advantages of Variational Principle Formulation-Conservation Theorems and Symmetry Properties-Energy Function and the Convertion of Energy.

UNIT - IV HAMILTON-JACOBI THEORY **10Hrs**

The Hamilton –Jacobi Equation for Hamilton's Principle Function-The Harmonic oscillator Problem as an example of the Hamilton Jocobi Method - The Hamilton –Jacobi Equation for Hamilton's Characteristic Function-Seperation of Variables in the Hamilton-Jacobi Equation-Ignorable Coordinates and the Kepler Problem.

UNIT - V CANONICAL TRANSFORMATIONS **16Hrs**

The Equations of Canonical Transformations- Examples of Canonical Transformations-The Symplectic Approach Canonical Transformations-Poisson Brackets and Other Canonical Invariants-Equations of Motions,Infinitesimal Canonical Transformations, and Conservation Theorems in the Poisson Brackets Formulation-The Angular Momentum Poisson Brackets Relations-Liouville's Theorem.

Text Book

- Green Wood.D, "*Classical Mechanics*"Prentice Hall of India, New Delhi 1985.

Reference Book

- Herbert Goldstein, Charles Poole, John Safko, "*Classical Mechanics*", Addison Wesley, 3rd edition 2000.

PMAM208 OPERATIONS RESEARCH

Semester : II **Credit : 4**
Category : Core IX **Hours/Week : 5**
Class &Major: I M.SC Mathematics **Total Hours : 65**

Objectives
To enable the students

- Acquire Knowledge on queuing systems, Network Schedule, Sensitivity and Decision Analysis.
- Use algorithms for solving problems.

UNIT - I SENSITIVITY ANALYSIS 12Hrs

Graphical Sensitivity Analysis - Algebraic Sensitivity Analysis–Right-hand Side of the Constraints - Algebraic Sensitivity Analysis–Objective-Function Coefficients - Sensitivity Analysis with TORA, Excel Solver, and AMPL.

UNIT - II INTEGER LINEAR PROGRAMMING 14Hrs

Illustrative Application - Integer Programming Algorithms**:** Branch-and-Bound (B&B) Algorithm Cutting-Plane Algorithm.

UNIT - III CPM and PERT 12Hrs

Network Representation - Critical Path Computations - Construction of the Time Schedule - PERT Calculations.

UNIT - IV QUEUING SYSTEMS 16Hrs

Generalized Poisson Queuing Model - Specialized Poisson Queues: Steady-State Measures of Performance - Single-Server Models - Multiple-Server Models - Machine Servicing Model–*(M/M/R)* : *(GD/K/K),R<K* - Pollaczek-Khintchine (P-K) Formula.

UNIT - V DECISION ANALYSIS 11Hrs

Decision Making under Certainty–Analytic Hierarchy Process (AHP) - Decision Making under Risk - Expected Value Criterion - Variations of the Expected Value Criterion - Decision under Uncertainty.

Text Book

- Hamdy A. Taha, *"Operations Research"*, Prentice Hall, 2010.

Reference Book

- Kapoor V.K, *"Introduction to Operations Research"*, Sultan Chand & Sons, New Delhi, 1996.

PMAX 201/PMAX202 MATHEMATICS FOR HIGH SCHOOL STUDENTS /ELEMENTARY MATHEMATICS FOR HIGHER SECONDARY STUDENTS

Semester : II **Credit : 1**
Category : Service Learning
Class and Major: I M.Sc. Mathematics

Objectives
To enable the students

- Acquire indepth knowledge about matrices and complex numbers.
- Inculcate innovative teaching methods.
- Apply the technique of differentiation to motion in physics.

UNIT- I MATRICES

Introduction to Matrix-Adjoint of the matrix-Inverse of the matrix-Rank of the matrix-Consistency of the linear equations.
Activity: Lecture, Chart presentation

UNIT- II VECTOR ALGEBRA

Vectors - Angle between two vectors-scalar product-vector product-product of three vectors-lines and planes.
Activity: Lecture, Chart presentation

UNIT- III COMPLEX NUMBERS

The Complex number system - Conjugate of the complex numbers-ordered pair of representation-modulus of the complex numbers-De-moivre's theorem and its applications roots of the complex numbers.
Activity: Lecture, Chart presentation.

UNIT- IVANALYTICAL GEOMETRY

Conic: parabola-ellipse-hyperbola. Parametric forms of conics.
Activity: Lecture, Model presentation.

UNIT- V DIFFERENTIAL CALCULUS

Derivative as measure – Rate of Change – Velocity – Acceleration – Related Rates derivative as a measure of Slope.
Activity: Lecture, Power Point presentation

Reference Books

- Narayanan and Manicavachagom Pillay.T.K,*Algebra VolumeI*, Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1996.
- Narayanan and Manicavachagom Pillay. T.K, *Trignometry* ,Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1994.
- Narayanan and Manicavachagom Pillay. T.K,*Vector Algebra*, Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1997.
- Narayanan and Manicavachagom Pillay.T.K, *Analytical Geomentry of 2D*, Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1993.

PCAM103/PCAM207 MATHEMATICAL FOUNDATIONS

Semester	**: II**	**Credit**	**: 3**
Category	**: Core III**	**Hours/Week**	**: 4**
Class & Major	**: I MCA**	**Total Hours**	**:52**

Objectives

To enable the students

- Discuss the various tools in solving numerical problems.
- Apply these methods in a computer environment.

UNIT-I LOGIC 10Hrs

Logic:introduction – TF statements – connectivities – atomic and compound statements – well formed formulae – tautology – tautology implications and equivalence of a formulae.

UNIT-II REPLACEMENT PROCESS 10Hrs

Replacement process – functionally complete sets of connectives and duality law – normals forms – principles of normal forms – theory of inference for predicate calculus – statement involving more than one quantifier.

UNIT-III SYSTEM OF LINEAR EQUATIONS 10Hrs

Gauss - Elimination methods - Pivoting-Gauss - Jordan Elimination method –Gauss - Seidal iteration method.

UNIT-IV NUMERICAL DIIFFERENTIATION 10Hrs

Numerial Differentiation – Numerical Intergration – Newton’s Cotes method – trapezoidal rule – Simpon’s rule.

UNIT-V NUMERICAL DIFFERENTIAL EQUATIONS 12Hrs

Initial value problem – Euler’s method – Runge – kutta method – Boundary value problem.

Text Book

- Termblay.J.P, Manohar.R, *Discrete Mathematical Structures with Applications to Computer science*, Tata Mc Graw Hill Publications Company, Pvt.Ltd, New Delhi, 1997 .

Reference Books

- Sastry.S.S., *Introductory Methods of Numerical Analysis*, Prentice Hall of India Pvt.Ltd, New Delhi, 2000.
- Rajaraman.V, *Computer Oriented Numerical Methods*, Prentice Hall of India Pvt.Ltd, New Delhi, 2000.

PCSM108/PCSM208 THEORETICAL FOUNDATIONS FOR COMPUTERS

Semester : II **Credit : 4**
Category : Core III **Hours/Week : 6**
Class & Major: I- M.Sc Mathematics **Total Hours : 78**

Objectives

To enable the students

- Acquire basic knowledge in Linear System
- Understand the concept of relations and operators.

UNIT-I LOGIC **15 Hrs**

Introduction – TF Statements- Connectivities-Atomic and Compound Statements-Well Formed Formulae-Tautology-Tautology implications and equivalence of a formulae.

UNIT-II RELATIONS AND OPERATORS **15 Hrs**

Relations: Representation of a Relation-Operations on Relation-Equivalence Relation-Closure and Warshall's Algorithm-Partitions and Equivalence Classes-Functions: Function and Operators-One-to-one, Onto Functions, Special types of Functions-Invertible Functions-Composition of Functions.

UNIT-III VECTOR SPACES **16 Hrs**

Vector Spaces and Subspaces-Solving Ax=0 and Ax=b Linear Independence, Basis, and Dimension-linear Transformation.

UNIT-IV ORTHOGONALITY **14 Hrs**

Orthogonal Vectors and Subspaces-Cosines and Projections onto lines-Projections and Least Squares-Orthogonal Bases and Gram-Schmidt.

UNIT-V DETERMINANTS **18 Hrs**

Introduction-Properties of the Determinant-Formulas for the Determinants-Applications of Determinants

Text Book

- Tremblay.J.P., Manohar.R, *Discrete Mathematical Structures with Applications to Computer science*, Tata Mc Graw Hills Publications Company Pvt. Ltd., Fourth Edition.
- Gilbert Strang, *Linear Algebra and its Applications*, Cengage Learning, 2006.

PMAE101/PMAE209 LATEX AND MATLAB

Semester : I **Credit : 4**
Category : Non Major Elective **Hours/Week : 5**
Class & Major: I PG **Total Hours : 65**

Objectives

To enable the students

- Introduces documentation in computer
- Develop computer skill.

UNIT- I DOCUMENTATION **10Hrs**

Document layout and organization-Document class- page style- parts of the document-text formatting- TeX and its Offspring- What's different in Latex 2€-Distinguishing Latex 2€ and Basics of Latex file.

UNIT- II COMMANDS **15Hrs**

Commands and environment-commands names and argument- Environments-Contents,-Fine – tuning text- Word Division- Labeling-Referencing- Displayed Text-Changing font- Centering and indenting- Lists-Generalised Lists- theorem-like declaration -Tabulator stops- Boxes.

UNIT- III TABLES **15Hrs**

Tables- printing literal text- Footnodes and marginal notes-Drawing pictures using Latex-Mathematical formulas-Mathematical environment- Main elements of math mode-Mathematical symbols- Addition elements- Fine – tuning Mathematics.

UNIT- IV MATLAB **12Hrs**

Introduction-Basics of MATLAb- Input-Output- File types-Platform dependence-General commands-Interactive Computation: Matrices and Vectors.

UNIT- V FUNCTIONS **13Hrs**

Matrix and Array operation-creating and using Inline functions-Using Built –in functions and On-Line Help-Saving and loading data-Ploting Simple graphs-Basics programming in MATLAB-creating cps files using MATLAB.

Text Books

- Daly P.W, *A Guide to LaTeX* by H.Kopka, Adison Wesley, London,1999.
- Rudra Pratap,*Getting started with MATLAB – A Quick introduction for Scientists and Engineers*, Oxford University Press, New York, 2003.

PMAE102/PMAE208 OPERATIONS RESEARCH

Semester : I **Credit : 4**
Category : NME **Hours/Week : 5**
Class & Major: I PG **Total Hours : 65**

Objectives
To enable the students

- Introduce various techniques of research.
- Discuss real life problems in Business and Management.
- Enlighten on applications in management techniques.

UNIT-I LINEAR PROGRAMMING PROBLEM **13 Hrs**

Mathematical Formulation of the Problem- Graphical Solution Method -General Linear Programming Problem - The Computational Procedure- Use of Artificial Variable Techniques- Big- M Method Simple problems.

UNIT-II TRANSPORTATION PROBLEM 1**3Hrs**

General Transportation Problem-The Transportation Table-Loops in Transportation Tables-Solution of a Transportation Problem-Finding an Initial Basic Feasible Solution-Test for Optimality-Degeneracy in Transportation Problem-Transportation Algorithm(MODI Method). Simple problems.

UNIT-III ASSIGNMENTPROBLEM **13Hrs**

Mathematical Formulation of the problem- the Assignment method- Special Cases in Assignment Problem. Simple problems.

UNIT-IV GAME THEORY **13Hrs**

Two-person Zero-sum Games- Some Basic Terms- The Maximin - Minimax

Principle- Games Without Saddle Points-Mixed Strategies- Graphic Solution of 2 × n and m × 2 Games- Dominance Property. Simple problems.

UNIT-V NETWORK SCHEDULING BY PERT/CPM 13Hrs

Network and Basic Components- Logical Sequencing- Rules of Network Construction- Critical Path Analysis- Probability Considerations in PERT- Distinction between PERT and CPM. Simple problems.

Text Book

- Kanti Swaroop,Gupta P.K.and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi, 2003.

Reference Books

- Kapoor .V.K, *Introduction to Operations Research*, Sulthan Chand & Sons, New Delhi, 1996.
- Taha.A Handy, *Operations Research-An Introduction*, Prentice hall of India Pvt Ltd, New Delhi, 2000.

PCAM206 APPLIED STATISTICS

Semester : II **Credit : 4**
Category : Core VI **Hours/Week : 5**
Class & Major: I MCA **Total Hours : 65**

Objectives
To enable the students

- Develop problem solving skills in sampling techniques and statistical inference
- Provide basic principles of experimentation and discuss the analysis of data relating to agriculture, biological sciences and industry.

UNIT-I CORRELATION AND REGRESSION 13Hrs

Correlation Analysis-Karl Pearson's correlation coefficient-rank correlation coefficient-Multiple and partial correlation (3 variables only)-regression analysis-regression equations-methods of least squares -fitting of the curve of the form

i. $Y=ax+b$ ii.$Y=ax^2+bx+c$ iii.$Y=ax^b$ iv.$Y=ae^{bx}$,$Y=ab^x$

UNIT-II PROBABILITY 13Hrs

Sample space-definitions of events-Axiometic approach to probability-conditional probability-Baye's theorem-random variables-continuous and discrete random variables-distribution function of random variable-characteristics of distribution-mathematical expectation, varience-moment generating function-Chebychev's inequality.

UNIT-III THEORETICAL AND CONTINUOUS DISTRIBUTION 13Hrs

Bivariate distribution - distribution function-marginal and conditional distributions-discrete distributions-binomial,poisson distribution-continuous distribution-Normal and exponential distribution.

UNIT-IV TESTS OF SIGNIFICANCE 13Hrs

Tests of significance –Sampling distribution-Standard Error – Hypothesis – Errors in Sampling – Critical region – level of significance - Large sample Tests – Sampling of Attributes –Sampling of Variables – Small sample tests – Student's t-Test – Test for single mean –Test for difference of means – Dependent and Independent samples –Test for Correlation coefficient –Applications in Medicine- Non parametric test- Chi-square test – Test for population variance, Goodness of fit, Independence of Attributes – F-test for testing equality of population variances.

UNIT-V ANALYSIS OF VARIANCE 13Hrs

Analysis of variance – one- way and two- way classifications. Statistical Quality Control-Introduction-types of control chart-x-charts-chart,c-chart,p-chart and its application in industry.

Note: No derivation required Emphasis on concepts and applications.

Text Books

- Gupta S.C. and Kapoor,V.K, *Elements of Mathematics Statistics,* Sultan Chand and Sons, 2006
- Gupta S.P., *Statistical Methods,* Sultan Chand and Sons, 2011.

Reference Books

- Murthy M.N.(1967) " Sampling Theory and Methods", Statistical Publishing Society, Calcutta.
- Robert V. Hogg & Elliot A. Tanis (1983), " Probability and Statistical Inference", Macmillan Publishing Company, New York.
- Mood A.M.,Graybill.F.A. & Boes. D.G., " Introduction to Mathematical Statistics", McGraw Hill, 1974.
- Dr.Parimal Mukhopadhyay, " Applied Statistics", Books abd allied(P) Ltd. 2011.
- Sundar Rao.P.S.S & Richard.J, " Introduction to Biostatistics and Research Methods", PHI Learning Private Ltd., 2009.

PMAE203 DISCRETE MATHEMATICS

Semester : II **Credit : 4**
Category : Non-Major Elective **Hours/Week : 5**
Class & Major : I PG **Total Hours : 65**

Objectives

To enable the students

- Understand the concepts of Set Theory and Finite Automata.
- Apply these methods in a computer environment.

UNIT-I LOGIC **15 Hrs**

Introduction – TF statements – Connectives – atomic and compound statements – Well formed Formulae.

UNIT-II TAUTOLOGY **15 Hrs**

Tautology – Tautology implications and equivalence of a formulae. Replacement process.

UNIT-III LATTICES AND BOOLEAN ALGEBRA **15 Hrs**

Functionally complete sets of connectives and duality law – normal forms Principles of normal forms –Lattices – Some properties of lattices – Hasse digrams – notations- Boolean algebras – Boolean polynomials.

UNIT-IV GRAPH THEORY **10 Hrs**

Basic concepts – Digraph,Incidence and Degree-Subgraph - Isomorphism.

UNIT-V FINITE AUTOMATA **10 Hrs**

Introduction – Finite automata - Definition of finite automation-representation of finite automation-acceptability of a string by finite automata.

Text Book

- Venkataraman.M.K., Sridharan.N & Chandrasekaran.N., *Discrete Mathematics*, The National publishing company, 2000.

Reference Books

- Sundaresan.V.ganapathy Subramanian.K.S & Ganesan.K *Discrete Mathematics*, A.R.Publications, 1996.
- Tremblay.J.P, Manohar.R, Discrete Mathematical Structures with Applications to Computer Science, Tata Mc Graw Hills Publications Company Pvt.Ltd., New Delhi, 1999.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core IV	PMAM105	Calculus of Variations and Integral equations	Assignment	Seminar
	Core V	PMAM106/ PMAM407	Fuzzy Analysis	Assignment	Seminar
	Core I	PMAM107	Abstract Algebra	Assignment	Seminar
	Core II	PMAM102	Real Analysis	Assignment	Seminar
	Core III	PMAM103	Ordinary Differential Equations	Assignment	Seminar
II	Core VI	PMAM209	Linear Algebra	Assignment	Seminar
	Core VII	PMAM202	Measure and Integration	Assignment	Seminar
	Core VIII	PMAM206	Partial Differential Equations	Assignment	Seminar

	Core IX	PMAM204	Classical Mechanics	Assignment	Seminar
	Core X	PMAM208	Operations Research	Assignment	Seminar

III and IV EVALUATION COMPONENTS OF CIA-Allied

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core III	PCAM103/ PCAM207	Mathematical Foundations	Assignment	Seminar
		PCSM108/ PCSM208	Theoretical foundations for computers	Assignment	Seminar
	Core VI	PCAM206	Applied statistics	Assignment	Seminar

III and IV EVALUATION COMPONENTS OF CIA-NME

Semester	Category	Course code	Course Title	Component III	Component IV
I	Non Major Elective	PMAE101/ PMAE209	LaTeX and MAT Lab	Assignment	Seminar
		PMAE102/ PMAE208	Operations Research	Assignment	Seminar

COURSE PROFILE M.Phil (Mathematics)

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Min	Max
I	Core 1	MMA103	Algebra and Analysis	6	5	5
	Core 2	MMA102	Topology and Differential Geometry	6	5	5
	Core 3	MMA105	Special Area Study Paper	6	5	5
II		MMAD201	Dissertation	30	15	15
▪ **Paper Presentation (minimum one) and /or Publication of articles in Journals (minimum one) is mandatory for submission of Dissertation.**						

MMA103 ALGEBRA AND ANALYSIS

Semester : I **Credit : 5**
Category : Core II **Hours/Week: 6**
Class & Major : M.Phil-Mathematics **Total Hours : 78**

Objectives
To enable the students

- Explore the concept of Topology through Manifold Differential geometry etc.
- Develop analyzing skill.

UNIT-I THE RADIAL **15Hrs**

The Radial of an Algebra – Wakayama's lemma – Jacobson Radial – The Radial of an Artinian Algebras – Artinian Algebras are Noe theorem – Nilpotent Algebras – The Radial of a grouph Algebra – Ideals in artinian Algebras.

UNIT-II TENSOR PRODUCTS **15Hrs**

Tensor Products of R – modules – Tensor Products of Algebras.

UNIT-III ABSTRACT INTEGRATION **18Hrs**

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.

UNIT-IV POSITIVE BOREL MEASURES **15Hrs**

Vector spaces – Topological Preliminaries – The Riesz Representation theorem – Regularity properties of Borel measures – Lebesgue measure - Continiuty properties of Measurable functions.

UNIT-V FOURIER TRANSFORMS **15Hrs**

The inversion Theorem – The Plancherel Theorem – The Banach algebra L^1

Text Books

- Pierce. R.S., *Treatment as in Associative Algebra*.
- Walter Rudin, *Real & Complex Analysis*, Third Edition, New Delhi Prentice Hall of India Private Limited,1997.

MMA102 TOPOLOGY AND DIFFERENTIAL GEOMETRY

Semester : I **Credit : 5**
Category : Core I **Hours/Week : 6**
Class & Major : M.Phil-Mathematics **Total Hours : 78**

Objectives
To enable the students

- Gain Knowledge in Foundations of Algebra and Analysis for further developments in Research.
- Develop analyzing skill.

UNIT-I FUNDAMENTAL GROUP AND COVERING SPACES **15Hrs**

Homotography – Fundamental group – Covering spaces

UNIT-II SIMPLICIAL COMPLEXES **15Hrs**

Geometry of simplicial complexes – Barycentric subdivisions – simplicial approximation Theorem.

UNIT-III **18Hrs**

Differentiable manifolds –Differential Forms.

UNIT-IV **15Hrs**

Miscellaneous Facts

UNIT-V **15Hrs**

De Rham's Theorem

Text Books

- Singer I.M., Thorpe Singer. J. A., *Lecture Notes on Elementary Topology and Geometry*, New York, Thorpe Publishers 1967.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core 1	MMA103	Algebra and Analysis	Assignment	Seminar
	Core 2	MMA102	Topology and Differential Geometry	Assignment	Seminar
	Core 3	MMA105	Special Area Study Paper	Assignment	Seminar

DEPARTMENT OF PHYSICS

PREAMBLE

UG : Course profile, list of courses offered to other department and the syllabi of courses offered in the first two semesters along with evaluation components III & IV (With effect from 2018-2021 batch onwards)

PG : Course profile, list of courses offered to other department and the syllabi of courses offered in the first two semesters along with evaluation components III & IV (With effect from 2018-2020 batch onwards)

M.Phil : Course Profile and the syllabi of courses offered in the two semesters (with effect from 2018-2019 batch onwards) are presented in this booklet.

COURSE PROFILE: B.Sc., (Physics)

PSO1: Application of the knowledge in the principles of nature and ability to solve and apply the concepts of physics in various fields including Material Science, Mechanics, Thermal Physics and Electricity.

PSO2: Learning of laboratory skills, enabling measurements in basic physics and analysis of measurements to draw valid conclusions.

PSO3: Development of the skills for problem solving and scientific reasoning for the prospective physicists and logical reasoning.

PSO4: Analysis of the behavior of materials from atomic level to macroscopic level.

Semester	Part	Category	Course code	Course Title	Contact Hrs/week	Credit	
						Min	Max
I	I	Language	UTAL105,UTAL106/ UHIL101/UFRL101	Basic Tamil-I/Advanced Tamil I/Hindi/French	4	2	3
	II	English	UENL107,UENL108	General English-I/ Advanced English-I	5	3	4
	III	Core I	UPHM103	Mechanics	5	5	5
	III	Core II	UPHM105/UPHM202	Properties of Matter	6	5	5
	III	Core Practical-I	UPHR102/UPHR202	Major Practical I	3	2	2
	III	Allied	UMAA104	Algebra, Differential Calculus and Trigonometry	5	5	5
	IV	Value Education			2	1	1
				TOTAL	**30**	**23**	**25**
II	I	Language	UTAL205,UTAL206 UHIL201/UFRL201	Basic Tamil-II/Advanced Tamil-II/Hindi/French	4	2	3
	II	English	UENL207,UENL208	General English-II/ Advanced English-II	5	3	4
	III	Core III	UPHM104/UPHM203	Thermal and Statistical Physics	7	6	6
	III	Core Practical-II	UPHR203/UPHR101	Major Practical II	3	2	2
	III	Allied	UMAA212	Integral Calculus, Laplace Transform and Ordinary Differential equation	5	5	5
	IV	NME	-	-	4	2	2
	IV	Soft Skill			2	1	1
	V	Extension Programme/ Physical Education/NCC	-	-	-	1	2

				Total	**30**	**22**	**25**
Semester	**Part**	**Category**	**Course Code**	**Course Title**	**Contact Hrs/week**	**Credit**	
						Min	**Max**
III	I	Language	UTAL305,UTAL306/ UHIL301/UFRL301	Basic Tamil-III/Advanced Tamil-III/Hindi/ French	4	2	3
	II	English	UENL307,UENL308	General English-III/Advanced English-III	5	3	4
	III	Core IV	UPHM303/UPHM402	Electricity and Magnetism	6	5	5
	III	Core V	UPHM304/ UPHM509	Mathematical Physics	4	3	3
	III	Core Practical-III	UPHR303	Major Practical III	3	2	2
	III	Allied	UCSA306	Computational Physics with Python	3	3	3
	III	Allied Practical	UCSR310	Computational Physics with Python Lab	3	2	2
	IV	Value Education	-	-	2	1	1
				TOTAL	**30**	**21**	**23**
Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
IV	I	Language	UTAL405,UTAL406/ UHIL401/UFRL401	Basic Tamil IV /Advanced Tamil - IV/Hindi/ French	4	2	3
	II	English	UENL407, UENL408	General English-IV/Advanced English-IV	5	3	4
	III	Core VI	UPHM406/UPHM302	Optics and Laser Physics	4	4	4
	III	Core VII	UPHM407	Atomic Physics	4	4	4
	III	Core Practical-IV	UPHR405	Major Practical IV	3	3	3
	III	Allied	UCHA401/UCHA402/ UCHA403	Chemistry for Physics	3	3	3
	III	Allied Practical	UCHA402/UCHR403	Volumetric and Organic Analysis-I	3	2	2
	III	Core VIII	UPHP401/UPHP402	Project / Instrumentation Techniques	2	-	-
	IV	Soft Skill			2	1	1
	V	Extension Programme/Physical Education			-	-	2
				TOTAL	**30**	**22**	**26**
Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
V	III	Core IX	UPHM501	Quantum Mechanics and Relativity	6	5	5
	III	Core X	UPHM505	Basic Electronics	6	5	5
	III	Core XI	UPHM506/UPHM608	Solid State Physics	6	5	5
	III	Core Practical-V	UPHR502	Major Practical V	3	3	3
	III	Core XII	UPHP501/UPHP502	Project / Instrumentation Techniques	4	4	4
	IV	Online Course		NPTEL/Spoken Tutorial	3	1	2
	IV	Value Education			2	1	1
				TOTAL	**30**	**24**	**25**

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
VI	III	Core XIV	UPHM609	Numerical methods and Basic Computational Physics	5	5	5
	III	Core XV	UPHM611	Nuclear and Radiation Physics	5	5	5
	III	Core XVI	UPHM612	Material Science	5	5	5
	III	Core XVII	UPHM613	Digital Electronics	5	4	4
	III	Core Practical VI	UPHR605	Major Practical VI	3	3	3
	III	Major Elective	UPHO601/ UPHO602/UPHO603	Nanophysics/ Astrophysics/Functional Materials	5	4	4
	III	Viva Voce	UPHM610	Comprehensive Viva Voce	-	1	1
	IV	Soft Skill			2	1	1
	V	Extension Programme/Physical Education			-	-	2
TOTAL					**30**	**28**	**30**
GRAND TOTAL					**180**	**140**	**154**

ALLIED

Semester	Part	Category	Course Code	Course Title	Contact Hrs /week	Credit	
						Min	Max
I	III	Allied	UPHA102	Allied Physics-I	3	3	3
I	III	Allied	UPHR103	Physics for Chemistry Practical -I	3	2	2
II	III	Allied	UPHA203	Allied Physics-II	3	3	3
II	III	Allied	UPHR202	Physics for Chemistry Practical-II	3	2	2
III	III	Allied	UPHA303	Digital Electronics	3	3	3
III	III	Allied	UPHR303	Digital Electronics Practical	3	2	2

NON-MAJOR ELECTIVES

Semester	Part	Category	Course Code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
II	IV	Non Major elective	UPHE202	Applied physics	4	2	2
			UPHE203	Biomedical instrumentation			
			UPHE204	Electrical appliances			
III	IV	Non Major Elective	UPHE304/ UPHE503	Telecommunication System	4	2	2
			UPHE303	Servicing and maintenance of home appliances			

IV	III	Allied	UPHA402	Electronics(For Mathematics major)	3	3	3
IV	III	Allied	UPHR402	Electronics(For Mathematics major) Practical	2	2	2

EXTRA CREDIT EARNING PROVISION

Semester	Part	Category	Course Code	Course Title	Hrs/week	Credit	
						Min	Max
II	III	Core VI	UPHI201	Summer Internship	-	-	1

UPHM103 MECHANICS

Semester : I **Credit : 4**
Category : Core II **Hours/week : 5**
Class & major : I B.Sc., Physics **Total hours : 65**

Objectives
To enable the students

- Apply the knowledge of different types of motion and gravitation
- Identify the dynamics of rigid bodies in terms of moment of inertia
- Understand the basics of classical mechanics and its applications

UNIT – I LAWS OF MOTION **13 Hrs**

Newton's laws of motion-conservation of energy-conservation forces-conservation of linear momentum-center of mass – angular momentum – conservation of angular momentum – relation between torque and angular momentum. Rocket motion – principle- theory – velocity of the rocket at any instant – rocket propulsion system – multi stage rocket – shape of the rocket – artificial satellites.

UNIT – II GRAVITATION **15 Hrs**

Kepler's law – Newton's law of gravitation - determination of G by Boy's method – density of earth – mass of the earth and sun – gravitational field – intensity of the field – gravitational potential – potential energy – inertial and gravitational masses – escape and orbital velocity – acceleration due to gravity – value of 'g' at the poles and at the equator – variation of 'g' with latitude, altitude & depth. Compound pendulum – radius of gyration – determination of 'g' by compound pendulum.

UNIT – III CIRCULAR MOTION **13 Hrs**

Angular displacement – angular velocity – relation between linear velocity and angular velocity – acceleration in uniform circular motion – centripetal force and centrifugal force – applications – condition for skidding and overturning of a car taking a turn – motion in horizontal circle – friction present on the road – motion in vertical circle – centrifuge.

UNIT – IV MOMENT OF INERTIA **10 Hrs**

Rigid body – moment of inertia – parallel axes theorem – perpendicular axes theorem. Moment of inertia of a thin rod, solid cylinder, and solid sphere – hollow sphere with external and internal radii – kinetic energy of rotation.

UNIT – V LAGRANGIAN AND HAMILTONIAN MECHANICS 14 Hrs

Mechanics of a system of particle – degrees of freedom – constrains – generalized coordinates – principles of virtual work – D' Alembert's principle – derivation of Lagrange's equation of motion – applications of Lagrange's equation to simple pendulum and linear harmonic oscillator – Hamiltonian function 'H' – Hamiltonian equation – physical significance of 'H' – applications of Hamiltonian equations to simple pendulum and linear harmonic oscillator.

Text Books

- Murugeshan.R, *Mechanics and Mathematical Physics*, S. Chand & Company Ltd, New Delhi, 2008.
- Brijlal, Subramaniam, *Properties of Matter*, Eurasia publishing house, New Delhi, 1993.
- Narayanamoorthy, M., *Mechanics and Properties of Matter*, National Publishing House, New Delhi,1995.

Reference Books

- Halliday D, Resnick, walker.J *Fundamentals of Physics*, willey, 6th edition, New York, 2006.
- Richard P. Feyman, R .B .Leighton & Mathew sands, *Feyman Lecture on Physics Series*, vol. 1,2 & 3, Narosa Publishing, 8th reprint, New Delhi, 1995.
- Mathur D.S, *Mechanics*, S.Chand & Company Ltd, New Delhi, 2005.
- Halliday D, Resnick, Walker. J *Fundamentals of Physics*, Willey, 6th edition, New York, 2006.

UPHM105/UPHM202 PROPERTIES OF MATTER

Semester : I **Credit : 4**
Category : Core -II **Hours/Week : 6**
Class & Major: I B.Sc., Physics **Total Hours : 78**

Objectives
To enable the students

- Understand the basics of elasticity and its importance in beams and griders
- Comprehend the concepts of surface tension, viscosity and their applications
- Examine the knowledge of diffusion, Bernoulli's theorem, ultrasonic and their applications

UNIT – I ELASTICITY 16 Hrs

Introduction – stress, strain, Hooke's law – types of elasticity – Poisson's ratio – workdone due to strain – relation between the elastic moduli – torsion – torsional oscillations of a body – rigidity modulus by torsion pendulum – bending of beams – expression for the bending moment – cantilever – uniform bending – pin and microscope – non uniform bending – scale and telescope.

UNIT – II SURFACE TENSION 16 Hrs

Introduction – explanation of surface tension in kinetic theory – surface energy – angle

of contact – express pressure inside a liquid drop and soap bubble – variation of surface tension with temperature – drop weight method of determination the S.T of a liquid – interfacial tension- experiment to determine the interfacial tension between water and kerosene.

UNIT – III VISCOSITY **15 Hrs**

Introduction – streamline and turbulent flow – determination of critical velocity – Poiseuill's formula – correction – Poiseuill's method for determination coefficient of a liquid – terminal velocity – Stoke's formula – Stoke's method for determination the coefficient of viscosity of a liquid – variation of viscosity with temperature and pressure – friction and lubrication.

UNIT – IV DIFFUSION AND HYDRODYNAMICS **15 Hrs**

Diffusion: Introduction – Fick's law of diffusion – analogy with heat conduction – experimental determination of coefficient of diffusion - Hydrodynamics:equation of continuity – energy of the liquid – Bernoulli's theorem – proof – applications of Bernoulli's theorem – Venturimeter – Pitot's tube.

UNIT – V ACOUSTICS **16 Hrs**

Forced vibrations – damped vibrations – resonance – intensity of sound – noise pollution – transverse vibration of a stretched string – expression for the velocity of transverse vibration of a stretched string – expression for the transverse vibration of a stretched string – laws of vibration of strings-A.C.freuency measurement using sonometer. Ultrasonics-production of ultrasonic waves-use of ultrasonics.

Text Books

- Murugeshan.R, Kiruthiga Sivaprasath, *Properties of Matter and Acoustics*, S.Chand and Company Ltd, New Delhi, 2010.
- Murugeshan R., *A textbook of Sound*, S.Chand and Company Ltd, New Delhi, 2008.

Reference Books

- Halliday D.Resnick,Walker.J, *Fundamentals of Physics*, Wiley,6th Edition, New York, 2006.
- Murugeshan.R, *Waves and Oscillations*, S.Chand and Company Ltd, New Delhi, 2005.

UPHR202/UPHR102 MAJOR PRACTICAL-I

Semester : I **Credit : 2**
Category : Core Practical I **Hours/Weeks : 3**
Class & Major : I B.Sc., Physics **Total Hours : 39**

Objectives
To enable the students

- Understand the theory of the application of subject knowledge
- Determine the techniques of handling equipments
- Compute error free measurements and error analysis

1. Young's Modulus-Cantilever Depression Using Scale and Telescope.
2. Young's Modulus-Uniform Bending-Scale and Telescope.
3. Young's Modulus-Non Uniform Bending-Pin and Microscope.
4. Rigidity Modulus –Torsion Pendulum-(with and without masses).
5. Surface Tension-Capillary rise method-(Radius using Vernier Microscope).
6. Surface Tension and Interfacial Tension-S.T by Drop Weight Method.
7. Co-efficient of Viscosity of a Liquid-Constant Pressure Head.
8. Sonometer-Frequency of Tuning Fork.

Optional

1. Young's Modulus-Uniform Bending-Koenig's Method.
2. Rigidity Modulus- Static Torsion.
3. Co-efficient of Viscosity of a Liquid-Stokes Method.
4. Sonometer - A.C. Frequency-Steel and Brass Wire.

Text Books

- Srinivasan M.N., Balasubramanian S.,Ranaganathan R.,*The Text Book of Practical Physics*, Sultan Chand and Sons, New Delhi, 2006.
- Ouseph C.C., Ranagarajan G., *A Textbook of Practical Physics Part-I,* S.Viswanathan Publisher, 1990.

Reference Book

- Gupta S.L and Kumar V, *Practical Physics*, Pragathi Prakashan.25th edition, 2002.

UPHM104/UPHM203 THERMAL AND STATISTICAL PHYSICS

Semester : II **Credit : 6**
Category : Core III **Hours/Week: 7**
Class & major: I B.Sc., Physics **Total hours : 91**

Objectives
To enable the students

- Understand the basics principles of heat and laws of thermodynamics
- Acquire knowledge of Maxwell's thermodynamics relations

- Summarize the concepts of statistical physics and its applications

UNIT – I THERMOMETRY 19Hrs

Definition of temperature – platinum resistance thermometer – construction & working – thermistor – specific heat capacity – Dulong and Petit's law – calorimeter – specific heat of a gas – relation between specific heat of a gas – Mayer's expression – Jolly's differential steam calorimeter for finding C_V - Callendar and Barne's continuous flow method – basis of kinetic theory – Maxwell's laws of velocity of distribution – experimental verification of Maxwell Boltzmann distribution – degrees of freedom – mean free path.

UNIT – II TRANSMISSION OF HEAT 18Hrs

Introduction – coefficient of thermal conductivity – Lee's disc method – convection – applications of convection – central heating system – thermopile – radiation – thermal radiation – Black body – Stefan's law- experimental verification of Stefan's law- distribution of energy in black body spectrum – Wien's law – Rayleigh – Jeans law – Newton's law of cooling – experimental verification of Newton's law of cooling – Planck's radiation law – solar constant – temperature of the sun – Angstrom's pyrheliometer.

UNIT – III THERMO DYNAMICS 18Hrs

Thermodynamics system – zeroth, first, second and third laws of thermodynamics – isothermal and adiabatic process – reversible and irreversible process – heat engine – efficiency of a Carnot's engine – Carnot's cycle - Carnot's Theorem - Entropy – temperature – entropy diagram – Maxwell's thermodynamic relations – Clapeyron's latent heat equation.

UNIT – IV LIQUEFACTION OF GASES AND SUPER CONDUCTIVITY 18Hrs

Introduction – cooling by adiabatic expression – Joule – Thomson expression – liquefaction of gases – principle of regenerative cooling – liquefaction of Helium – He I & II- peculiar properties of He II - Adiabatic demagnetization – superconductivity – Meissner effect –applications.

UNIT – V STATISTICAL PHYSICS 18 Hrs

Introduction – micro and macro states – thermodynamic probability – ensembles – derivation of Maxwell – Boltzmann distribution law – application of M-B law to ideal gas – identical particles – derivation of Bose-Einstein distribution law – application of B-E statistics – derivation of Fermi-Dirac distribution law – applications of F-D statistics – comparison of three statistics.

Text Books

- Mathur.D.S, *Heat and Thermodynamics*, S.Chand & Company Ltd, New Delhi, 2010.
- Brijlal, Subramaniam, P.S. Hemne, *Heat Thermodynamics and Statistical Physics*, S Chand & Company ltd, New Delhi, 2010.
- Murugesan R., Krithika Sivaprasath.S, *Thermal Physics*, S.Chand & Company Ltd, New Delhi, 2008.

Reference Books

- Chakrabati, P.K. *Theory and Experiments on Thermal Physics*, new central book agency (P) Ltd, Kolkata, 2006.
- Rajam.J.B and Arora.C.L, *Heat and Thermodynamics*, S.Chand & Company Ltd, New Delhi, 2004.

UPHR101/UPHR203 MAJOR PRACTICAL-II

Semester : I **Credit : 2**
Category : Core Practical-II **Hours/Week: 3**
Class & major: I B.Sc Physics **Total Hours : 39**

Objectives
To enable the students

- Understand the theory of the application of subject knowledge in practical
- Demonstrate the techniques of handling equipments
- Make error free measurements and error analysis

1. Compound pendulum-acceleration due to gravity 'g' and radius of gyration.
2. Bifilar pendulum-verification of M.I theorem.
3. Specific heat capacity – Newton's law of cooling.
4. Lee's disc – thermal conductivity of card board.
5. Specific heat of a liquid – verification of Newton's law of cooling.
6. Thermistor – temperature coefficient ''a'' – multimeter.
7. Thermocouple – temperature coefficient ''a'' – multimeter.
8. P.O box – temperature coefficient of thermistor.

Optional

1. Sonometer – measurement sun radiation.
2. Bifilar pendulum – Determination of earth's gravitation field.
3. Measurement of Stefan's constant.
4. Measurement of 'g' by falling plate.

Text books

- Srinivasan.M.N., Balasubramanian S.Ranganathan R., *The Text book of Practical Physics*, Sulthan Chand & Sons, New Delhi, 2006.
- Ouseph.C.C., Rangarajan G., *A Text book of practical of Physics Part – I*, S.Vishvanathan Publisher, 1990.

Reference book

- Gupta.S.L, Kumar.V, *Practical Physics*, Pragathi Prakashan, 25th edition, 2002.

UPHA102 ALLIED PHYSICS-I

Semester : I **Credit : 3**
Category : Allied I **Hours/Week: 3**
Class & Major :I B.Sc Chemistry **Total Hours : 39**

Objectives

To enable the students

- Gain knowledge of basics of particle dynamics and properties of matter
- Understand diffraction and polarization of light waves
- Acquire knowledge on crystal diffraction

UNIT – I Particle Dynamics **7 Hrs**

Displacement, velocity and acceleration – distance-time graph – velocity-time graph – projectile motion – uniform circular motion – tangential acceleration in circular motion – relative velocity and acceleration.

UNIT – II Gravitation **7 Hrs**

Kepler's laws - Newton's law of gravitation – 'g' and measurement – earth-moon system - earth satellites – parking orbit – earth density – mass of the sun – gravitational potential – velocity of escape – satellite potential and kinetic energy.

UNIT – III Properties of matter **9 Hrs**

Elastic properties: Elastic limit – Hooke's law – moduli of elasticity – Poission's ratio – relation between q,n,k – force in a bar due to contraction or expansion – energy stored in a wire – rigidity modulus – torsion in a wire – static torsion and torsional oscillations method.

Viscosity and surface tension: Newton's formula – Stoke's formula – Poiseuille's flow –molecular theory of surface tension – excess pressure over curved surface – spherical and cylindrical drops – surface energy – capillary rise – Quincke's method for mercury.

UNIT – IV Optics **9 Hrs**

Diffraction: Fresnel and Fraunhoffer diffractions – Fraunhoffer diffraction at a single slit - diffraction at multiple slits - plane diffraction grating – determination of wavelength of a spectral line of a Hg lamp.

Polarisation: Double refraction of crystals – geometry of Nicol prism – Huygen's theory – polaroid – circular and elliptical polarization – quarter and half wave plates – production and analysis of polarized beams – optical activity.

UNIT – V Crystal Physics **7 Hrs**

Crystal structures: Introduction – crystal lattice – unit cell – classification of crystals – Bravais lattice in three dimensions –crystal planes and Miller indices – simple crystal structures.

Crystal diffraction: Bragg's law – experimental X-ray diffraction methods - Laue method – rotating crystal method – powder method

Text Books

- Narayanamurthy M and N.Nagararathnam, *Dynamics*, National Publishing House, New Delhi, 2004.
- Mathur D.S., *Properties of Matter*, S.Chand and Company, New Delhi, 2012.
- Murugesan R., Kiruthiga Sivaprasath, *Modern Physics*, S.Chand & Company Ltd, New Delhi, 2006.

Reference Books

- Halliday D and R.Resnick , *Fundamentals of Physics*, Wiley, 6th edition, New York, 2006.
- Brijlal, N. Subramaniam, *A Text book of optics*, S. Chand & company Ltd, New Delhi, 2008.

UPHR103 PHYSICS FOR CHEMISTRY PRACTICAL – I

Semester : I **Credit : 2**
Category : Allied Practical I **Hours/Week : 3**
Class & Major : I B.Sc Chemistry **Total Hours : 39**

Objectives

To enable the students

- Understand the theory of the application of subject knowledge in practical
- Understand the techniques of handling equipments
- Make error free measurements and error analysis

1. Young's Modulus by Strenching – Vernier microscope.
2. Rigidity Modulus – Torsional Pendulum.
3. Surface Tension and Interfacial Tension – Method of Drops.
4. Surface Tension – Capillary Rise.
5. Viscosity – Capillary Flow.
6. Specific heat of Liquid – Newton's law of cooling.
7. Sonometer – verification of Laws of Vibration.
8. Compound bar Pendulum –Determination of 'g' and Radius of Gyration.

Optional

1. Specific Heat of Liquid – Electrical Heating.

Text Books

- Srinivasan M.N., Balasubramanian S.,Ranaganathan R.,*The Text Book of Practical Physics*, Sultan Chand and Sons, New Delhi, 2006.
- Ouseph C.C., Ranagarajan G., *A Textbook of Practical Physics Part-I*, S.Viswanathan Publisher, 1990.

Reference Book

- Gupta S.L and Kumar V, *Practical Physics*, Pragathi Prakashan.25th edition, 2002.

UPHA203 ALLIED PHYSICS -II

Semester : II **Credit : 3**
Category : Allied II **Hours/week : 3**
Class & Major : I B.Sc Chemistry **Total Hours : 39**

Objectives
To enable the students

- Be aware of semiconductor devices and their working principle
- Study the basic number system, digital gates, flip flops, counters and registers
- Acquire the knowledge of atom model, quantum numbers and periodic table

UNIT – I Semiconductor devices **8 Hrs**

Semiconductor- intrinsic and extrinsic semiconductor - Fermi level-mechanism of current conduction- PN - junction diode - Zener diode-LED- Solar cell. Transistor: construction-mechanism of amplification- current components- modes of operation-transistor amplifier.

UNIT – II Digital electronics **7 Hrs**

Number system- binary – octal-hexadecimal-digital gates-Boolean Algebra – K-map-RS-flip flop-JK- flip flop- shift register- full and half adder-binary counter-modulus counter-decade counter

UNIT –III Atomic Physics **8 Hrs**

Atomic Physics: Bohr's atom model- hydrogen spectrum-fine structure splitting-sodium doublet-quantum numbers- Pauli's exclusion principle-periodic table.

X-ray and photoelectric effect: Production of X- ray – continuous and characteristics – X-ray spectra – industrial and medical applications of X-rays. Law of photoelectric emission-Einstein's photoelectric equation- Millikan's experiment-photoelectric cells (emissive, electric and voltaic) –Photo multiplier tubes.

UNIT –IV Nuclear physics **7 Hrs**

General properties of nuclei: Nuclear mass and binding energy –BE/A versus A curve- nuclear spin and magnetic moment- mass, half life and spin of neutron-semi empirical mass formula- nuclear models and elementary particles – nuclear reactions: cross section- nuclear fission- liquid drop model- nuclear forces-elementary particles: classification- quarks and lepton

UNIT –V Mechanical waves **9 Hrs**

Waves in strings and pipes: velocity of a transverse wave along a stretched string – velocity of sound in gases- Newton's formula for velocity of sound-effect of temperature, pressure, humidity and density of medium on sound

Ultrasonic and acoustics: Ultrasonics - Piezo electric effect-detection of ultrasonic's-applications- reverberation time and Sabine's law- measurement of noise – reduction and sound insulations.

Text books

- Brijlal and Subramaniyam, *Electricity and Magnetism*, Ratan Prakash Mandir Publisher, 1995.
- Mani H.S. and Mehta, *Introduction to Modern Physics*, G.K publication, Affiliated East-West Press Ltd, New Delhi, 1998.

Reference Books

- Richard P. Feynman, R.B.Leighton and Mathew Sands, *Feynman Lectures on Physics Series*,Vol, 1,2 and 3,Narosa Publishing ,8th reprint, New Delhi, 2005.
- Khanna R and Bedi R.S, *Text Book of Sound*, Atma ram and sons, New Delhi, 1985.

UPHR202 PHYSICS FOR CHEMISTRY PRACTICAL – II

Semester : I **Credit : 2**
Category : Allied Practical I **Hours/week: 3**
Class & Major : I B.Sc Chemistry **Total Hours: 39**

Objectives:
To enable the students

- Understand the theory of the application of subject knowledge in practical.
- Understand the techniques of handling equipments.
- Make error free measurements and error analysis.

1. Determination of Young's Modulus (Non-uniform Bending) – Pin and Microscope.
2. Determination of Rigidity Modulus (pointer method) – Static Torsion.
3. Determination of Focal Length – Concave and Convex Lenses.
4. Determination of Thickness of Wire – Air Wedge.
5. Universal Building Block – NAND Gates.

6. Determination of Wavelengths (Grating) – Hg Spectrum.
7. LCR Parallel Resonant Circuit.
8. Characteristics of Zener Diode.

Optional

1. Construction of Half and Full Adders – Digital Gates.
2. Determination of Velocity of Sound Waves – Melde' String.

Text books

- Srinivasan.M.N., Balasubramanian S.Ranganathan R., *The Text book of Practical Physics*, Sulthan Chand & Sons, New Delhi, 2006.
- Ouseph.C.C., Rangarajan G., *A Text book of practical of Physics Part – I*, S.Vishvanathan Publisher, 1990.

Reference book

- Gupta.S.L, Kumar.V, *Practical Physics*, Pragathi Prakashan, 25th edition, 2002.

III and IV Evaluation components of CIA

Semester	Category	Course Code	Course Title	Component-III	Component-IV
I	Core II	UPHM103	Mechanics	Seminar - Power Point Presentation	Working Models
	Core IV	UPHM105	Properties of Matter	Assignment (Collection of real time examples of elasticity)	Seminar(Statistical analysis(Noise pollution)
	Allied	UPHA101	Allied Physics - I	Assignment	Poster presentation
II	Core III	UPHM104/ UPHM203	Thermal and Statistical Physics	Poster Presentation	Simple Heat experiments(Model display)
	Allied	UPHA202	Allied Physics - II	Seminar	PPT

COURSE PROFILE M.Sc., (Physics)

PSO1: Proficiency in various mathematical concepts for the proper understanding of application in all physical systems especially in electronics, electromagnetism, material science, classical and quantum mechanics.

PSO2: Learning of laboratory skills, enabling measurements in a physics and electronics laboratory and analysis of the measurements to draw valid conclusions.

PSO3: Operation of the different electronic and physical devices such as microprocessor, microcontroller, laser, linear and nonlinear optical instruments in atomic scale.

PSO4: Ability to synthesis crystals and nanomaterials for various technological applications.

Semester	Category	Course Code	Course Title	Contact Hrs/week	Credit	
					Min	Max
I	Core I	PPHM101	Mathematical Physics I	5	4	4
	Core II	PPHM102	Classical Mechanics	5	4	4
	Core III	PPHM105	Electronics	5	4	4
	Core IV	PPHM104	Electromagnetic Theory	5	4	4
	Core V	PPHM106/ PPHM203	Molecular Spectroscopy	5	4	4
	Core Practical I	PPHR202	General practical –I	5	3	3
Total				**30**	**23**	**23**
II	Core VI	PPHM205/ PPHM401	Mathematical Physics II	5	4	4
	Core VII	PPHM201	Quantum Mechanics I	5	5	5
	Core VIII	PPHM202	Statistical Mechanics	5	4	4
	Core Elective -I	PPHM207/ PPHM302	Solid State Physics I	5	3	3
	Core Practical I	PPHR202	General practical –I	5	3	3
	NME			5	4	4
Total				**30**	**23**	**23**
III	Core IX	PPHM301	Quantum Mechanics II	6	5	5
	Core X	PPHM302	Microprocessor and Microcontroller	6	4	4
	Core XI	PPHM305	Material Science	6	4	4
	Project	PPHP301		2	-	-
	Core Practical- II	PPHR402	General practical –II	5	3	3
	Core XII	PIDM301	Sustainable Materials And Technologies	5	5	5
Total				**30**	**21**	**21**
IV	Core Elective-II	PPHM406/ PPHM303	Laser and nonlinear optics	5	3	3
	Core XIII	PPHM402	Nuclear and Particle Physics	6	4	4
	Core XIV	PPHM403	Solid State Physics-II	5	5	5
	Core Elective -II	PPHM405	Crystal growth and Thin Films	5	4	4
	Core Practical-II	PPHR402	General practical –II	5	3	3

	Project	PPHP401		4	4	4
TOTAL				**30**	**23**	**23**
GRAND TOTAL				**120**	**90**	**90**

PPHM101 MATHEMATICAL PHYSICS-I

Semester : I **Credit : 4**
Category : Core I **Hours/Weeks : 5**
Class & Major : I M.Sc., Physics **Total Hours : 65**

Objectives
To enable the students

- Acquire mathematical knowledge and apply it to various physical phenomena
- Develop problem solving ability related to physical problems
- Enhance basic skills of learning and appreciating physics through mathematics

UNIT – I VECTOR ANALYSIS **13 Hrs**

Concept of vector and scalar fields – Gradient, divergence, curl and Laplacian – Vector identities – Line integral, surface integral and volume integral – Gauss theorem, Green's Theorem, Stoke's theorem and applications – Orthogonal curvilinear coordinates – Expression for gradient, divergence, curl and Laplacian in cylindrical and spherical co-ordinates - Definitions – Linear independence of vectors – Schmidt's orthogonalisation process – Schwartz inequality.

UNIT – II COMPLEX ANALYSIS **12 Hrs**

Functions of complex variables – Differentiability - Cauchy-Riemann conditions – Complex integration – Cauchy's integral theorem and integral formula – Taylor's and Laurent's series – Residues and singularities - Cauchy's residue theorem – Evaluation of definite integrals -Derivatives of analytic functions -calculus of residues.

UNIT – III FOURIER SERIES AND LAPLACE TRANSFORMS
13Hrs

Fourier Series-Dirichlet‟s Theorem-Change of Interval-Complex Form-Fourier Series in the Interval $(0, \infty)$ - Uses of Fourier Series-Laplace Transform-Definition-Properties-Translation Property-Inverse Laplace Transform-Properties, example problems.

UNIT – IV PARTIAL DIFFERENTIAL EQUATIONS **14Hrs**

Homogeneous and non-homogeneous equations of first and second order partial differential equations separation of variables technique-solution by Fourier series-use of double Fourier series. Applications: (1) One dimensional wave equation (2) one dimensional heat flow equation (separation of variables and use of Fourier series) (3) two dimensional Laplace's equation in Cartesian coordinate (separation of variables and double Fourier series.)

UNIT – V SPECIAL FUNCTIONS **13 Hrs**

Sturm-Liouville problem – orthogonal functions - Legendre, Associated Legendre, Bessel, Laugerre and Hermite differential equations: series solution – Rodriguez formula –

Generating functions – Orthogonality relations – Important recurrence relations- Gamma and Beta functions.

Text Books

- Erwin Kreyzig, *Advanced Engineering Mathematics*, Publishers-John Wiley & Sons, Inc, 8th edition, 2005.
- Michael Tinkham, *Group Theory and Quantum Mechanics*, Tata McGraw-Hill Co. Ltd, TMH edition,1974.
- Joshi A.W., *Group Theory for Physicists* Wiley Eastern Limited, 2nd Edition,1997.
- Spiegel. M.R., *Theory and Problems of Fourier Analysis*, Schaum's outline series,2000.

Reference Books

- Murray R. Spiegel, *Theory and Problems of Fourier Analysis with Applications to Boundary Value Problems*, Mchraw Hill Book Company, 2000.
- Sankara Rao K., *Introduction to Partial Differential Equations,* Prentice Hall of India, 2nd Edition, 2005.
- Greenberg M. D, *Advanced Engineering Mathematics*, Publishers-Pearson Education (singapore) pvt. Ltd, 2nd edition, 2002.

PPHM102 CLASSICAL MECHANICS

Semester : I **Credit : 4**
Category : Core II **Hours/Weeks : 5**
Class & Major : I M.Sc., Physics **Total Hours : 65**

Objectives
To enable the students

- Understand the fundamental principles of classical mechanics and their applications
- Develop familiarity with the physical concepts and facility with the mathematical methods of Classical Mechanics.
- Examine different formulations on classical dynamics with their applications.

UNIT – I FUNDAMENTAL PRINCIPLES AND MATHEMATICAL FORMULATION **13 Hrs**

Mechanics of a particle and system of particles – Conservation laws – Constraints – Generalized coordinates – D' Alembert's principle and Lagrange's equation – Hamilton's principle –Lagrange's equation of motion – conservation theorems and symmetry properties – Motion under central force : General features.

UNIT – II LAGRANGIAN AND HAMILTONIAN FORMULATIONS **13 Hrs**

Hamilton's variational principle - Lagrange's equations of motion –Conservation theorems and symmetry properties – Cyclic coordinates - Application of Lagrange's equation; Linear harmonic oscillator, particle moving under a central force, Atwood's machine - Hamilton's equations of motion - Application of Hamiltonian's equations of motion; Particle moving in an electromagnetic field - Phase space - Principle of least action Lagrange and Poisson brackets – Hamilton – Jacobi method – Action angle variables – Kepler problem in action – angle variables.

UNIT – III TWO-BODY CENTRAL FORCE PROBLEMS 12 Hrs

Equations of motion and first integrals – The equivalent one – dimensional problem and classification of orbits – The Keplar problem – Inverse square law of force, the Laplace Runge-Lanz Vector – Scattering in a central force field – Scattering in laboratory and centre of mass frames.

UNIT - IV RIGID BODY DYNAMICS AND OSCILLATORY MOTION 13 Hrs

Euler angles – Moments and Products of Inertia – Euler's equations – symmetrical top – applications – theory of small oscillations and normal modes – frequencies of free vibration and normal coordinates – Linear triatomic molecule.

UNIT - V RELATIVISTIC MECHANICS 14 Hrs

Algebra of tensors – quotient law – fundamental tensor – Cartesian tensors – four vectors in special theory of relativity – Lorentz transformations in real four dimensional spaces, Covariant four dimensional formulations – force and energy equations in relativistic mechanics – Lagrangian and Hamiltonian formulation of relativistic mechanics.

Text Books

- Goldstein H., Poole C., Safko J., *Classical Mechanics*, Addison Wesley, New Delhi, 2002.
- Upathaya J. C., Classical Mechanics, *Mimalgya publishing house*, Mumbai,2005.
- Gupta, Kumar, Sharma, *Classical Mechanics*, 22nd Edition, Pragati Bhawan, Meerut, 2006.

Reference Book

- Rana N.C. and Joag P.S., *Classical Mechanics*, Tata McGraw Hill, New Delhi, 1991.

PPHM105 ELECTRONICS

Semester : I **Credit : 4**
Category : Core III **Hours/Weeks : 5**
Class & Major: I M.Sc., Physics **Total Hours : 65**

Objectives

To enable the students

- Understand basic and advanced electronic concepts
- Understand how to design circuits which can process digital data
- Establish the various principles of analog electronics and its applications

UNIT – I OPERATIONAL AMPLIFIERS 13 Hrs

Ideal Op-Amp-inverting, non-inverting, logarithmic, summing and difference amplifiers-integrator - differentiator- comparator-CMRR – Op-Amp Applications- summing amplifiers- Application of summing amplifiers.

UNIT – II UJTS AND THYRISTORS 14 Hrs

Operational Principle of UJT- Characteristics- SCR- V-I Characteristics –TRIAC- Thyristors: Basic Parameters- Current Controllable Devices- Thyristors in Series and Parallel- Applications of Thyristors - TRIAC based AC power control. Bistable Multivibrator, Half and Full Wave Controlled Rectifier.

UNIT – III DIGITAL INTEGRATED CIRCUITS 12 Hrs

7400 TTL- TTL Parameters; TTL-MOSFET - CMOS FET - Three State TTL Devices-External drive for TTL Loads - TTL Driving External Loads-74C00 CMOS- CMOS Characteristics- TTL to CMOS Interface- CMOS to TTL interface- Current Tracers.

UNIT – IV ANALOG INTEGRATED CIRCUITS 13 Hrs

Electronic Analog Computation- Active Filters- High/Low Pass Filter-Band Pass Filter-Band Reject Filter- Delay Equalizer- Switched Capacitor Filters; Comparators- Sample and Hold Circuits- Waveform Generators- Square Wave Generator- Triangle wave Generator-Sawtooth Generator.

UNIT-V INTEGRATED CIRCUITS AS DIGITAL SYSTEM 13 Hrs

Binary Adders- Half / Full Adder- - MSI Adder-Serial/Parallel Operation-Decoder/Demultiplexer- BCD to Decimal Decoder-4-to-16 line Demultiplexer- Data Selector/Multiplexer-16-to-1 Multiplexer; Encoder; ROM:Code Converters-Programming the ROM-Applications-Basic RAM Elements-Bipolar RAM-Static and Dynamic MOS RAM-Ladder Type D/A Converter-Multiplying D/A Converter.

Text Books

- Chattopadhyay S., *Text Book of Electronics*, New Central Book Agency P.Ltd., Kolkata, 2006.
- Malvino A.P., D.P. Leach, *Digital Principles and Applications*, Tata McGraw-Hill, Publishing Co., New Delhi, 2005.

Reference Books

- Bhattacharya A.B., *Electronics Principles and Applications*, New Central Book Agency P.Ltd., Kolkata, 2007
- Jacob Millman, Christos C Halkins and Chetan Parikh, *Integrated Electronics Analog and Digital Circuits and Systems* , 2nd Edition, Tata McGraw Hill Educatio Private Limited, New Delhi, 2010.
- Anil K. Maini and VarshaAgarwal, *Electronic Devices and Circuits*, Wiley India Pvt. Ltd., New Delhi, 2009.

PPHM104 ELECTROMAGNETIC THEORY

Semester : I **Credit : 4**
Category : Core IV **Hours/Weeks : 5**
Class & Major : I M.Sc., Physics **Total Hours : 65**

Objectives

To enable the students

- Understand the law and their applications associated with electrostatics and magneto statics
- Explain the laws associated with electromagnetic and its applications
- Compare the production of electromagnetic waves and its propagation in different media

UNIT – I ELECTROSTATICS **13 Hrs**

Coloumb's law- electric field- Continuous charge distribution- Gauss Law and its application –Electric potential-Poisson & Laplace equations- boundary value problems-Dielectrics-Polarization and Displacement vectors-Boundary conditions-Dielectric sphere in a uniform field- Molecular polarisability and electric susceptibility

UNIT – II MAGNETOSTATICS **12 Hrs**

Biot-Savart's law-Divergence and curl of magnetic induction-magnetic vector potential-Ampere's circuital law-Ampere's law in magnetized materials-Effect of magnetic field in atomic orbits –Magnetic field inside matter-Linear and nonlinear media-Magnetic susceptibility and permeability

UNIT – III ELECTRODYNAMICS **14 Hrs**

Electromotive force-Ohms law- faradays law-Electromagnetic induction- Maxwell's equations in free space and linear isotropic media- -Magnetic charge-Maxwell equations in matter- Boundary conditions- Conservation laws – Conservation of energy – Poynting's theorem - conservation of momentum-Scalar and vector potentials- Gauge invariance-Dynamics of charged particles in static and uniform electromagnetic fields.

UNIT – IV WAVE PROPAGATION **13Hrs**

Electromagnetic waves in free space- Reflection and refraction, Fresnel's law, interference, coherence, and diffraction non conducting medium-conducting medium-skin depth-reflection and transmission at dielectric boundaries-polarization-Guided waves-Wave guides-Propagation of waves in a rectangular wave guide-inhomogeneous wave equation and retarded potentials-Radiation- from moving charges and dipoles and retarded potentials.

UNIT – V APPLICATIONS – PLASMA PHYSICS **13Hrs**

Plasma – Plasma criteria – plasma oscillations-plasma behavior in a magnetic field-Dispersion relations in plasma. Debye shielding problem- plasma confinement in a magnetic field- pinch effect- magneto hydrodynamic waves- Alfven waves.

Text Books

- David J. Griffiths, *Introduction to Electrodynamics*, Prentice Hall of India, New Delhi, 1995.
- Laud B.B., *Electromagnetics*, New Age International Pvt., Ltd., New Delhi, 2005.
- Chopra and Agarwal, *Electromagnetic Theory*, Kadernath and Ramnath & Co. Meerut, 2005.
- Sathya Prakash, *Electromagnetic Theory and Electrodynamics*, Kadernath Ramnath & Co., Meerut, 2007.

Reference Books

- Jackson J.D., *Classical Electrodynamics*, Wiley Eastern, 1998.
- Balmain K.G., *Electromagnetic Waves and Radiating System*, Prentice Hall of India, 1995.

- Edward C. Jordan, Keith G. Balmain, *Electromagnetic waves and Radiating system*, Second Edition, Prentice Hall of India, New Delhi, 2001.

PPHM106/PPHM203 MOLECULAR SPECTROSCOPY

Semester : I **Credit : 4**
Category : Core V **Hours/Weeks : 5**
Class & Major : I M.Sc., Physics **Total Hours : 65**

Objectives
To enable the students

- Acquire the knowledge of interaction electromagnetic radiation with atoms and molecules and study the different types of spectra
- Know the spectroscopic techniques to use in finding the molecular structure, bond angles, bond length etc.
- Explain use of spectroscopic methods for qualitative and quantitative analysis.

UNIT – I MICROWAVE SPECTROSCOPY 13 Hrs

Rotation of molecules-Rotational spectra-Rigid and non-rigid diatomic rotator-Intensity of spectral lines-Isotopic substitution-Poly atomic molecules (Linear and symmetric top)-Hyperfine structure and quadrupole effects-Inversion spectrum of ammonia-Chemical analysis by microwave spectroscopy-Techniques and instrumentation.

UNIT – II VIBRATIONAL SPECTROSCOPY 14 Hrs

Infrared spectroscopy-Vibration of molecules-Diatomic vibrating rotator-vibrational rotational spectrum-Interactions of rotations and vibrations-Influence of rotation on the vibrational spectrum of linear and symmetric top and poly atomic molecules-Analysis by infrared techniques-Instrumentation-FTIR spectroscopy -Raman spectroscopy: Classical and quantum mechanical picture of Raman effect-Pure rotational Raman spectrum -Raman activity of vibrations of CO_2 and H_2O Rule of mutual exclusion- Vibrations of spherical top molecule-structural determination from IR and Raman spectroscopy techniques and instrumentation-FT Raman Spectroscopy

UNIT – III ELECTRONIC SPECTROSCOPY 12 Hrs

Electronic spectra-Frank-Condon principle-Dissociation energy and dissociation products-Fortrat diagram- predissociation-shapes of some molecular orbits- Chemical analysis by electronic spectroscopy-Techniques and instrumentation-Mass spectroscopy-ESR spectroscopy-Introduction-techniques and instrumentation-Double resonance

UNIT – IV NUCLEAR RESONANCE SPECTROSCOPY 13 Hrs

Nuclear magnetic resonance spectroscopy-Introduction-Interaction of spin and magnetic field-population of energy levels- Larmor precession-Relaxation times-Chemical shift and its measurement-Coupling constant-coupling between several nuclei-quadrupole effects-C^{13} NMR spectroscopy-Mossbauer spectroscopy: Principle-instrumentation-Effect of electric and magnetic fields.

UNIT - V SURFACE SPECTROSCOPY **13 Hrs**

Electron energy loss spectroscopy (EELS)-Reflection absorption spectroscopy (RAIRS)-Photoelectron spectroscopy (PES)- XPES, UPES-Auger electron spectroscopy (AES) X-ray Fluorescence spectroscopy (XRF)-SIMS.

Text Book

- Colin N. Banwell and Elaine M. *Fundamentals of Molecular Spectroscopy* (5^{th} Edition Tata McGraw-Hill Publishing Company limited), 2013.

Reference Book

- Jack D.Graybeal, *Molecular Spectroscopy*, Mc Graw Hill Education, 2014

PPHM205/PPHM401 MATHEMATICAL PHYSICS-II

Semester : II **Credit : 4**
Category : Core VI **Hours/Weeks : 5**
Class & Major : II M.Sc., Physics **Total Hours : 65**

Objectives
To enable the students

- Understand the various mathematical representations
- Acquire knowledge about the tensor analysis
- Formulate the Greens function and probability

UNIT- I PROBABILITY **13Hrs**

Probability - Addition rule of Probability - Multiplication Law of Probability - Probability Distributions - Binomial distribution - mean Binomial distribution - Standard deviation of binomial distribution - Poisson distribution - Normal distribution - characteristics of normal distribution - Applications of normal distribution.

UNIT- II APPLICATION IN MATRICES AND DETERMINANTS **13Hrs**

Properties of matrix addition and multiplication – different type of matrices and their properties – Rank of a Matrix and some of its theorems – Solution to linear homogeneous and non-homogeneous equations – Cramer's rule – eigenvalues and eigenvectors of matrices – differentiation and integration of matrix.

UNIT - III ROLE OF GROUP THEORY IN PHYSICS **13Hrs**

Definition of Group – Subgroup invariant group abelian group orthogonal and unitary groups - Homomorphism, isomorphism - Reducible and irreducible representations - generators
of Continuous groups.

UNIT – IV TENSOR ANALYSIS **13Hrs**

Definition of Tensor – coordinate transformation - Summation convention - Contravariant, covariant and mixed tensors – rank of tensor – addition and subtraction of Tensors –Symmetry and antisymmetry Tensor – Contraction of tensor – product rule and Quotient rule- invariant tensors – Kronecker delta and Levi-Civita Symbol - irreducible tensors.

UNIT –V GREEN'S FUNCTIONS **13Hrs**

Green's function - One dimensional Green function – boundary conditions – Eigen function - expansion of the Green's function- Reciprocity theorem – Sturm Liouville type equations in one dimension and their Green's functions.

Text Books

- Arfken & Weber, *Mathematical Methods for Physicists* - Elsevier 7th edition, US, 2012.
- Joglekar S.D., *Mathematical Physics* - Universities Press Pvt. Ltd. 1st edition, Hydrabad, 2005.
- Satya Prakash, *Mathematical Physics*, Sultan Chand & Sons, 6th Revised Edition, New Delhi, 2014.

Reference Books

- Dass H.K. and Verma R., *Mathematical Physics*, S. Chand & Company, 4th edition, 2011.
- Erwin Kreyszig, *Advanced Engineering Mathematics*, Wiley Eastern, 10th edition, 2010.
- Gupta B.D., *Mathematical Physics*, Vikas Publishing House Pvt.Ltd, 3rd edition, 2006.
- A.W.Joshi , *Elements of Group Theory of Physicists*, Wiley Eastern Ltd, 2010.

PPHM201 QUANTUM MECHANICS I

Semester : II **Credit : 5**
Category : Core VII **Hours/Weeks : 5**
Class & Major : I M.Sc., Physics **Total Hours : 65**

Objectives

To enable the students

- Understand basic idea of Dirac formalism to Quantum Mechanics.
- Apply the same formalism to study the angular momentum concept, scattering of fundamental particles and necessary relativistic modification in particle behavior.
- Understanding of similarities between classical and quantum mechanics.

UNIT – I SCHRÖDINGER EQUATION AND GENERAL FORMULATION 14 Hrs

Schrödinger Equation – Physical meaning and conditions on the wave function – Expectation values and Ehrenfest's theorem – Hermitian operators and their properties – Commutator relations - Uncertainty relation - Bra and ket vectors - Hilbert space – Schrödinger, Heisenberg and interaction pictures. Linear Vector Space- Linear Operator- Eigen Functions and Eigen values- Postulates of Quantum Mechanics- Simultaneous Measurability of Observables - Dirac's Notation- Equations of Motion; Schrodinger, Heisenberg and Dirac representation- momentum representation.

UNIT – II QUANTUM MECHANICS IN THREE DIMENSION 12 Hrs

Schrodinger equation in spherical co-ordination- Separation of variable-Angular equation- Hydrogen Atom- Radial Wave equation- Spectrum of Hydrogen.

UNIT - III ANGULAR MOMENTUM **13 Hrs**

The angular momentum operator – eigenvalues and eigen functions of L_2 – The commutation relations – angular momentum and rotations – ladder operators – the constants C+ and C- angular momentum matrices corresponding to j = ½ and j = ½ - Pauli spin matrices – Pauli wave function and Pauli equation – addition of angular momenta – Clebsh – Gordan Coefficients – concept of isospin.

UNIT – IV APPROXIMATION METHODS **13 Hrs**

Time independent perturbation theory: Non-degenerate and degenerate perturbation theories -Stark effect – WKB Approximation- Application to tunneling problem and quantization rules. Time dependent perturbation theory: Harmonic Perturbation - Transition probability.

UNIT – V RELATIVISTIC WAVE EQUATIONS **13 Hrs**

The Klein – Gordan equation – the Dirac Equation – Dirac's a and b matrices – the continuity equation – the free particle solutions– the hole theory – spin of the Dirac electron – magnetic dipole moment of the electron – the velocity operator – expectation value of the velocity – relativistic invariance of Dirac equation.

Text Books

- Griffths, *Quantum Mechanics*, 2nd edition, Dorling Kindersley India (Pvt), New Delhi, 2005.
- Ghatak and Lokanathan S., *Quantum Mechanics*, Macmillam India Ltd., New Delhi, 2005.
- Devanathan V., *Quantum Mechanics*, Narosa Publishing House, New Delhi, 2006.

Reference Book

- Ajoy Ghatak, Lokanathan S., *Quantum Mechanics*, 5th Edition, Macmillan Publishers India Ltd, 2013.

PPHM202 STATISTICAL MECHANICS

Semester : II **Credit : 4**
Category : Core VIII **Hours/Weeks : 5**
Class & Major : I M.Sc., Physics **Total Hours : 65**

Objectives

To enable to the students

- Review the fundamental concepts of thermodynamics in order to understand Statistical Mechanics.
- Understand the principles of classical statistical mechanic and its application to compute the various parameters of molecules.
- Apply techniques from statistical mechanics to a range of situations

UNIT – I INTRODUCTION **13 Hrs**

Phase Space-Ensemble-Ensemble average-Liouville Theorem-Equation of motion-Equal-a priori-probability-Statistical equilibrium-Micro canonical ensemble-Entropy of an ideal Boltzmann gas using micro canonical ensemble-Gibb's paradox- MB, BE and FD statistics-various distributions using micro canonical ensemble.

UNIT - II CANONICAL AND GRAND CANONICAL ENSEMBLES 13 Hrs

Entropy of a system in contact with a heat reservoir-Ideal gas in canonical ensemble-Maxwell velocity distribution-Equipartition of energy-photons. Grand canonical ensemble-Ideal gas in grand canonical ensemble-Canonical partition function-Harmonic oscillator in canonical ensemble and grand canonical ensemble.

UNIT – III BOSE-EINSTEIN STATISTICS 13 Hrs

Bose-Einstein distribution-Bose-Einstein condensation- Thermodynamic properties of an ideal BE gas-Liquid Helium-Landau spectrum of Phonons and Rotons- Helium 4 and Helium 3 mixtures-Superfluid phases of Helium 3.

UNIT – IV FERMI-DIRAC STATISTICS 13 Hrs

Fermi-Dirac distribution-degeneracy-Thermionic emission-White dwarfs-Nuclear matter- Quantum Hall effect-Specific heat of an electron gas-One-dimensional metal- Effect of Periodic structures.

UNIT - V FLUCTUATIONS 13 Hrs

Introduction-mean square deviation-Fluctuations in ensembles-Concentration fluctuations in quantum statistics-One dimensional random walk-Brownian motion-Fourier analysis of a random function-Electrical noise.

Text Books

- Agarwal .B.K. and Melvin Eisner, *Statistical Mechanics*, New Age International Limited, 2nd edition, 2003.
- Bhattacharjee, *Statistical Mechanics*, Allied Publishers Limited,1996.
- Pathria R. K. and Paul D. Beale, *Statistical Mechanics*, Butterworth-Heinemann print 3rd Edition, New Delhi, 2011 .

Reference Books

- Donald A. McQuarrie, *Statistical Mechanics*, Viva Books Private Limited, 2003.
- Silvio. R.A Salinas, *Introduction to Statistical Physics*, Springer, 2004.

PPHM207/PPHM302 SOLID STATE PHYSICS -I

Semester : II **Credit : 3**
Category : Core IX **Hours/Week : 5**
Class and Major: I M.Sc., Physics **Total Hours : 65**

Objectives
To enable the students

- Understanding of the structural aspects and physical properties of condensed matter.
- Evaluate about nature of the materials.
- Describe basic experimental measurements, to show typical data sets and to compare these with theory.

UNIT- I CRYSTAL STRUCTURE 13Hrs

Crystal classes and symmetry – 2D, 3D lattices - Ewald's sphere construction – Bragg's law – Systematic absences – Atomic scattering factor – Diffraction – Structure factor

– Experimental techniques – Laue, Powder, Rotation methods – Phase problem – Electron density distribution (elementary ideas only).

UNIT -II LATTICE VIBRATION AND THERMAL PROPERTIES 13Hrs

Dynamics of a chain of identical atoms - dynamics of a diatomic linear chain anharmonicity and thermal expansion-thermal conductivity-phonon-phonon interaction-normal and Umklapp processes heat capacity-density of phonon states-Dulong Pities' law – Einstein specific heat- Debye's model of specific heat.

UNIT - III ELECTRON THEORY OF METALS 13Hrs

Electron moving in a one - dimensional well - density of states in three dimension - Fermi-Dirac statistics - effect of temperature on Fermi distribution function - electronic heat capacity-electrical resistivity - Ohm's law-Widemann - Franz law-Hall effect.

UNIT- IV FREE ELECTRON THEORY 13Hrs

Bloch's theorem-Kronig - Penney model-construction of Brillouin zones-extended, reduced and periodic zone schemes - effective mass of an electron-nearly free electron model-conductors, semiconductors and insulator.

UNIT- V FERMI SURFACE 13Hrs

Fermi surface and Brilloiun zones - Harrison's method of constructing Fermi surface in 2Delectron, hole and open orbits - characteristics of Fermi surface - effects of electric field on the Fermi surface - effect of magnetic field on the Fermi surface - quantization of electron orbits-experimental study of Fermi surface.

Text Books

- Wahab, M.A. *Solid state physics, Structure and properties of materials*, 2nd edition Narosa Publishing House, 2005.
- Micea S Rogalski and Stuart B.Palmer *Solid State Physics* Gordon and Breach Science Publishing, 2001.
- Puri R.K. and V.KBabbar, *Solid State Physics*,3rd edition, S.Chand and Company Ltd, 2005.
- Palanisamy P.K., *Solid State Physics,* Scitech publications (India). Ltd, 2003.

Reference Books

- Charles Kittel, *Introduction to Solid State Physics,* Wiley Eastern Limited,7th edition, 2008.
- Ajay Kumar Saxena, *Solid State Physics,* MacMillan Publishers, 2006.

PRACTICALS
PPHR202 GENERAL PRACTICAL - I

Semester : I & II **Credit : 3+3**
Category : Core practical-I **Hours/Week : 5+5**
Class & Major : I M.Sc., Physics

Objectives
To enable the students

- Understand the theory of the application of subject knowledge in practical
- Understand the techniques of handling equipments
- Make error free measurements and error analysis

A. GENERAL EXPERIMENTS

1. Determination of q, n, b by elliptical fringes method
2. Determination of q, n, b by hyperbolic fringes method
3. Determination of Planck's constant
4. Determination of Stefan's constant
5. Determination of wavelength and thickness of a film by using Michelson Interferometer
6. Identification of prominent lines by spectrum photography – Copper spectrum
7. Identification of prominent lines by spectrum photography – Iron spectrum
8. Determination of Hall effect.
9. Dielectric constant of material to study the susceptibility of material
10. Hydrogen spectrum-Rydberg constant

Optional

1. Determination of e/m of an electron by Thomson's method
2. Determination of wavelength of monochromatic source using biprism.
3. Determination of refractive index of liquids using biprism (by scale & telescope method).
4. Determination of Laser beam parameter
5. Air method- Co-efficient of linear expansion

B. ELECTRONICS EXPERIMENTS

1. Design and study of monostable multivibrator and Schmitt trigger.
2. Design and study of Wein bridge Oscillator (Op-amp).
3. Design and study of phase shift Oscillator (Op-amp).
4. IC 555 timer – Schmitt trigger.
5. IC 555 Timer Astable multivibrator.
6. Operational amplifier wave generator.
7. OP-Amps phase shift oscillator.
8. Digital to Analog converter.
9. Solving simultaneous equation using IC 741.
10. Op-Amp Design of active filter.

Optional

1. Common source amplifier using FET.
2. Construction of an Instrumentation amplifier.
3. BCD to seven segment display using 7447.

4. AC to DC converter using Power Supply.
5. Half wave and Full-wave rectifier.

Text Book

- Srinivasan.M.N., Balasubramanian.S., Ranaganathan.R., *The Text Book of Practical Physics*, Sultan Chand and Sons, New Delhi,2006.

Reference Book

- Gupta S.L. and Kumar V, *Practical Physics*, Pragathi Prakashan.25th edition,2002.

Evaluation: III and IV components of CIA-PG

Semester	Category	Course Code	Course Title	Component-III	Component-IV
I	Core I	PPHM101	Mathematical Physics- I	Seminar - Power Point Presentation	Problem solving
	Core II	PPHM102	Classical Mechanics	Poster Presentation	Assignment
	Core III	PPHM105	Electronics	Poster Presentation	Simple experiments(Model display)
	Core IV	PPHM104	Electromagnetic Theory	Assignment	Poster presentation
	Core V	PPHM106/ PPHM203	Molecular Spectroscopy	Poster Presentation	Model display
II	Core VI	PPHM205/ PPHM401	Mathematical Physics II	Problem solving	Assignment
	Core VII	PPHM201	Quantum Mechanics I	Assignment	PPT
	Core VIII	PPHM202	Statistical Mechanics	Seminar	Statistical Analyses (Noise Pollution)
	Core Elective - I	PPHM207/ PPHM302	Solid State Physics I	Assignment	Seminar

PPHE101/201 -NANOSCIENCE

Semester : II **Credit : 4**
Category : Non-Major Elective **Hours/Weeks : 5**
Class & Major : I PG **Total Hours : 65**

Objectives

To enable the students

- Introduce the developing field of nanoscience and technology
- Special focus on the methods of synthesis, characterization techniques and application.

UNIT –I FUNDAMENTALS OF NANOSCALE SCIENCE 13Hrs

Introduction-nano and nature-background to nanotechnology-scientific revolutions opportunities at the nanoscale-time and length scale in structures-energy landscapes basic intermolecular force inter dynamic aspects of intermolecular forces.

UNIT –II CLASSIFICATION ON NANOPARTICLES AND ITS PROPERTIES 14Hrs

Metal Nan particles: Size control of metal nano particles, Structure, surface, electronic and optical properties. Semiconductor Nanoparticles: solid state phase transformation, Exactions, Quantum confinement effect, Semiconductor quantum dots(SQDs), Correlation of properties with size, Quantum Well, Quantum Wires, Supper lattices band Band offsets, Quantum dot lasers.

UNIT –III SYNTHESIS OF NANOMATEERIALS 12 Hrs

Wet chemical Synthesis for Nanomaterials: Chemical and co-precipitation, Sol fundamentals-sol-gel synthesis of metal oxides, Micro emulsions or reverse micelles, Solvotherma, Microwave heating synthesis, son chemical synthesis, Electrochemical synthesis, Photochemical synthesis, Langmuir Blodgett(LB) techniques.

UNIT –IV CHERACTERZATION TECHNIQUES 13Hrs

Powder X-Ray Diffraction, Energy dispersive X –ray (EDX), X-ray photoelectron spectroscopy(XPS),Scanning tunneling microscope (STM), atomic force microscope (AFM), UV- Visible absorption.

UNIT – V APPLICATION OF NANOMATERIALS AND NANOCOMPOSTES 13Hrs

Nanosensors based on optical properties and quantum size effects: sensors based on physical properties-Electrochemical sensors, sensors aerospace, defence and Biosensors. Energy: Solar cells, LED and Photovoltaic device application.

Text book

- Viswanathan B., Structure and Properties of solid state Materials Oxford: Alpha Science International, 2nd Edition 2006.
- Pradeep T.,Nano the Essentials, Tata McGraw – Hill Publishing Company Limited 2007.

Reference Books

- Schmidt G.,Wiley Weinheim, Nanoparticles: from Theory to Application, 2004.
- Sulabha K. Kulkarni, Nanotechnology Principle and Practices, Capital Publishing Company, India,2007

M.Sc PHYSICS

Semester	Category	Course Code	Course Title	Credit	
				Min	Max
II	PG Service learning	PHYX201	Energy Audit	-	1

PHYX201- ENERGY AUDIT

Semester : II **Credit : 1**
Category : PG Service Learning **Total Hours : 40 hrs**
Class & Major: M. Sc Physics

Objectives
To enable the students

- Understand about the Energy audit and its measurements.
- Acquire the knowledge about the practical auditing methodology.
- Interpret the power optimization.

INTRODUCTION TO ELECTRICAL POWER AND ELECTRICITY

Electrical parameters - definitions - resistive, inductive, capacitive loads - active power - reactive power - apparent power - power factor - linear and non-linear loads – electricity demand (kVA/kW) calculation - electricity tariff.

ELECTRICAL DISTRIBUTION SYSTEM

HT supply – control - distribution transformer - power control centre (PCC) - captive generator - power cables - motors - LT power capacitors - lighting – UPS - servo stabilizer - electrical measuring instruments - importance of measurements - types of meters - instantaneous measuring meter

Activity

Purpose: To gain the basic knowledge and understanding about audit the energy for electrical consumption.

1. To study and analyze the power utilization for the given building area/room.
2. To measure and calculate the voltage/current of an available electrical system (Lights and Fans) and equipments.
3. To analyze the power utilization and make the strategy for power consumption in the electrical items.
4. To submit the detailed report with the conclusion made during the audit.

References

- Muthuvelan M and Balasubramanian H, *A practical guide to reactive power management in industry*, 2012, SITRA publication, Coimbatore-641014, email:info@sitra.org.in, www.sitra.org.in
- Wayne C Turner, *Energy Management Handbook*, The Fairmount Press, Inc., 1997.
- IEEE Recommended practice for energy management in industrial and commercial facilities, IEEE STD 739-1995 (Bronze Book).
- TERI, *Handbook on energy audit & Management*, TERI Press, New Delhi.
- Francisco C.DE LA ROSA, *Harmonics and Power systems*, Indian edition, CRC press, 2010.
- Ramasamy Natarajan, *Power system capacitors*, Indian edition, CRC press, 2010.
- Ewald F.Fuchs, Mohammad A.S.Masoum, *Power quality in power systems and electrical machines*, Indian edition, Elsevier Inc, 2008.

COURSE PROFILE M.Phil., (Physics)

Semester	Category	Course code	Course Title	Hours per week	Credit	
					Min	Max
I	Core 1	MPHM101	Research Methodology	6	5	5
	Core II	MPHM102	Advanced Material Science	6	5	5
	Core III	MPHM103	Special area study	6	5	5
II	Core IV	MPHM201	Dissertation and viva voce	30	15	15
TOTAL				**48**	**30**	**30**
Paper presentation (minimum one) and / or publication of articles in journals (minimum one) is mandatory for submission of dissertation.						

MPHM101 RESEARCH METHODOLOGY

Semester : I **Credit : 5**
Category : Core I **Hours/ Week : 6**
Class & Major : M.Phil Physics **Total Hours :78**

Objectives
To enable the students

- Enhance the knowledge on research and its methodologies
- Expose the student with various mathematical methods for numerical analysis and use of computation tools
- Impart the knowledge on data and property analysis and programming concepts

UNIT – I Techniques for Research **15 Hrs**

Identification of the problem–determining mode of attack–literature survey–references – awareness of current status of the art - abstraction of a research paper – possible ways of getting abreast of current literature – Role of scholar and guide.

UNIT – II Techniques of Scientific Writing **15 Hrs**

Scientific Writing - definition – organizing a scientific paper – Title – listing of authors and address – abstract – introduction – materials and methods section – results section – discussion section – acknowledgement – references – design of effective tables – effective illustrations – manuscript – submission – review process – publishing process – reprints – review paper – conference report – oral and poster presentation – thesis — usage of English.

UNIT- III Numerical Methods **16 Hrs**

System of linear equations – Gauss-Jordan elimination method – iterative method – Newton – Raphson method – Numerical integration – Simpson's 1/3 rule – Simpson's 1/8 rule – Gauss – Legendre quadrature – Solution of differential equations – Runge-Kutta Method – Eigen values and Eigen vectors – Power method — Jacobi's method.

UNIT- IV Programming in C **16 Hrs**

Basic structure of C programming – Character set – constants – keywords and identifiers – variables – data declaration of variables – assigning values to variables – defining symbolic constants. Operators (Arithmetic, relational, logical, assignment, increment, decrement, conditional and special) type conversion in expressions.

UNIT- VAdvanced Analytical techniques **16 Hrs**

Analytical Technique – principles of single crystal and powder X-ray diffraction , FT-IR, Raman and UV-visible spectrometers – SEM, TEM, EDAX, AFM, EPMA – Instrumentation – Sample preparation – Analysis of materials – study of dislocation – ion implantation uses.

Text Books

- Singh, Y.K., *Fundamentals of Research Methods and Statistics*. New Age International (P) Ltd, New Delhi, 2007.
- Kothari, C.R. and Gourav G, *Research Methodology*, Third Edition, New Age International Publication, New Delhi, 2014.
- Peter Deuflhard Andreas Hohmann, *Numerical Analysis in Modern Scientific Computing*: An Introduction, Springer New York, 2003.
- Balagurusamy, E, *Programming in ANSI C*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.

Reference Books

- Kothari C.R., *Research methodology: Methods and Techniques,* New age International, New Delhi, 2006.
- Jain, N.K., Iyengar, S.R.K., and Jain, R.K. *Numerical methods for scientific and Engineering Computation* – New Age International Publisher, New Delhi, 2004.
- Mahinder K J, *Numerical Methods: For Scientific and Engineering Computation*, New

Age International Publication, New Delhi, 2012.
- Willard, Merritt, Dean and Settle, *Instrumental Methods of Analysis*, CBS Publishers, New Delhi, 2012.

MPHM102 ADVANCED MATERIALS SCIENCE

Semester : I **Credit : 5**
Category : Core II **Hours/ Week : 6**
Class & Major : M.Phil Physics **Total Hours : 78**

Objectives
To enable the students

- Apply the knowledge of different techniques about crystal growth and nanotechnology
- Understand the nonlinear optics, electrical and thermal analysis properties
- Import the knowledge on solar cell concepts and its applications

UNIT – I Crystal Growth 16 Hrs

Introduction to various crystal growth techniques – Classification of growth processes, kinetics of growth – nucleation, diffusion and surface migration, dislocation, theory of interface stability, Bulk crystal growth methods; Kyropolous, Bridgeman – Stockbargar, CZ, Growth of III –V and II – VI compounds; high pressure techniques, chemical vapour deposition: molecular beam epitaxy, liquid and vapour phase epitaxy, MOCVD.

UNIT – II Nanotechnology 16 Hrs

Introduction to Nanotechnology – The Nanoscale – Consequences of the Nanoscale for technology and society. Beyond Moore's law –Visualisation, manipulation and characterization at the Nanoscale Proximal probe technologies. Nanomanipulation – Nanolithography – Nanocomposites – Quantum wells, Wires, Dots and nanoparticles – Applications.

UNIT – III Electrical and thermal Analysis 16 Hrs

Principles and experimental techniques – Vanderpauw method, Hall Effect measurement, Thermoelectric power measurement, Magnetoresistance measurement, Photoconductivity measurement – Applications. Differential scanning calorimetry and Differential analysis – Thermogravimetry – Differential thermal analysis – Thermo mechanical analysis.

UNIT – IV Energy storage and solar applications 14 Hrs

Types of energy storage Thermal storage Latent heat storage – Electrical storage Principle of operation of solar ponds –Solar cells for direct conversion of solar energy to electric powers – Solar cell parameter – Solar cell electrical characteristics – Efficiency – Applications of solar energy: Solar water heating – space heating and space cooling – solar photo voltaics – agricultural and industrial process heat.

UNIT – V Nonlinear Optics **16 Hrs**

Introduction to Non-linear optics – Propagation of electromagnetic waves in nonlinear optical media. Second harmonic generation, phase matching techniques, efficiency, Quantum mechanical description of Raman Scattering. Electromagnetic theory of Stimulated Raman Scattering, Optical Kerr effect – Acousto optic materials and acousto optic modulators.

Text books

- Peter E. Powers, Joseph W. Haus, *Fundamentals of Nonlinear Optics*, Taylor and Francis Group, Boca Raton, 2017.
- Tiwari G. N, Solar Energy: *Fundamentals, Design, Modeling and Application* (Revised Edition), Narosa Publishing House Pvt. Ltd., New Delhi, 2012.
- Ohring M, *Materials Science of Thin Films*, Academic Press, Boston, 2001.
- Paul G, *Principles and Applications of Thermal analysis*, Blackwell Publishing Ltd, UK, 2008.

References books

- Mullin, J.M., *Crystallisation*, 4th Edition, Butterworth Heinemann, Oxford, UK, 2001.
- Laud, B. B., *Lasers and Non-Linear Optics*, New Age International Private Ltd, New Delhi, 2011.
- Sauter, E. G. *Nonlinear Optics* (Wiley Series in Microwave and Optical Engineering), Wiley-Interscience, New York, 2008.
- Rai G.D., *Solar Energy Utilization*, Khanna Publications, New Delhi, 2004.

III and IV Evaluation components of CIA - M.Phil

Semester	Category	Course Code	Course Title	Component-III	Component-IV
I	Core I	MPHM101	Research Methodology	Seminar	Term paper
	Core II	MPHM102	Advanced Material Science	Seminar	Term paper

DEPARTMENT OF COMPUTER SCIENCE

PREAMBLE

UG : Course Profile- List of Courses offered to other departments and Syllabi of courses in the I and II semesters along with Evaluation Components III and IV (With effect from 2018-2021 batch onwards) and

PG : Course Profile- List of Courses offered and Syllabi of courses in the I and II semesters along with Evaluation Components III and IV (With effect from 2018-2020 batch onwards) and

M.Phil : Course Profile and Syllabi(With effect from 2018-2019 batch onwards) are presented in booklet.

COURSE PROFILE B.Sc. (Computer Science)

PSO1 : Ability to understand, analyze, design, develop and optimize solutions related to computer programming languages.

PSO2 : Application of concepts in core areas related to computer programming for efficient design of computer-based systems of varying complexity.

PSO3 : Ability to test the technical issues in Software Engineering and deliver a quality product for business success.

PSO4 : Ability to innovate and develop new technologies.

Semester	Part	Category	Course Code	Course Title	Contact Hrs/Week	Credit	
						Min	Max
I	I	Language	UTAL105 / UTAL106/	Basic Tamil-I / Advanced Tamil–I	4	2	3
			UHIL101/ UFRL101	Hindi-I / French-I			
	II	English	UENL105/ UENL106	General English-I / Advanced English-I	5	3	4
	III	Core I	UCSM106/ UCAM107	Programming in C	6	5	5
	III	Core II	UCSM107 / UCAM108	Fundamental of Computer Science	5	4	4
			UCSM108 / UCAM109	Advanced Computer Science			
	III	Core III	UCSR109/ UCAR105	Programming in C - Practical	3	2	2
	III	Allied I	UMAA113	Statistical Methods	5	4	4
	IV	Value Education			2	1	1
Total					**30**	**21**	**23**
II	I	Language	UTAL205/ UTAL206	Basic Tamil-II / Advanced Tamil–II	4	2	3
			UHIL201/ UFRL201	Hindi-II / French-II			
	II	English	UENL205/ UENL206	General English-II / Advanced English-II	5	3	4
	III	Core IV	UCSM206/ UCAM205	Data Structures	6	6	6
	III	Core V	UCSR206/ UCAR204	Data Structures - Practical	4	3	3
	III	Allied II	UMAA210	Mathematics for Computer Science	5	4	4

	IV	Non Major Elective			4	2	2
	IV	Soft Skill			2	1	1
	V	Extension Programme / Physical Education			-	1	2
Total					**30**	**22**	**25**
III	I	Language	UTAL305/ UTAL306	Basic Tamil-II / Advanced Tamil–II	4	2	3
			UHIL301/ UFRL301	Hindi-II / French-II			
	II	English	UENL305/ UENL306	General English-II/ Advanced English-II	5	3	4
	III	Core VI	UCSM305/ UCAM310	Java Programming	6	6	6
	III	Core VII	UCSR308/ UCAR304	Java Programming – Practical	4	3	3
	III	Allied III	UPHA304	Digital Electronics	5	4	4
	III	Allied IV	UPHR304	Digital Electronics – Practical	4	2	2
	IV	Value Education			2	1	1
Total					**30**	**21**	**23**
IV	I	Language	UTAL405/ UTAL406/	Basic Tamil-IV / Advanced Tamil–IV	4	2	3
			UHIL401/ UFRL401	Hindi-IV / French-IV			
	II	English	UENL405/ UENL406	General English-III / Advanced English-III	5	3	4
	III	Core VIII	UCSM408/ UCSM507	System Analysis and Design	5	5	5
	III	Core IX	UCSM409	Open Source Technology	6	6	6
	III	Core X	UCSR411	Open Source Technology-Practical	5	3	4
	IV	Online Courses		NPTEL/Spoken Tutorial	3	2	2
		Soft skill			2	1	1
	V	Extension Programme / Physical Education			-	-	2
Total					**30**	**22**	**27**
V	III	Core XI	UCSM506	Middleware Technologies	5	5	5
	III	Core XII	UCSM509	Database Management System	5	4	4
	III	Core XIII	UCSM510	Computer Networks	5	5	5
	III	Core XIV	UCSM511	Software Engineering	5	4	4
	III	Core XV	UCSR509	Middleware Technologies – Practical	4	3	3
	III	Core XVI	UCSR511	Database Management System-Practical	4	3	3
	IV	Value Education			2	1	1
Total					**30**	**25**	**25**
VI	III	Core XVII	UCSM608	Multimedia System Design	5	5	5
	III	Core XVIII	UCSM609	Operating System	5	5	5
	III	Core XIX	UCSM610	Big Data Tools	4	4	4

	III	Core XX	UCSR606	Operating System – Practical	4	3	3
	III	Core XXI	UCSP601	Project	5	5	5
	III	Major-Optional	UCSO606/ UCSO607	Network Security / Mobile Computing	5	5	5
	III	Viva – Voce	UCSM611	Comprehensive Viva Voce	-	1	1
	IV	Soft skill			2	1	1
	V	Extension Programme / Physical Education			-	-	2
Total					**30**	**29**	**31**
Grand Total					**180**	**140**	**154**

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

Class & Major	Semester	Category	Course Code	New Course Title	Contact Hrs/Week	Credit
B.Com with Computer Applications	I	Allied	UCSA104	C Programming	3	3
	I	Allied Practical	UCSR110	C Programming Lab	3	2
	II	Allied	UCSA204	Object Oriented Programming	3	3
	II	Allied Practical	UCSR207	Object Oriented Programming – Lab	3	2
	III	Allied	UCSA305	Fundamentals of Block chain Technology	3	3
	III	Allied Practical	UCSR309	Blockchain Technology Using Solidity – Lab	3	2
	IV	Allied	UCSA406	Cryptocurrency	3	3
	IV	Allied Practical	UCSR412	Cryptocurrency Using BigchainDB / Naivecoin - Lab	3	2
	V	Allied	UCSA509	Business Analytics and Intelligence .	3	3
	V	Allied Practical	UCSR512	Business Analytics and Intelligence using SAS - Lab	3	2
BBA, B.Com and Economics	IV	Allied	UCSA407	Cyber Security in Finance	3	3
	IV	Allied Practical	UCSR413	Cyber Security Lab	3	2
Tamil	V	Allied	UCSA505	Tamil Kanini	3T + 2P	5
Maths	III	Allied	UCSA304	Mathematical Programming using C	3	3
	III	Allied Practical	UCSR307	Mathematical Programming using C – Lab	3	2
	V	Allied	UCSA507	Object Oriented Programming using Java	3	3
	V	Allied Practical	UCSR508	Object Oriented Programming using Java - Lab	3	2
Physics	III	Allied	UCSA306	Computational Physics with Python	3	3
	III	Allied Practical	UCSR310	Computational Physics with Python – Lab (python)	3	2

NON-MAJOR ELECTIVE

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit
II	IV	Non Major Elective	UCSE206	Tableau Programming	2T+2P	2
			UCSE207	Python Programming	4P	2
			UCSE208	R Programming	4P	2
			UCSE209	Arduino Programming	4P	2

EXTRA CREDIT EARNING PROVISION

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
II	III	Core	UCSI201	Summer Internship / Working Model	-	-	1
IV	III	Core	UCSI401	Summer Internship	-	-	1
V	III	Self Study Paper	UCSS501/ UCAS501	Python Programming	2	-	2
V	III	Self Study Paper	UCSS502/ UCAS502	Android Applications	2	-	2
VI	III	Self Study Paper	UCSS601/ UCAS601	Angular JS	2	-	2
VI	III	Self Study Paper	UCSS602/ UCAS602	Green Computing	2	-	2

UCSM106/ UCAM107 PROGRAMMING IN C

Semester : I **Credit : 5**
Category : Core 1 **Hours/Week : 6**
Class & Major :I B.Sc (CS) **Total Hours : 78**

Objectives

To enable the Students

- Understand the concepts of structured Programming.
- Acquire Knowledge on Control Structure, Arrays, Functions, Pointers and Files
- Solve Logical problems using C language.

UNIT- I INTRODUCTION **15 Hrs**

Overview of C – Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data Types – Declaration of Variables – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaring a Variable as Constant – Declaring a Variable as Volatile – Operators and Expressions.

UNIT- II DECISION AND LOOPING **15Hrs**

Introduction – Decision making with if statement –Simple if statement – The if-else statement – Nesting of if-Else Statements – The Else if Ladder – The Switch Statement – The Goto Statement - The Ternary Operator. **Looping**: The While statement – The Do-While Statement – The For Statement – Jumps in Loops.

UNIT- III ARRAYS AND FUNCTIONS **16 Hrs**

Introduction – One-Dimensional Arrays – Declaration of One-Dimensional Arrays – Initialization of One-Dimensional Arrays – Two-Dimensional Arrays – Initialization of Two-Dimensional Arrays – Multi-Dimensional Arrays – Dynamic Arrays – Character Arrays and Strings – User-Defined Functions.

UNIT- IV STRUCTURES AND UNIONS **16 Hrs**

Introduction – Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization – Copying and Comparing Structure Variables – Operations on Individual Members – Arrays of Structures – Arrays within Structures – Structure and Functions – Unions – Size of Structure.

UNTI- V POINTERS AND FILES **16 Hrs**

Introduction to Pointers – Accessing the Address of a Variable – Declaring Pointer Variables – initialization of Pointer Variables – Accessing a Variable though its Pointer – chain of Pointers – Pointer Expressions – Pointers Increments and Scale Factor – Pointer and Arrays – Pointers and Character Strings – Arrays of Pointers. **Files**: Introduction – Defining and opening a file – Closing a File – Input/Output Operations on files. Dynamic Memory Allocation – Allocating a Block of memory: Malloc – Allocating Multiple Blocks of Memory – Altering the size of Block .C Preprocessor-Directives - Macros - Working with Several Files - Command Line Arguments.

Text Book

- Bala Gurusamy.E," *Programming in ANSI C"*, 6th Edition, Tata McGraw-Hill, New Delhi, 2012.

Reference Books

- Herbert Schildt.H, "*C The Complete Reference",* 4th Edition, Tata McGraw-Hill Edition, New Delhi, 2000.
- Byron S. Gottfried,*" Programming with C"*, 4th Edition, Tata McGraw Hill Edition, New Delhi, 2006.
- Brian W. Kernighan and Dennis M.Ritchie, *"The C Programming Language"*, 2nd Edition, Prentice hall of India Pvt.ltd, New Delhi, 2005.

UCSM107/UCAM108 FUNDAMENTALS OF COMPUTER SCIENCE

Semester : I **Credit : 4**
Category : Core II **Hours/Week : 5**
Class &Major : I B.SC(CS) **Total Hours : 65**

Objectives
To enable the students

- Obtain basic knowledge about Computer Classification and Applications.
- Acquire knowledge on Number systems , Elements of Computer Architecture
- Inculcate knowledge on Internet and E-Mail.

UNIT- I INTRODUCTION **13 Hrs**

Introduction To Computers - Characteristics of computers - Evolution of computers- Generation of Computers - Classification of Computers - The Computer System- Applications of Computers.

UNIT- II PROGRAMMING LANGUAGES **13 Hrs**

Introduction - Evolution of Programming Languages- Classification of Programming Languages - Generations of Programming Languages - Features of a Good Programming Language- Selection of a Programming Language.

UNIT- III NUMBER SYSTEMS **13 Hrs**

Introduction - Decimal Number System - Binary Number System - Complements - Signed and Unsigned Number Representations - Fixed-Point Representation of Numbers - Floating-point Representation of Numbers - Binary Coded Decimal (BCD) - Gray Code - Excess-3 Code - ASCII Code - EBCDIC Code - Bits, Bytes, and Words - Octal number system - Hexadecimal Number System.

UNIT –IV FUNDAMENTALS OF COMPUTER ARCHITECTURE **13 Hrs**

Introduction- Central Processing Unit (CPU) Memory- Communication between Various Units of a Computer System- The Instruction Format- Instruction Set- Processor Speed- Multiprocessor Systems. Primary Memory Introduction- Memory Hierarchy- Random Access Memory (RAM)- Types of RAM- Read Only Memory (ROM)- Types of ROM. Secondary Storage Introduction- Classification of Secondary Storage Devices- Magnetic Tape- Magnetic Disk- Optical Disk- Magneto Optical disk. Input Devices - Output Devices.

UNIT -V INTERNET AND E-MAIL **13 Hrs**

Introduction - Internet Access - Internet protocols - Internet Addressing - World Wide Web - Web pages and HTML - Web Browsers - Searching the Web - Internet Chat - Overview of Electronic Mail - Internet - E-Commerce and E-Business.

Computer Program Introduction- Developing a Program- Algorithm- Flowchart- Psedocode (P-Code)

Text Book

- Alexis Leon And Mathews Leon, *"Fundamentals of Information Technology",* Vikas Publishing House Pvt. Ltd, 2009

Reference Books

- Dennis P. Curtin ,Kim foley, Kunal Sen and Cathleen Morin - *"Information Technology - the breaking wave"*, Tata-McGraw Hill Publications, 2005 Seventeenth Reprint., (ISBN 0-07- 463558-1)..
- Alexis Leon And Mathews Leon. *"Fundamentals of Information Systems"* co-published by Vijay Nicole Imprints Pvt Ltd, 2004.

UCSM108/UCAM109 ADVANCED COMPUTER SCIENCE

Semester : I **Credit : 4**
Category : Core II **Hours/Week : 5**
Class & Major : I B.SC(CS) **Total Hours :65**

Objectives

To enable the Students

- Obtain knowledge on Object Oriented Programming concepts.
- Understand the basics Microprocessor and Compiler.
- Acquire knowledge on Information Security and Open Source Software.

UNIT - I INTRODUCTION TO OBJECT ORIENTED CONCEPTS 12 Hrs

Principles of Object Oriented Programming: Basic concepts of OOP - Benefits of OOP - Object Oriented Language Applications of OOP. Classes and Objects - Constructors and Destructors - Type Conversions – Method Overloading – Inheritance - Exception Handling.

UNIT - II MICROPROCESSOR 12 Hrs

Introduction to Microprocessor – Microcontroller - 8085 Microprocessor and Architecture - Opcode fetch - Machine cycle - Memory Read Machine Cycle - Memory Write Machine Cycle - IO Read Machine Cycle - IO Write Machine Cycle - Execution time of the Instruction Cycle.

UNIT - III INTRODUCTION TO COMPILERS 11 Hrs

Compilers – Analysis of Source Program – The Phases of compilers – Cousins of Compilers – The grouping of Phases – Analysis of Source Program.

UNIT - IV INFORMATION SECURITY 15 Hrs

Introduction to Information Security - Components of Information System - Balancing Information Security and Access - The Systems Development Life Cycle - The Security Systems Development Life Cycle - Security Professionals and Organization.

UNIT - V OPEN SOURCE SOFTWARES 15 Hrs

Introduction to Open sources – Need of Open Sources – Advantages of Open Sources – Application of Open Sources. Open Source Operating Systems : LINUX – Introduction: MySQL - PHP – Python.

Text Books

- Michael E Whitman and Herbert J Mattord, "*Principles of Information Security"*, 4th Edition, Course Technology, Cengage Learning, 2012.
- Rasmus Lerdorf and LevinTatroe, "*Programming in PHP"*, Reilly, 2012
- Ramesh.S.Goankar, "*Microprocessor Architecture, Programming and Applications with 8085",* Fifth Edition, Penram International, 2011.

Reference Books

- Alfred V.Aho, Ravi Sethi, Jeffery D.Ullman, "*Compilers, Principles and Techniques and Tools"*, Addison-Wesley, New Delhi, 2006.
- Herbert Schildt, "*The Complete Reference C++*", Fifth edition, Tata McGraw-Hill Publishing, New Delhi, 2015.

UCSR109/UCAR105 PROGRAMMING IN C – PRACTICAL

Semester : I **Credit : 2**
Category : Core Practical 1 **Hours/Week : 3**
Class & Major :I B.SC(CS) **Total Hours : 39**

Objectives

To enable the Students

- Implement basic concepts of the C Programming language.
- Develop programs by using Control Structure, Arrays, Functions, Pointers and Files
- Design, build, Execute and Debug C programs.

I. Arithmetic and Trigonometric Operations **6 Hrs**

1. Perform Arithmetic Operations
2. Solve Quadratic Equations.
3. Find the largest and smallest number.

II. Looping **6 Hrs**

1. Pascal Triangle
2. Armstrong Number Checking
3. Decimal to Binary Conversion

III. Arrays and functions. **18 Hrs**

1. Sorting and Searching
2. Perform the operation of Matrix Manipulation.
   a. Addition and Subtraction. b. Multiplication
3. Perform the operation Recursive and Non-Recursive functions to find
   a. Factorial
   b. Fibonacci
4. Perform the String manipulation(without using string function)
   a. Concatenation
   b. Palindrome Checking
   c. Count the number of vowels, consonants, characters and white spaces in a line

IV. Structure **3 Hrs**

1. Generate mark sheet processing for set of students using Structure

V. Pointers and Files **6 Hrs**

1. Perform Arithmetic Operation using Pointer.
2. Copies the contents of one file to another file using command line arguments.

UCSM206/ UCAM205 DATA STRUCTURES

Semester : II **Credit : 6**
Category : Core III **Hours/Week : 6**
Class & Major :I B.SC(CS) **Total Hours : 78**

Objectives

To enable the Students

- Impart the basic concepts of data structures.
- Understand basic concepts about stacks, queues, Lists, trees and graphs.
- Understand concepts about searching and sorting techniques.

UNIT- I INTRODUCTION **15 Hrs**

Introduction – Classification of Data Structure – Operations on Data Structures – Abstract Data Type – Algorithms – Different Approaches to Design an Algorithms – Time and Space Complexity – Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis.

UNIT- II STACKS, QUEUES AND LINKED LISTS **16 Hrs**

Stacks: Definition – Array representation of Stacks – Evaluation of a Postfix Expression –Transforming Infix Expressions into Postfix Expressions. **Queues:** Definition – Array representation of Queues – Circular Queues.

Linear Lists: Linked Lists – Representation of Linear Lists in Memory – Traversing a Linked List – Searching a Linked List – Insertion into a Linked List – Deletion from Linked List – Circular Linked Lists – Doubly Linked Lists.

UNIT- III TREES **16 Hrs**

Introduction and Definition of Trees – Tree terminology – Binary Tree – Representing Binary Trees in Memory – Traversing Binary Tree: preorder, in-order, post-order traversal – Binary Search Trees – Searching and Inserting in Binary Search Trees – Deleting in a Binary Search Tree.

UNIT- IV GRAPHS **16 Hrs**

Introduction to Graph - Directed Graphs. Sequential representation of Graphs: Adjacent Matrix- Path Matrix - Linked representations of a Graph . Operations on Graphs: Searching in a Graph - Inserting in a Graph. Traversing a Graph: Breadth- First Search - Depth-First Search.

UNIT –V SORTING AND SEARCHING **15 Hrs**

Sorting: Bubble Sort - Insertion Sort - Quick Sort - Selection Sort - Merge-Sort. **Searching:** Sequential and Binary Searches - Indexed Search - Hashing Schemes.

Text Book

- Ashok N Kamthane, "*Introduction to data structures in C*", Pearson Education, Indian Print, Dorling Kindersley publications, New Delhi 2012.

Reference Book

- Ellis Horowitz and Sartaj Sahni, "*Fundamentals of data structures",* Galgotia Book Source, 2005.

UCSR206/UCAR204 DATA STRUCTURES – PRACTICAL

Semester : II **Credit : 3**
Category : Core Practical II **Hours/Week : 4**
Class & Major : I B.SC(CS) **Total Hours : 52**

Objectives

To enable the Students

- Implement basic concepts of Linear Data Structures.
- Develop programs using the Non Linear concept.
- Solve the sorting and searching algorithms.

To implement the Programs

I. Linear Data Structures **16 Hrs**

1. Stack using arrays.
2. Queue using arrays.
3. Single linked list.

II. Non-Linear Data Structures **4 Hrs**

4. Binary tree.
5. Graph Using Adjacency Matrix.

III. Sorting **16 Hrs**

6. Merge sort using arrays.
7. Insertion sort using arrays.
8. Quick sort using arrays.
9. Selection Sort using arrays.

IV. Searching **16 Hrs**

10. Linear search using arrays.
11. Binary search using arrays.
12. Depth first search.
13. Breadth first search.

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

UCSA104 C PROGRAMMING

Semester : I **Credit : 3**
Category : Allied **Hours/Week : 3**
Class & Major : I B.Com CA **Total Hours : 39**

Objectives

To enable the students

- Understand the Basic computer knowledge
- Implement basic concepts of the C programming language.
- Design, build, execute and debug C applications.

UNIT- I COMPUTER BASICS **8 Hrs**

Introduction – Evolution, Generation and Classification of Computers – Computer system – Application of computers. Input devices, output devices, storage devices. **Information – Technology:** IT- Role of IT – IT and Internet – Careers in IT Industry. **Internet Tools**: Web Browser – Browsing Internet – Email – Search Engines – Instant Messaging. E-commerce – Electronic Data Interchange (EDI) – Mobile Communication – Bluetooth – Global Positioning System.

UNIT- II OVERVIEW OF C **8 Hrs**

Importance of C - C program structure - sample C program. Constants - Variables and Data Types - Character set - C tokens - keywords and identifiers - declaration of variables - Assigning values to variables - Operators – Expression - Arithmetic - Relational - Logical - Assignment - Increment - Decrement – Conditional - bitwise and special operators - Arithmetic expressions - Operator precedence - Type conversions.

UNIT- III DECISION MAKING AND BRANCHING **7 Hrs**

Decision making with If - Simple IF - IF ELSE - nested IF ELSE - ELSE IF ladder – switch - GOTO statement. **Looping:** While - Do-While – For - Jumps in loops.

UNIT- IV ARRAYS, STRINGS AND USERDEFINED FUNCTIONS **8 Hrs**

Declaration and Accessing of one and two-dimensional Arrays - initializing two-dimensional Arrays - multidimensional Arrays. Declaring and Initializing String Variables – Reading Strings from terminal – Writing strings to screen – Putting strings together – Comparison of two strings – String handling functions. User defined Functions -Recursion.

UNIT- V STRUCTURES, UNIONS AND POINTERS **8 Hrs**

Defining - Giving values to members - initialization and comparison of Structure variables - Arrays of Structure - Structure and Functions – Unions – Pointers.

Text Book

- Bala Gurusamy.E, "*Programming in ANSI C"*, 6th Edition, Tata McGraw-Hill, New Delhi, 2012.

Reference Books

- Ashok N. Kamthane, "*Programming in ANSI C and Turbo C"*, 3rd Edition, Pearson Education, New Delhi, 2006.
- Yashavant Kanetkar.Y, "*Let us C*", 10th Edition, BPB Publication, New Delhi, 2010.

e-Resources

- http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical programming-in-c-january-iap-2010/lecture-notes/
- http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures/2
- http://www.powershow.com/view/d7c5Y2Y2N/OBJECT_ORIENTED_PROGRAMMING_powerpoint_ppt_presentation

UCSR110 C PROGRAMMING – LAB

Semester : I **Credit : 2**
Category : Allied **Hours/Week : 3**
Class & Major :I B.Com CA **Total Hours : 39**

Objectives

To enable the students

- Implement basic concepts of the C Programming language.
- Develop programs by using Control Structure, Arrays, Functions, Pointers and Files
- Design, build, Execute and Debug C programs.

Lab Exercises **39 Hrs**

1. Operators
2. Decision Making
3. Decision Looping
4. Arrays
5. Strings
6. Functions
7. Recursion
8. Structures.

9. Union
10. Pointers

UCSA204 OBJECT ORIENTED PROGRAMMING

Semester : II **Credit : 3**
Category : Allied **Hours/Week : 3**
Class & Major : I B.Com CA **Total Hours : 39**

Objectives

To enable the students

- Understand the concepts of Object Oriented Programming.
- Acquire knowledge on C++ and Java
- Develop programming skills on OOPs concept.

UNIT- I BASICS OF OOPS **7 Hrs**

Principles of Object Oriented Programming - Basic concepts of OOP - Benefits of OOP - Object Oriented Language Applications of OOP. Classes and Objects - Constructors and Destructors - Type Conversions.

UNIT- II INHERITANCE AND POLYMORPHISM **8 Hrs**

Inheritance - Polymorphism - Function and Operator Overloading - Virtual Functions – Arrays, Pointers and References – Exception Handling.

UNIT- III FUNDAMENTALS OF JAVA **8 Hrs**

Introduction : Data Types - Literals - Variables - Type Conversion and Casting – Operators and Expressions – Arrays – Strings. **Class Fundamentals:** Declaring Class Objects Constructors - Garbage Collection – The finalize () Method - Overloading Methods - Argument Passing – Recursion.

UNIT- IV INHERITANCE AND INTERFACES **8 Hrs**

Inheritance: Using Super - Method Overriding - Abstract Classes - The final Keyword.**Interfaces:** -Structure of an Interface – Interface Inheritance.

UNIT- V APPLET **8 Hrs**

The Java Applet Class and Interfaces – Sample Programs.

Text Books

1. Herbert Schildt, "*The Complete Reference C++*", 5th edition, Tata McGraw-Hill Publishing, New Delhi, 2015
2. Balagursamy E - "Object Oriented Programming with C++", Tata McGraw Hill Publications, 6th Edition, 2013.
3. Patric Naughtonand Herbert Schildt, "*The Complete Reference Java 2",* Tata McGraw Hill Publishers, 2017.
4. E. Balagurusamy, *"Programming with Java - A Primer",* Tata McGraw-Hill Publish., 5th Edition, 2013.

Reference Books

1. Barbara Johnston, C++ Programming Today, Pearson education/Prentice-Hall of India, ISBN 81-317-1079-3, 2011.
2. C. Xavier, "Programming with Java 2", Scitech Publications., 2005.

UCSR207 OBJECT ORIENTED PROGRAMMING LAB

Semester : II **Credit : 2**
Category : Allied **Hours/Week : 3**
Class & Major : I B.Com CA **Total Hours : 39**

Objectives

To enable the students

- Understand and implement OOPS concepts.
- Impart practical training in object oriented programming in C++ and Java.
- Develop compile and run programs in C++ and Java.

Lab Exercise (Finance oriented concepts)

C++:

1. Classes and Objects
2. Constructors and Destructors.
3. Function and Operator overloading
4. Inheritance
5. Exceptions.

Java:

1. Classes and Objects
2. Constructors
3. Method Overloading and Method Overriding
4. Abstract Class and Interface
5. Applet

NON-MAJOR ELECTIVES

UCSE206 TABLEAU PROGRAMMING

Semester : II **Credit : 2**
Category : NON MAJOR ELECTIVE **Hours/Week : 2T+ 2P**
Class & Major : I UG **Total Hours : 52**

Objectives

To enable the students

- Learn basic concepts of Tableau statistics and Tableau interactive dashboard.
- Acquire Knowledge in Master Tableau Reporting, Graphs, Maps, Table Calculation.
- Implementing the concepts in Tableau

UNIT- I INTRODUCTION **5 Hrs**

Introduction Tableau – Design Flow – File Types – Data Types - Connecting to Databases -Working with Data – Analyzing - Formatting.

UNIT- II CALCULATIONS **6 Hrs**

Introduction to Calculations - Dashboard Development – Sharing - Data Calculations - Aggregate Calculations - User Calculations - Table Calculations - Logical Calculations - String Calculations - Number Calculations – LOD Expressions.

UNIT- III OPERATORS AND FUNCTIONS **5 Hrs**

Type Conversion – Operators – Functions - Data Joining - Data Blending - Trendlines.

UNIT- IV SORTING AND FILTERING **5Hrs**

Add Worksheets – Paged Workbook – Sorting – Filtering Conditions - Filtering Measures - Grouping – Sets.

UNIT- V CHARTS **5 Hrs**

Histograms - All types of Charts - Tree maps- Pareto Charts-Waterfall Charts-Bump Charts-Funnel Charts-Bollinger Bands.

Lab Exercise

1. Data Visualization with Tableau - Tableau, Installation.
2. Basic Visualization Design - Exporting Data, Connecting Sheets, Loading into Tableau visualization engine.
3. Visualizations Deep Dive - to make Advance Charts and Graphs (Circle Plots, Side by Side Bars, Dual Charts, Area Charts, Tree Maps).
4. Data Organization - Calculated Metrics, Sorting, Filtering, Totals and Sub Totals, Various Aggregated Measures, Percentages.
5. Data Organization - Date and time functions, String Functions and logical functions.
6. Playing with Time Dimension - Table Calculations, Moving Averages, Running totals, Window Averages.
7. Incremental Loading and Blending - Custom SQL Queries, Creating Incremental Loads, Creating File Extractions.
8. Macros in tableau – Parameters, Global Parameters.
9. Sharing Insights with Enterprise Dashboards - Creating Dashboards.

Text Book

- Joshua N. Milligan,*" Learning Tableau"*, Packt Publishing, 2015

e-Resource

- https://www.tutorialspoint.com/tableau/

UCSE207 PYTHON PROGRAMMING

Semester : II **Credit : 2**
Category : NON MAJOR ELECTIVE **Hours/Week : 4**
Class & Major : I UG **Total Hours : 52**

Objectives

To enable the students

- Implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.

Lab Exercise

1. Strings and Lists
    - To calculate the length of a string
    - To get the largest number from a list
    - To remove duplicates from a list
2. Dictionary and Tuple
    - To sort (ascending and descending) a dictionary by value
    - To print a dictionary line by line
    - To create a tuple with different data types
3. Sets
    - To create a intersection ,union, and difference of sets
4. Array
    - To append a new item to the end of the array.
    - To remove the first occurrence of a specified element from an array
5. Conditional Statements
    - To get the Fibonacci series between 0 to 50.
    - To accepts a string and calculate the number of digits and letters.
6. Functions
    - To calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument
    - To reverse the digits of an integer

- To add two binary numbers

7. Data structure
    - To create an Enum object and display a member name and value
    - To compare two unordered lists (not sets).
    - To push three items into the heap and print the items from the heap.
8. Searching and Sorting
    - Binary search
    - Insertion sort

UCSE208 R PROGRAMMING

Semester : II **Credit : 2**
Category : NON MAJOR ELECTIVE **Hours/Week : 4**
Class & Major : I UG **Total Hours : 52**

Objectives
To enable the students

- Understand the different data types in R
- Use of vectorized calculations and control statements
- Write user-defined R functions and Loop constructs in R

Lab Exercise

1. Vectors and Matrices
2. Lists
3. Factors
4. Data frame
5. Array
6. Time series
7. Storing data as Textual and Binary Format
8. Reading and Writing data in Files
9. Functions
10. Control Structures
11. Debugging
12. Simulations
13.

UCSE209 ARDUINO PROGRAMMING

Semester : II **Credit : 2**
Category : NON MAJOR ELECTIVE **Hours/Week : 4**
Class & Major : I UG **Total Hours : 52**

Objectives
To enable the students

- Understand the basic of Arduino Programming
- Develop a basic program in Arduino
- Gain Knowledge in Arduino Software

Lab Exercise

1. Structure and Flow
2. Variables
3. Operators - Arithmetic Operators, Relational Operators, Logical Operators, Conditional Operator, and Increment Operator and Commenting
4. Decision Statement - if Statement , if-else, and if-else-if
5. Switch and Break
6. Looping - For Loop and While Loop
7. Functions – Calling Function and Returning a Value from a Function
8. Arrays
9. Strings
10. Serial Input

e-Resource

- https://startingelectronics.org/software/arduino/learn-to-program-course/

III and IV Evaluation Components of CIA

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
I	III	Core I	UCAM106/ UCAM107	Programming in C	Assignment	Problem Solving
	III	Core II	UCSM107 / UCAM108	Fundamental of Computer Science	Number Conversion	Assignment
			UCSM108 / UCAM109	Advanced Computer Science	Assignment	Assignment
	III	Core Practical I	UCSR109 / UCAR105	Programming in C-Practical	DPA	Viva-voce
II	III	Core III	UCSM206	Data Structures	Assignment	Problem Solving

	III	Core Practical II	UCSR206 / UCAR204	Data Structures - Practical	DPA	Viva-voce

ALLIED COURSES OFFERED TO OTHER DEPARTMENT

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
I	III	Allied	UCSA104	C Programming	Assignment	Problem Solving
	III	Allied Practical	UCSR110	C Programming Lab	DPA	Viva-voce
II	III	Allied	UCSA204	Object Oriented Programming	Assignment	Problem Solving
	III	Allied Practical	UCSR207	Object Oriented Programming – Lab	DPA	Viva-voce

NON-MAJOR ELECTIVES

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
II	IV	Non Major Elective	UCSE206	Tableau Programming	Assignment	Problem Solving
			UCSE207	Python Programming	DPA	Viva-voce
			UCSE208	R Programming	DPA	Viva-voce
			UCSE209	Arduino Programming	DPA	Viva-voce

COURSE PROFILE M.Sc. (Computer Science)

PSO1: Demonstration of the knowledge of advanced programming skills and distributed environmental need for sustainable development.

PSO2: Ability to design and develop hardware and software in emerging technology environments.

PSO3: Ability to solve problems using the techniques of data analytics like pattern recognition and knowledge discovery.

PSO4 : Ability to work out effective and efficient real time solutions using acquired knowledge in various domains.

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Min	Max
I	Core I	PCSM111/ PCSM403	Internet of Things	5	4	4
	Core II	PCSM112	Object Oriented Software Engineering	4	4	4
	Core III	PCSM113/ PCAM314	Data Mining	5	4	4
	Core IV	PCSM114/ PCSM210	Design and Analysis of Algorithm	4	3	3
	Core V	PCSM115	Virtual Reality	4	4	4
	Core VI	PCSR106/ PCAR405	UML - Practical	3	2	2
	Core VII	PCSR107/ PCAR306	Data Mining using WekaTool - Practical	4	3	3
			Library	1	-	-
Total				**30**	**24**	**24**
II	Core VIII	PCSM212	Multimedia and its Applications	4	3	3
	Core IX	PCSM211	Software Testing	4	3	3
	Core X	PCSM213/ PCSM309	TCP / IP Networks	4	3	3
	Core XI	PCSM214	Biometrics	4	4	4
	Core XII	PCSR206/ PCSR304	Networking – Practical	4	3	3
	Core XIII	PCSR207	Biometrics Using Matlab- Practical	4	3	3
	Non Major Elective	PALE201/ PALE301		5	4	4
	Service Learning	PCSX201/ PCAX201		-	1	1
			Library	1	-	-
Total				**30**	**24**	**24**
III	Core XIV	PCSM311	Cloud Computing	4	4	4
	Core XV	PCSM315	Big Data Analytics	5	4	4
	Core XVI	PCSM313	Artificial Intelligence and Robotics	5	4	3
	Core XVII	PCSM314	Cyber Security	4	4	4
	Core XVIII	PCSI301	Fuzzy Set and Systems	5	4	4

	Core XIX	PCSR306	Big Data Analytics - Practical	4	3	3
	Core XXI	PCSR302	Project	2	2	2
			Library	1	-	-
Total				**30**	**25**	**25**
IV	Core XXII	PCSM404	Digital Image Processing	5	4	4
	Core XXIII	PCSM406/ PCSM208	Research Methodology	4	3	3
	Core XIV	PCSP402	Project	20	10	10
			Library	1	-	-
Total				**30**	**17**	**17**
Grand Total				**120**	**90**	**90**

COURSES OFFERED TO OTHER DEPARTMENTS
(Major and Major Elective)

Course	Semester	Category	Course Code	Course Title	Contact Hrs/Week	Credit
M.Sc Tamil	IV	Major Elective	PTAM406	Kaninipayanpattiyal	5	3
M.Sc Bio Informatics	I	Core III	PBIM103	Introduction to Computer Programming	6	4
	I	Core Practical I	PBIR102	Introduction to Computer Programming- Practical	6	4
	II	Core VI	PBIM203	Computer Programming in Perl and CGI	5	4
	II	Core Practical II	PBIR201	Computer Programming in Perl and CGI- Practical	4	2
	IV	Core XII	PBIM401	Database Management Systems	5	5

NON-MAJOR ELECTIVE

Semester	Category	Course Code	Course Title	Contact Hrs/week	Credit
I	Non Major Elective	PCSE205	Programming in J2EE	3T+2P	4
		PCSE206	Mobile Computing Lab	5P	4

EXTRA CREDIT EARNING PROVISION

Semester	Category	Course Code	Course Title	Hrs/week	Credit	
					Min	Max
III	Self Study Paper	PCSS301/PCAS502	R-Programming	2	-	2
III	Self Study Paper	PCSS302/PCAS503	Rich Internet Applications	2	-	2
IV	Self Study Paper	PCSS401/PCAS601	Silverlight Applications	2	-	2
IV	Self Study Paper	PCSS402/PCAS602	Extreme Programming	2	-	2

PCSM111/PCSM403 INTERNET OF THINGS

Semester : I **Credits : 4**
Category : Core I **Hours/Week : 5**
Class &Major : I M. Sc Computer Science **Total Hours : 65**

Objectives:
To enable the students

- Understand the basic issues- policy and challenges in the Internet.
- Examine the components and the protocols in Internet.
- Build a small low cost embedded system with the Internet.

UNIT - I INTRODUCTION 12 Hrs

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security –privacy. Components in internet of things: Control Units – Sensors – Communication Modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication.

UNIT - II PROGRAMMING THE MICROCONTROLLER FOR IOT 13 Hrs

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors- Communication: Connecting microcontroller with mobile devices – communication throughBluetooth and USB – connection with the internet using wifi / Ethernet.

UNIT - III RESOURCE MANAGEMENT IN THE INTERNET OF THINGS 14 Hrs

Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet ofThings Architecture - The Role of Context - Design Guidelines -Software Agents for Object – DataSynchronization- Types of Network Architectures - Fundamental Concepts of Agility andAutonomy-Enabling Autonomy and Agility by the Internet of Things-Technical Requirements forSatisfying the New Demands in Production.

UNIT - IV BUSINESS MODELS FOR THE INTERNET OF THINGS 13 Hrs

The Meaning of DiY in the Network Society- Sensor-actuator Technologies and Middleware as aBasis for a DiY Service Creation Framework - Device Integration - Middleware TechnologiesNeeded for a DiY Internet of Things Semantic Interoperability as a Requirement for DiY Creation-Ontology- The Internet of Things in Context of EURIDICE - Business Impact

UNIT - V FROM THE INTERNET OF THINGS TO THE WEB OF THINGS 13 Hrs

Resource-oriented Architecture and Best Practices- Designing REST ful Smart Things - Web- enabling Constrained Devices - The Future Web of Things - Set up cloud environment – send datafrom microcontroller to cloud – Case studies – Open Source e-Health sensor platform – Be CloseElderly monitoring – Other recent projects.

Text Books

- CharalamposDoukas- *Building Internet of Things with the Arduino*- Create space- April 2002.
- Dieter Uckelmann et.al- *Architecting the Internet of Things*- Springer- 2011.

References Book

- Luigi Atzor et.al- *The Internet of Things: A survey*- Journal on Networks- ElsevierPublications- October - 2010.

e-Resources

- http://postscapes.com/
- http://www.theinternetofthings.eu/what-is-the-internet-of-things

PCSM112 OBJECT ORIENTED SOFTWARE ENGINEERING

Semester : I **Credits : 4**
Category : Core II **Hours/Week : 4**
Class &Major : I M. Sc Computer Science **Total Hours : 52**

Objectives:

To enable the students

- Learn about software prototyping- analysis and design
- Learn the various OO Design models and Testing Objects
- Case studies to apply the principles

UNIT- I INTRODUCTION **9 Hrs**

Software Engineering Paradigms - Software Development Process Models - Project and Process - Project management – Process and Project metrics - Object Oriented Concepts and Principles.

UNIT- II PLANNING AND SCHEDULING **10 Hrs**

Software prototyping - Software project planning – Scope – Resources - Software Estimation - Empirical Estimation Models-Planning-Risk Management - Software Project Scheduling – Object Oriented Estimation and Scheduling.

UNIT- III ANALYSIS AND DESIGN **14 Hrs**

Analysis Modeling - Data Modeling - Functional Modeling and Information Flow-Behavioral Modeling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object Oriented Analysis process - Object Relationship Model - Object Behavior Model. Design Concepts and Principles - Design Process - Design Concepts - Modular Design – Design Effective Modularity - Introduction to Software Architecture - Data Design – Transform Mapping – Transaction Mapping – OOD - Design System design process- Object design process -Design Patterns.

UNIT- IV IMPLEMENTATION AND TESTING **10 Hrs**

Top-Down - Bottom-Up - Object Oriented Product Implementation and Integration. Software Testing methods-White Box- Basis Path-Control Structure –Black Box- Unit Testing- Integration Testing-Validation and System Testing. Testing OOA and OOD models-Object Oriented Testing Strategies.

UNIT- V MAINTENANCE **9 Hrs**

Maintenance Process-System Documentation-Program Evolution Dynamics-Maintenance Costs- Maintainability Measurement - Case Studies.

Text Books

- Bruegge and Dutoit's." *Object-Oriented Software Engineering Using UML", Patterns, and Java – Third Edition*, published by Pearson Education - 2013.
- Ivar Jacobson- *"Object-Oriented Software Engineering"*- Pearson Education- 2009.

Reference Books

- Stephen R. Schach- *"Object-Oriented Classical Software Engineering"*- Mc Graw Hill-2010.
- Yogesh Singh- *"Object-Oriented Software Engineering"*- 2012.

PCSM113/PCAM314 DATA MINING

Semester : I **Credits : 4**
Category : Core III **Hours/weeks : 5**
Class & Major: I M.Sc Computer Science **Total Hours : 65**

Objectives:
To enable the students

- Gain knowledge in Data wareshouse and Datamining Techniques
- Analyze patterns in Data
- Depth Knowledge in Classification and Clustering algorithms.

UNIT- I DATA WAREHOUSE **12 Hrs**

Data Warehousing - Operational Database Systems vs Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries and Tools.

UNIT- II DATA MINING AND DATA PREPROCESSING **13 Hrs**

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT- III ASSOCIATION RULE MINING **13 Hrs**

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint – Based Association Mining.

UNIT- IV CLASSIFICATION AND PREDICTION **14 Hrs**

Classification vs Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT- V CLUSTERING **13 Hrs**

Cluster Analysis - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint Based Cluster Analysis – Outlier Analysis.

Text Books

- Jiawei Han and Micheline Kamber- *"Data Mining Concepts and Techniques"*-Second Edition- Elsevier- Reprinted 2011.
- K.P. Soman- ShyamDiwakar and V. Ajay- *"Insight into Data mining Theory and Practice"*- Easter Economy Edition- Prentice Hall of India- 2006.

Reference Book

- G. K. Gupta- *"Introduction to Data Mining with Case Studies"*- Easter Economy Edition 2012.

PCSM114 /PCSM210 DESIGN AND ANALYSIS OF ALGORITHM

Semester : I **Credit : 4**
Category : Core IV **Hours/Week : 4**
Class &Major : I M.Sc Computer Science **Total Hours : 52**

Objectives:
To enable the students

- Understand the concept of Algorithm.
- Solve problems on Greedy and backtracking

- Analysis the algorithm.

UNIT- I INTRODUCTION **10 Hrs**

Introduction – Algorithm – Specification – Performance Analysis – Divide and Conquer – General Method – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick sort.

UNIT- II GREEDY ALGORITHMS **11 Hrs**

The Greedy Method – General Method – Knapsack problem – Tree Vertex Splitting Dynamic Programming – General Method – Multistage Graphs – All pairs shortest path – Single – Source Shortest paths – The Traveling Salesperson problem – Flow Shop Scheduling.

UNIT- III TREES AND GRAPHS **10 Hrs**

Basic Traversal and Search techniques – Binary Trees – Graphs – Connected Components and Spanning trees – Biconnected Components.

UNIT- IV PROBLEM SOLVING ALGORITHMS **10 Hrs**

Backtracking – General Method – 8 Queens Problem – Graph Coloring – Branch and Bound Method – 0/1 Knap sack Problem.

UNIT- V NP HARD AND NP COMPLETE PROBLEM **11 Hrs**

Basic Concepts – Cooke's Theorem – NP Hard Problem – Clique Decision Problem – Job Shop Scheduling – Code Generation with Common Sub Expressions – Approximation Algorithms – Introduction – Absolute Approximations – E-Approximations.

Text Book

- Ellis Horowitz- SartajSahni and Sanguthevar Rajasekaran -*Computer Algorithms*- Galgotia Publications Pvt. Ltd.- 2002.

Reference Books

- Sara Baase and Allen Van Gelde- *Computer Algorithms- Introduction to Design and Analysis*- Third Edition- New Delhi- Pearson education- 2002.
- Aho- Hoproft and Ullman- *The Design and Analysis of Computer Algorithms*- New Delhi- Pearson Education- 2001.
- Basu S.K.- *Design Methods and Analysis of Algorithms*- PHI- 2006.

PCSM115 VIRTUAL REALITY

Semester : I **Credits : 4**
Category : Core V **Hours/weeks : 4**
Class & Major : I M.Sc Computer Science **Total Hours : 52**

Objectives:
To enable the students

- Understand the basic concept and framework of virtual reality.
- Learn the technology for multimodal user interaction and perception in VR- in particular the visual- audio and haptic interface and behavior.
- Manage large scale VR environment in real time

UNIT - I INTRODUCTION 10 Hrs

The three I's of virtual reality - Short History of Early Virtual Reality - Early Commercial - VR Technology commercial VR technology - The five classic components of a VR system.

UNIT - II INPUT DEVICES 10 Hrs

Trackers - Navigation - and Gesture Interfaces: Three-dimensional position trackers: Tracker Performance Parameters - Mechanical Trackers - Magnetic Trackers - Ultrasonic Trackers - Optical Trackers - Hybrid Inertial Trackers - **Navigation and manipulation**: Tracker-Based Navigation/Manipulation Interfaces - Trackballs - Three-Dimensional Probes. **Gesture Interfaces:** The Pinch Glove - The 5DT Data Glove-The DidjiGlove- The CyberGlove.

UNIT -III OUTPUT DEVICES 10 Hrs

Graphics displays: The Human Visual System- Personal Graphics Displays-Large-Volume Displays - **Sound displays**: The Human Auditory System-The Convolvotron-Speaker-Based Three-Dimensional Sound - **Haptic feedback:** The Human Haptic System-Tactile Feedback Interfaces-Force Feedback Interfaces.

UNIT- IV MODELING AND HUMAN FACTORS 11 Hrs

Geometric Modeling: Virtual Object Shape-Virtual Object Appearance - **Kinematics Modeling:** Homogeneous Transformation Matrices-Object Position-Transformation Invariants-Object Hierarchies-Viewing the Three-Dimensional World. **Physical Modeling:** Collision Detection- Surface Deformation-Force computation- Force Smoothing and Mapping- Haptic Texturing. **Behavior Modeling:** Model Management- Level-d-Detail-Management-Cell-Management.

UNIT -V APPLICATIONS 11 Hrs

Medical applications of VR: Virtual Anatomy- Triage and Diagnostics- Surgery- **Military VR Applications:** Army Use of VR- VR Applications in the Navy- Air Force Use of VR - **Applications of VR in Robotics:** Robot Programming-Robot Teleoperation.

Text Books

- Virtual Reality Technology - Second Edition - Gregory C. Burdea and Philippe Coiffet - John Wiley and Sons - Inc. – 2003.
- Killer Game Programming in Java - Andrew Davison - Oreilly-SPD - 2005.

Reference Books

- Understanding Virtual Reality - interface - Application and Design - William R.Sherman - Alan Craig - Elsevier(Morgan Kaufmann) 2018.
- 3D Modeling and surfacing - Bill Fleming - Elsevier(Morgan Kauffman).
- 3D Game Engine Design - David H.Eberly - Elsevier.
- Virtual Reality Systems - John Vince - Pearson Education.

PCSR106/PCAR405 UML PRACTICAL

Semester : I **Credits : 2**
Category : Core Practical I **Hours/Week : 4**
Class & Major : I M.Sc Computer Science **Total Hours : 52**

Objectives:
To enable the students

- Acquire practical skills on various tools in UML Language.
- Analyze and test the project using UML diagrams.
- Design the project and provide solution to the applications.

Prepare the following documents for two or three of the experiments listed below and develop the software engineering methodology.

1. Program Analysis and Project Planning.

   Thorough study of the problem – Identify project scope – Objectives –Infrastructure.

2. Software requirement Analysis

   Describe the individual Phases / Modules of the project – Identify Deliverables.

3. Data Modeling

   Use work products – Data dictionary – Use diagrams and activity Diagrams build and test class diagrams – Sequence diagrams and add Interface to class diagrams.

4. Software Developments and Debugging

5. Software Testing

   Prepare test plan – perform validation testing – Coverage analysis – Memory leaks – develop test case hierarchy – Site check and Site Monitor.

Suggested List of Applications

1. Student Marks Analyzing System
2. Quiz System
3. Online Ticket Reservation System
4. Payroll System

5. Course Registration System
6. Online Shopping
7. ATM Systems
8. Stock Maintenance system
9. Library Management System
10. Remote Monitoring System

PCSR107/ PCAR306 DATA MINING USING WEKATOOL -PRACTICAL

Semester : I **Credits : 3**
Category : Core Practical II **Hours/Week : 4**
Class & Major : I M.Sc Computer Science **Total/Hours : 52**

Objectives:
To enable the students

- Understand the concepts in Data mining.
- Apply programming skills in Weka tool.
- Analyze the dataset.

Lab Exercise

Create a Dataset with 'n' number of tuples for the following

1. Student Details
2. Super Market Details
3. Library Details
4. Employee Details
5. Recruitment Details
6. Patient Laboratory Details
7. Social Networking Reviews Details

To implement the Dataset in WekaTool

1. **Preprocessing on Dataset**
2. **Classification Rule Process of Dataset**
    a. J48 Algorithm
    b. ID3 Agorithm
    c. Naïve Bayes Algorithm

3. **Clustering Rule Process of Dataset**
    a. Simple k-means
4. **Association Rule Process on Dataset**
    a. APriori Algorithm
    b. FPgrowth Algorithm
5. **Data Visualiazation**

PCSM212 MULTIMEDIA AND ITS APPLICATIONS

Semester : II **Credits : 3**
Category : Core VI **Hours/Week : 4**
Class & Major : I M.Sc Computer Science **Total/Hours : 52**

Objectives:
To enable the students

- Analyze and compare various compressions - multimedia file formats and storage media.
- Understand basics of front end design as well as composition strategies for digital texts and environments
- Study to create and critique digital text and its central role in human – computer interactions.

UNIT- I MULTIMEDIA AN OVERVIEW 7 Hrs

Introduction-Characteristic of Multimedia Presentation-Hardware and Software Requirements-Uses of Multimedia-Analog and Digital Representation-Digitization-Text-Image-Graphics-Audio-Video.

UNIT- II MULTIMEDIA ANIMATION AND COMPRESSION 12 Hrs

Use of Animation-Traditional Animation-principal of animation-computer based animation-3D Animation-Rendering-Animation file format-Animation Software-Lossless compression techniques-Lossy compression techniques-Image - Audio - Video compression techniques-MPEG standard overview-Fractal compression.

UNIT- III MULTIMEDIA DATABASE AND DOCUMENT 12 Hrs

CBSR-Designing a basic multimedia Database-Image color - Texture - Shape - Audio - Video Feature-Classification of Data-Artificial neural network-Semantic in multimedia Data-Document and Document architecture-Hypermedia concept-Hypermedia Design-Digital library-Multimedia application development-Virtual Reality.

UNIT- IV ACTION SCRIPT IN FLASH AND FLEX 12 Hrs

Programming Concepts – Variables - Data types - conditionals - loops - arrays - functions - Custom objects - Properties - Methods and Events – Display List - Timeline

Control.- Setting up the environment –Using Design mode and Source mode –Adding Interactivity –Using Data Binding –Layout –Creating Rich Forms.

UNIT -VADVANCE CONCEPTS IN ACTION SCRIPT USING FLASH BUILDER **9 Hrs**

OOP –Motion –Drawing with Vectors and Pixels –Text –Sound and Video – Understanding XML .

Text Books

- Ranjan Parekh - *"Principles of Multimedia "* - Publisher: McGraw Hill Education; 2 edition (1 July 2017)
- Michael Labriola - *"Breaking out of Web Browser With Adobe AIR"* - Prentice Hall - Inc. - 2011.
- Joseph Lott - Kathryn Rotondo - Sam Ahn and Ashley Atkins - *"Adobe AIR in Action"* - Manning Publications Co - 2011

Reference Books

- Rich Shupe and Zevan Rosser - *"Learning ActionScript 3.0: A Beginner's Guide"* - Adobe Developer Library.
- Chafic Kazoun and Joey Lott - *"Programming Flex 3"* - Adobe Developer Library.

e-Reference

- http://www.niecdelhi.ac.in/uploads/Notes/btech/6sem/cse/multimedia.pdf

PCSM211 SOFTWARE TESTING

Semester : II **Credit : 4**
Category : Core VIII **Hours/Week : 4**
Class &Major : I M.Sc Computer Science **Total Hours : 52**

Objectives

To enable the students

- Acquire the knowledge in software Testing.
- Gain knowledge in Quality assurance and Control.
- Analyze the quality of the project.

UNIT- I SOFTWARE TESTING TECHNIQUES **8 Hrs**

Software Testing Fundamentals- Psychology of testing - Testing economics- White box testing techniques- Black box testing techniques -Weyuker's adequacy axioms.

UNIT – II SOFTWARE TESTING STRATEGIES **8 Hrs**

SDLC and Testing- Strategic Approach to Software Testing- Unit Testing- Integration Testing- validation Testing- System Testing- The art of debugging- Testing Maturity Models TMM and TMMI.

UNIT – III TESTING OBJECT ORIENTED SOFTWARE **8 Hrs**

Challenges - Differences from testing non-OO Software - Class testing strategies - Class Modality - State-based Testing - Message Sequence Specification- Difference between design based and code testing- Interdependency Testing Models in OO software.

UNIT IV QUALITY CONTROL **8 Hrs**

Introduction to Quality and Quality Control - Evolution of Quality Control - Quality assurance - Quality circles and Quality improvement teams - Benefits of Quality control- Quality and Reliability - Quality costs - Measuring Quality costs - Total Quality Management- Quality Metric Models - McCall s model- FURPS model and ISO 9126 model.

UNIT V CMM Model **7 Hrs**

CMM Model and its stages - Introduction to PCMM- CMMI and Six Sigma concepts. Introduction to ISO 9000- ISO 9000 Part3 for software Quality.

Text Books

- Roger S. Pressman- *Software Engineering*. A Practitioners Approach - Seven Edition- 2012.
- William E.Perry- *Effective Methods for Software Testing (2nd Edition)* - John Wiley and Sons- 2000.
- Robert V.Binder- *Testing Object-Oriented Systems: Models Patterns and Tools* - Addison Wesley- 2000.

Reference Book

- GlenfordJ.Myers- *"The Art of Software Testing "*- John Wiley and Sons- 1997.

PCSM213/PCSM309 TCP/IP NETWORKS

Semester : II **Credit : 4**
Category : Core VIII **Hours/Week : 4**
Class &Major: I M.Sc Computer Science **Total Hours : 52**

Objectives
To enable the students

- Understand the concepts of TCP/IP.
- Examine the process of TCP/IP.
- Implement TCP/IP concepts in network.

UNIT I INTRODUCTION **11 Hrs**

Internetworking Concepts and Architectural Model - Classful Internet addresses – CIDR-Subnetting and Supernetting –ARP- RARP- IP – IP Routing –ICMP – Ipv6

UNIT II TCP **11 Hrs**

Services – Header – Connection Establishment and Termination- Interactive Data Flow- Bulk Data Flow- Timeout and Retransmission – Persist Timer - Keepalive Timer- Futures and Performance.

UNIT III IP IMPLEMENTATION **10 Hrs**

IP Global Software Organization – Routing Table- Routing Algorithms-Fragmentation and Reassembly- Error Processing (ICMP) –Multicast Processing (IGMP).

UNIT IV TCP IMPLEMENTATION - I **10 Hrs**

Data Structure and Input Processing – Transmission Control Blocks- Segment Format-Comparison-Finite State Machine Implementation-Output Processing- Mutual Exclusion-Computing the TCP Data Length.

UNIT V TCP IMPLEMENTATION - II **10 Hrs**

Timers-Events and Messages- Timer Process- Deleting and Inserting Timer Event-Flow Control and Adaptive Retransmission-Congestion Avoidance and Control – Urgent Data Processing and Push Function.

Text Books

- Douglas E.Comer- *Internetworking with TCP/IP Principles- Protocols and Architecture* -Vol.1 and 2 6th editions- Pearson Education Asia- 2013. (Unit I in Comer Vol. I- Units II- IV and V – Comer Vol. II)
- W.Richard Stevens- *TCP/IP illustrated*- Volume 1- 6th edition- Pearson Education 2011. (Unit II)

Reference Books

- Forouzan- *TCP/IP protocol suite*- 2nd edition- TMH- 2003.
- W.Richard Stevens- *TCP/IP illustrated*- Volume 2- Pearson Education- 2003.

PCSM214 BIOMETRICS

Semester : II **Credit : 4**
Category : Core IX **Hours/Week : 4**
Class &Major : I M.Sc Computer Science **Total Hours :52**

Objectives
To enable the students

- Understand the concepts of Image Processing.
- Examine the process of Biometrics.
- Implement Biometrics concepts in security.

UNIT- I INTRODUCTION **10 Hrs**

Biometric Fundamentals –Biometric Technologies–Biometrics Vs Traditional Techniques – Characteristics of a Good Biometric System – Benefits of Biometrics – Key Biometric Processes: Verification - Identification and Biometric Matching.

UNIT- II FINGERPRINT BIOMETRICS **10 Hrs**

Fingerprint Patterns- Fingerprint Features- Fingerprint Image- width between two Ridges - Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification- Matching Policies.

UNIT- III FACE RECOGNITION **10 Hrs**

Detection and Location of Faces: Statistics-Based method- Knowledge-Based method - Feature Extraction and Face Recognition: Gray Value Based Method- Geometry Feature Based Method- Neural Networks Method.

UNIT- IV IRIS BIOMETRICS **11 Hrs**

Iris System Architecture- Definitions and Notations - Iris Recognition: Iris Location- Doubly Dimensionless Projection- Iris Code- Comparison - Coordinate System: Head Tilting Problem- Basic Eye Model- Searching Algorithm - Texture Energy Feature.

UNIT- V FUSION IN BIOMETRICS **11 Hrs**

Introduction to Multibiometrics - Information Fusion in Biometrics - Issues in Designing a Multibiometric System - Sources of Multiple Evidence - Levels of Fusion in Biometrics - Sensor Level - Feature Level- Rank Level- Decision Level Fusion - Score Level Fusion.

Text Books

- Anil K Jain - Patrick Flynn - Arun A Ross - *"Handbook of Biometrics"* - Springer - 2008
- David D. Zhang- *"Automated Biometrics: Technologies and Systems"*- Kluwer Academic Publishers- New Delhi- 2000.
- Rafael C.Gonzalez- Richard E.Woods- Steven L.Eddins- *"Digital Image Processing using MATLAB"*- 2e Pearson Education- New Delhi- 2011
- Arun A. Ross -KarthikNandakumar- A.K.Jain- *"Handbook of Multibiometrics"*- Springer- New Delhi- 2011.

e- Resources

- *http://www.mlmu.cz/wp-content/uploads/2014/09/Iris-MLMU.pdf*
- *https://webcache.googleusercontent.com/search?q=cache:HppWfW4ovnkJ:https://www.springer.com/cda/content/document/cda_downloaddocument/9780387222967-c2.pdf%3FSGWID%3D0-0-45-321290-p52104448+&cd=3&hl=en&ct=clnk&gl=in*

PCSR206/PCSR304 Networking - PRACTICAL

Semester : II **Credits : 3**
Category : Core Practical III **Hours/Week : 4**
Class &Major: I M.Sc Computer Science **Total Hours : 52**

Objectives
To enable the students

- Understand concepts in Network.
- Apply programming skills in network.
- Develop application in network.

Lab Exercise

1. Implementation of ECHO server using Socket Programming
2. Programs using UDP Sockets (like simple DNS)
3. Programs using TCP (like packet capturing and filtering)
4. Programs using RPC

5. Implementation of RMI
6. Simulation of sliding window protocol
7. Implementation of ARP
8. Implementation of RARP
9. Network Simulator
    a. Study of network simulator –NS2
    b. Network simulator GloMoSim
10. Simulation of Dynamic Routing Protocol

PCSR207 BIOMETRIC USING MATLAB - PRACTICAL

Semester : II **Credits : 3**
Category : Core Practical IV **Hours/Week : 4**
Class &Major : I M.Sc Computer Science **Total Hours : 52**

Objectives
To enable the students

- Understand concepts in Biometric.
- Apply programming skills in Biometric Image Processing.
- Develop application using Matlab

Lab Exercise

1. Image Enhancement
2. Image Segmentation
3. Image Acquisition - Fingerprint
4. Feature Extraction - Fingerprint
5. Image Acquisition - Face
6. Feature Extraction - Face
7. Image Acquisition - Iris
8. Feature Extraction - Iris

NON-MAJOR ELECTIVE

PCSE205 PROGRAMMING IN J2EE

Semester : II **Credits : 4**
Category : NON MAJOR ELECTIVE **Hours/Week : 3T+2P**
Class &Major : I PG **Total Hours : 39T+26 P**

Objectives
To Enable the Students

- Understand the fundamental concepts of the J2EE Technologies
- Communication of client and server in the programming paradigm - Component and Framework model.
- Provide experience in developing distributed enterprise applications using J2EE.

UNIT- I INTRODUCTION **8 Hrs**
Introducing J2EE basics: Need for enterprise programming– J2EE advantages – Enterprise architecture types – J2EE Multi-Tier Architecture – Architecture of J2EE.
Introducing J2EE components: J2EE containers – Types of J2EE technologies

UNIT -II DATABASES **8 Hrs**
JDBC objects –concept of JDBC – JDBC driver types – JDBC packages –overview of JDBC process-Database connection-statement objects - Resultset.

UNIT -III PRESENTATION SERVICES **7 Hrs**
Java server pages: Introduction- JSP tags – variables and objects – methods – control statements – loops – tomcat -cookies – session objects.

UNIT- IV SERVLETS **8 Hrs**
Java servlets: simple java servlet – anatomy of a java servlet – deployment descriptor – session tracking with servlets – cookies.

UNIT -V STRUTS **8 Hrs**
Struts Framework: Introduction – Building a simple struts – Model layers –View layer – controller layer – Validator – Tiles –Declarative Exception Handling –Struts Modules.

Lab Exercise

1. Creating tables as per specification.

- Creating a transaction referencing any number of local or remote tables.
- Extracting only the necessary data from remote tables - process that data and send the results to the local site for final processing.
- Updating records in a table based on a query.
- Adding a new record to a table.
- Calculating the total number of records in a table as per query.
- Listing records based on a query.

- Deleting an item based on a query.

2. To Create a java application for manipulating the Student details with database connectivity in MS Access using JDBC objects
3. A web page for login verification using HTML and Servlets.
4. A J2EE application that displays the current date and time using JSP.
5. A web page for calculating mark percentage of a student using HTML and JSP.

Any two web application

6. A web application for College Administration System.
7. A web application for Software Development System.
8. A web application for ATM Banking system.
9. A web application for Library Management system

Text Books:

- "Java server programming (J2EE 1.4) Black Book" - 2007 - Kogent Solutions Inc
- Jim Keogh - **J2EE1.4 Complete Reference** - Tata McGraw–Hill Publishing Company - NewDelhi - 2006.
- James Holmes "The Complete References Struts Second Edition" Tata McGrawHill Edition-2007.

Reference Books:

- James McGoven - Rahim Adatis & Group- **J2EE 1.4 Bible** - Dreamtech Publishing - 2006 .
- Paul Tremblett - "Instant Enterprise Java Y-Beans" - Tata McGraw Hill Publishing Company - New Delhi - 2001.

PCSE206 MOBILE COMPUTING LAB

Semester : II **Credits : 4**
Category : NON MAJOR ELECTIVE **Hours/Week : 5**
Class &Major : I PG **Total Hours : 65**

Objectives:
To Enable the students

- Understand the concepts mobile technologies
- Develop and deploy effective mobile applications.
- Impart practical training in Mobile Application Development.

Lab Exercise (Any 10):

1. Create an application which deals with the Android Content Providers.
2. Create an application using Android Layouts - Views and Events.
3. Create an application which uses Files - Preferences and Notifications.
4. Create an application to Create - Modify and Query an SQLite Database.

5. Create an application for Querying web services and Parsing response.
6. Create an application which uses the concept of Services and Background Threats.
7. Creating Android Audio Video Application.
8. Create an application which uses Map Activity and points the locations onto the Map Locations.
9. Create an application with One-Time - Repeating Alarms - and Long-Running Background Task as Service.
10. Create an Application for Simple Mobile Game.
11. Develop an application that uses GUI components - Font and Colours.
12. Develop an application that uses Layout Managers and event listeners.
13. Develop a native calculator application.
14. Write an application that draws basic graphical primitives on the screen.
15. Develop an application that makes use of database.
16. Implement an application that implements Multi threading.
17. Develop a native application that uses GPS location information.
18. Implement an application that writes data to the SD card.
19. Implement an application that creates an alert upon receiving a message.
20. Write a mobile application that creates alarm clock.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
	Core I	PCSM111/ PCSM403	Internet of Things	Problem Solving	Seminar
	Core II	PCSM112	Object Oriented Software Engineering	Assignment	Seminar
	Core III	PCSM113/ PCAM314	Data Mining	Assignment	Seminar
	Core IV	PCSM114/ PCSM210	Design and Analysis of Algorithm	Case Study	Seminar
	Core V	PCSM115	Virtual Reality	Assignment	Seminar
	Core VI	PCSR106/ PCAR405	UML - Practical	DPA	Viva Voce
	Core VII	PCSR107/ PCAR306	Data Mining using WekaTool -Practical	DPA	Viva Voce
II	Core VIII	PCSM212	Multimedia and its Applications	Case study	Seminar
	Core IX	PCSM211	Software Testing	Assignment	Seminar
	Core X	PCSM213/ PCSM309	TCP / IP Networks	Working Model	Seminar
	Core XI	PCSM214	Biometrics	Assignment	Seminar
	Core XII	PCSR206/ PCSM304	Networking – Practical	DPA	Viva Voce
	Core XIII	PCSR207	Biometrics Using Matlab - Practical	DPA	Viva Voce

NON-MAJOR ELECTIVE

Semester	Category	Course Code	Course Title	Component III	Component IV
II	Non Major Electives	PCSE205	Programming in J2EE	Assignment	Problem Solving
		PCSE206	Mobile Computing - Practical	DPA	Viva Voce

COURSE PROFILE M.Phil (Computer Science)

PSO1 : Ability to analyze and apply the latest technologies in the concepts of key areas in computer science.

PSO2 : Critical analysis of problems and thorough evaluation of potential benefits of alternative solution in designing software and/or hardware systems.

PSO3 : Ability to analyze and synthesize computing systems through quantitative and qualitative techniques.

PSO4 : Ability to use knowledge in various domains to identify research gaps and provide solution to new ideas and innovations.

Semester	Category	Course Code	Course Title	Contact Hrs/Week	Credit	
					Min	Max
I	Core Paper I	MCSM108	Research Methodology	6	5	5
	Core Paper II	MCSM109	Advanced Topics in Computer Science	6	5	5
	Core Paper III	MCSM107	Special Area Study	6	5	5
II	Core Paper IV	MCSD201	Dissertation and Viva-voce	30	15	15
			Total	**48**	**30**	**30**
• **Paper presentation (minimum one) and / or publication of articles in journals (minimum one) are mandatory for submission of dissertation.**						

MCSM108 RESEARCH METHODOLOGY

Semester : I **Credit : 5**
Category : Core I **Hours/Week : 6**
Class & Major: M.Phil Computer Science **Total Hours :78**

Objectives
To enable the students

- Understand the basic knowledge and concepts required for research and thesis writing.
- Analyze the Research Design - Sampling and Data analysis.
- Gain Knowledge on research ethics and tools

UNIT- I FOUNDATIONS AND PROBLEM IDENTIFICATION 16 Hrs

Foundations of Research: Meaning - Objectives - Motivation - Utility. Concept of theory - empiricism - deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept - Construct - Definition - Variable. Research Process.

Problem Identification and Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis and Alternative Hypothesis. Hypothesis Testing – Logic and Importance.

Recent Issues in Computer Science: Identification and Biometrics, Telemedicine, Healthcare, Data privacy. Green computing, Cyberspace.

UNIT- II RESEARCH DESIGN 16 Hrs

Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept - types and uses - Descriptive Research Designs – concept - types and uses.

Experimental Design: Concept of Independent and Dependent variables.

Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement - causality - generalization - replication. Merging the two approaches.

UNIT- III DATA COLLECTION AND DATA ANALYSIS 16 Hrs

Data Collection: Methods of Data Collection –Collection of primary data –Collection of data through questionnaires –Schedules –Differentiation between questionnaires and schedules – Other methods of data collection –Collection of secondary data –Selection of appropriate method for data collection – Guidelines for constructing questionnaire/Schedule –Guidelines for successful Interviewing – Difference between survey and experiment –Data Collection using Journals

Data Analysis: Data Preparation – Univariate analysis (frequency tables - bar charts - pie charts - percentages) - Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association

UNIT- IV DATA INTERPRETATION 16 Hrs

Interpretation of Data–Meaning of Interpretation - Technique of Interpretation - Precaution in Interpretation - Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports - Oral Presentation - Mechanics of Writing a Research Report - Precautions for Writing Research Reports - Conclusions.

UNIT -V RESEARCH ETHICS - IPR - SCHOLARY PUBLISHING AND TOOLS 14 Hrs

Ethics: Ethical issues in research paper.

IPR: Intellectual Property Rights and Patent Law - Commercialization - Copy Right - Royalty - Trade Related aspects of Intellectual Property Rights (TRIPS).

Scholarly Publishing: Layout of a Research Paper - Ethical issues related to publishing - Citation and Acknowledgement - Plagiarism and Self-Plagiarism - Reproducibility and Accountability.

Use of tools / techniques for Research: methods to search required information effectively - Reference Management Software: Zotero/Mendeley

Software for paper formatting: LaTeX

Software Design: - Rational Suite

Software for detection of Plagiarism: Online - EduBirdie - smallseotools

Statistical Data Analysis: SPSS – SAGEMATH LAB

Text Books

- C.R.Kothari - Gaurav Garg - *"Research Methodology- Methods and Techniques"* - new edition - (New Age International (P) Limited)- 2018.
- Wadehra - B.L. - Law relating to patents - trademarks - copyright designs and geographical indications. Universal Law Publishing - 2004.
- Satarkar - S.V. - Intellectual property rights and Copy right. Ess Ess Publications - 2002.

MCSM109 ADVANCED TOPICS IN COMPUTER SCIENCE

Semester : I **Credit : 5**
Category : Core II **Hours/Week: 6**
Class &Major: M.Phil Computer Science **Total Hours : 78**

Objectives

To enable the students

- Understand the concepts of Cloud Networking
- Implement the Digital Image processing and Data mining.
- Gain deep knowledge on Bigdata analytics and Data Science.

UNIT- I DIGITAL IMAGE PROCESSING **15 Hrs**

Introduction – Digital Image representation – Fundamental steps and components in DIP. Digital Image Fundamentals: Elements of Visual Perception - Sensing and acquisition. Sampling and Quantization – Basic relationship between pixels – Intensity Tranformations and Spatial Filtering: Intensity Transformations – Basic Intensity Transformation Functions – Histogram Processing – Fundamentals of Spatial Filtering – Filtering in the Frequency Domain.

Self Learning Practice: SAGEMATH LAB

UNIT- II DATA MINING **15 Hrs**

Introduction - Data Mining and Data Preprocessing – Mining Frequent Patterns.

Classification: Statistical-Based Algorithms - Distance-Based Algorithms - Decision Tree-Based Algorithms - Neural Network-Based Algorithms - Rule-Based Algorithms - Combining Techniques.

Clustering: Similarity and Distance Measures - Hierarchical Algorithms - Partitional - Algorithms - Clustering Large Databases - Clustering with Categorical Attributes.

Association Rules: Basic Algorithms - Parallel and Distributed Algorithms - Incremental Rules - Advanced Association Rule Techniques - Measuring the Quality of Rules.

Data Mining Trends and Research Frontiers.

Self Learning Practice:WEKA / RapidMiner / DB Miner .

UNIT- III CLOUD NETWORKING **16 Hrs**

Introduction to Cloud Networking: Networking Basics - The network stack - Packets and frames - Network equipment - Interconnect - Cloud Data Center - Cloud Networking - Characteristics of Cloud Networking - Ethernet usage - Virtualization - Convergence - Scalability - Software.

Data Center Evolution: Mainframes to the Cloud: The Data Center Evolution - Computer Networks - Ethernet - Enterprise versus Cloud Data Centers - Movement to the Cloud.

Cloud Data Center Networking Topologies: Data Center Network Switch Types - Flat Data Center Networks - Rack Scale Architectures - Network Function Virtualization.

Data Center Networking Standards: Ethernet Data Rate Standards - Virtual Local Area Networks - Data Center Bridging - Improving Network Bandwidth - Remote Direct Memory Access.
Network Virtualization: Multi-tenant Environments - Traditional Network Tunneling Protocols - VXLAN - NVGRE - Tunnel Locations - Load Balancing.
Storage Networks: Advanced Storage Technologies - Storage Communication Protocols - Network Convergence - Software-Defined Storage - Storage in Cloud Data Centers.
Self LearningPractice VMware / Cloud Foundary / Open Stack.Globus Toolkit / Eucalyptus / Open Nebula.

UNIT- IV BIGDATA ANALYTICS with R Programming 16 Hrs
Big Data Processing Architectures - Big Data Technologies - Data Driven Architecture - Information Management and Lifecycle - Big Data Analytics - Visualization and Data Scientist - Implementing The "Big Data" Data. Writing Hadoop Map Reduce Programs - Integrating R and Hadoop - Learning Data Analytics with R and Hadoop - Understanding Big Data Analysis with Machine Learning - The Evolution of Analytic Scalability - The Evolution of Analytic Processes.
R: R for Business Analytics - R Interfaces - Manipulating Data - Exploring Data - Building Regression Models - Forecasting and Time Series Models..

Self Learning Practice:VMWare / Hortonsandbox / R Programming

UNIT -V DATA SCIENCE 16 Hrs
Introduction – Data Science Process - Three Machine Learning Algorithms: Linear Regression - K-Nearest Neighbors - k-means. Feature Generation and Feature Selection - Mining Social - Network Graphs (Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs) - Data Visualization - Data science and Ethical Issues.

Self LearningPractice One More Machine Learning Algorithm and Usage in Applications

1. Motivating application: Filtering Spam -
2. Why Linear Regression and k-NN are poor choices for Filtering Spam
3. Naive Bayes and why it works for Filtering Spam
4. Data Wrangling: APIs and other tools for scrapping the Web

For Term Paper Writing:
*** Self Learning Practice –** One Problem is given to the scholar they have to solve it in any one of the tool.

Text Books

- Anil K Jain - *"Fundamentals of Digital Image Processing"* - 2nd Edition - Prentice Hall of India Private Limited - NewDelhi - 2011.
- Jiawei Han- Micheline Kamber- Jian Pei- - *"Data Mining: Concepts and Techniques"*- Third Edition- Elsevier- 2011
- Gary Lee - *"Cloud Networking* - Understanding Cloud-based Data Center Networks" - Elsevier - 2014

- Boris lublinsky- Kevin t. Smith- Alexey Yakubovich- *"Professional Hadoop Solutions*"- Wiley- ISBN: 9788126551071- 2015.
- Nina Zumel- John Mount- *"Practical Data Science with R*"- Manning Publications- 2014.

e_Resources

- http://www.johndcook.com/R_language_for_programmers.html
- Big Data Analytics with R and Hadoop by Vignesh Prajapati - 2013.
- Cathy O'Neil and Rachel Schutt. Doing Data Science - Straight Talk From The Frontline. O'Reilly. 2014.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Core I	MCSM108	Research Methodology	Term Paper	Seminar
	Core II	MCSM109	Advanced Topics in Computer Science	Term Paper	Seminar
	Core III	MCSM107	Special Area Study	Term Paper	Seminar

DEPARTMENT OF COMPUTER APPLICATIONS

Preamble

UG : Course profile, list of courses offered to the other departments and the syllabi of courses in the I & II semesters along with evaluation components III & IV (with effect from 2018-2021 batch onwards) and

PG : Course profile, list of courses offered to the other departments and the syllabi of courses in the I, II, III & IV semesters along with evaluation components III & IV (with effect from 2018-2021 batch onwards) are presented in the booklet.

COURSE PROFILE: BCA

PSO1 : Understanding of the key concepts and principles of programming languages.
PSO2 : Capacity to analyze a problem, identify the computing requirements and using Procedures find a solution.
PSO3 : Development of practical skills to solve problems and provide solutions using current trends in the discipline of Computer Applications.
PSO4 : Ability to apply the algorithmic principles, mathematical foundations and computer science theory for designing computer-based systems.

Semester	Part	Category	Course Code	Course Title	Contact / Week	Credit	
						Min	Max
I	I	Language	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil-I/ Advanced Tamil-I/ Hindi-I/ French-I	4	2	3
	II	English	UENL107/ UENL108	General English-I/ Advanced English-I	5	2	3
	III	Core I	UCAM107/ UCSM106	Programming in C	6	5	5
	III	Core II	UCAM108/ UCSM108 UCAM109/ UCSM109	Fundamental of Computer Science/ Advanced Computer Science	5	4	4
	III	Core Practical I	UCAR105/ UCSR108	Programming in C- Practical	3	2	2
	III	Allied I	UMAA110	Mathematical Methods-I	5	4	4
	IV	Value Education			2	1	1
				Total	**30**	**20**	**22**
II	I	Language	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil-II/ Advanced Tamil-II/ Hindi-II/ French-II	4	2	3

	II	English	UENL207/ UENL208	General English-II/ Advanced English-II	5	2	3
	III	Core III	UCAM205/ UCSM206	Data Structures	6	6	6
	III	Core Practical II	UCAR204/ UCSR205	Data Structures - Practical	4	3	3
	III	Allied II	UMAA216	Mathematical Methods-II	5	4	4
	IV	Non - Major Elective			4	2	2
	IV	Soft Skill			2	1	1
	V	Extension Programme/ Physical Education			-	1	2
				Total	**30**	**21**	**24**
III	III	Core IV	UCAM310/ UCSM305	Java Programming	6	6	6
	III	Core V	UCAM308	MIS and ERP	5	4	4
	III	Core VI	UCAM311	Multimedia and its Applications	5	4	4
	III	Core Practical III	UCAR304/ UCSR306	Java Programming - Practical	4	3	3
	III	Allied III	UCOA303	Financial Accounting	5	5	5
	IV	Online Courses		NPTEL/Spoken Tutorial	3	1	2
	IV	Value Education			2	1	1
				Total	**30**	**24**	**25**
IV	III	Core VII	UCAM404	Database Management System	6	6	6
	III	Core VIII	UCAM403	Object Oriented Analysis and Design	5	4	4
	III	Core IX	UCAM405	Data Communication Networks	6	5	5
	III	Core Practical IV	UCAR402	Database Management System - Practical	3	2	2
	III	Core Practical V	UCAR403	Case Tools - Practical	3	2	2
	III	Allied IV	UCOA403/ UCOR403	Accounting Package	5	5	5
	IV	Soft skill			2	1	1
	V	Extension Programme/ Physical Education			-	-	2
				Total	**30**	**25**	**27**
V	III	Core X	UCAM507	Operating System	5	5	5
	III	Core XI	UCAM504	Software Engineering	6	5	5
	III	Core XII	UCAM505	Web Programming	6	5	5
	III	Core XIII	UCAM508	Open Source Technology	5	5	5
	III	Core Practical VI	UCAR506	Open Source Technology - Practical	3	2	2
	III	Core Practical VII	UCAR505	Web Programming - Practical	3	2	2
	IV	Value Education			2	1	1
				Total	**30**	**25**	**25**
VI	III	Core XIV	UCAM609	Data Mining	5	4	4

	III	Core XV	UCAM610	Software Testing	5	4	4
	III	Core XVI	UCAM611	Internet of Things	4	3	3
	III	Core Practical VIII	UCAR602	Data Mining - Practical	4	3	3
	III	Core Project	UCAP601	Project Work	5	5	5
	III	Major-Elective	UCAO606/ UCAO604	Network Security/ Cloud Computing	5	4	4
	III	Viva-Voce	UCAM601	Comprehensive Viva Voce	-	1	1
	IV	Soft Skill			2	1	1
	V	Extension Programme/ Physical Education			-	-	2
Total					**30**	**25**	**27**
Grand Total					**180**	**140**	**150**

EXTRA CREDIT EARNING PROVISION

Semester	Part	Category	Course Code	Course Title	Contact/ Week	Credit	
						Min	Max
II	III	Summer Internship	UCAI201	Summer Internship	-	-	1
IV	III	Summer Internship	UCAI401	Summer Internship	-	-	1
V	III	Self Study	UCSS501/ UCAS501	Python Programming	2	-	2
V	III	Self Study	UCSS502/ UCAS502	Android Applications	2	-	2
VI	III	Self Study	UCSS601/ UCAS601	Angular JS	2	-	2
VI	III	Self Study	UCSS602/ UCAS602	Green Computing	2	-	2

NON-MAJOR ELECTIVES-UG

Semester	Part	Category	Course Code	Course Title	Contact/ Week	Credit
II	IV	NME	UCAE207	Data Science using R	4P	2
			UCAE208	Cyber Forensics	4T	2
			UCAE209	PyMOL	4P	2
			UCAE210	Qlick View	4P	2

UCAM107/UCSM106 PROGRAMMING IN C

Semester : I **Credit : 5**
Category : Core 1 **Hours/Week: 6**
Class & Major: I BCA **Total Hours : 78**

Objectives
To enable the Students

- Understand the concepts of Structured Programming.
- Acquire Knowledge on Control Structure, Arrays, Functions, Pointers and Files
- Solve Logical problems using C language.

UNIT- I INTRODUCTION **15 Hrs**

Overview of C – Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data Types – Declaration of Variables – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaring a Variable as Constant – Declaring a Variable as Volatile – Operators and Expressions.

UNIT- II DECISION AND LOOPING **15Hrs**

Introduction – Decision making with if statement –Simple if statement – The if-else statement – Nesting of if-Else Statements – The Else if Ladder – The Switch Statement – The Goto Statement - The Ternary Operator. **Looping**: The While statement – The Do-While statement – The For statement – Jumps in Loops.

UNIT- III ARRAYS AND FUNCTIONS **16 Hrs**

Introductions – One-Dimensional arrays – Declaration of One-Dimensional arrays – Initialization of One-Dimensional arrays – Two-Dimensional arrays – Initialization of Two-Dimensional arrays – Multi-Dimensional arrays – Dynamic Arrays – Character Arrays and Strings – User-Defined Functions.

UNIT- IV STRUCTURES AND UNIONS **16 Hrs**

Introduction – Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization – Copying and Comparing Structure Variables – Operations on Individual Members – Arrays of Structures – Arrays within Structures – Structure and Functions – Unions – Size of Structure.

UNTI- V POINTERS AND FILES **16 Hrs**

Introduction to pointers – Accessing the Address of a Variable – Declaring pointer Variables – initialization of pointer Variables – Accessing a Variable though its pointer – chain of Pointers – Pointer Expressions – Pointers Increments and Scale Factor – Pointer and Arrays – Pointers and Character Strings – Arrays of Pointers. Files: Introduction – Defining and opening a file – Closing a File – Input/Output Operations on files. Dynamic Memory Allocation – Allocating a Block of memory: Malloc – Allocating Multiple Blocks of Memory – Altering the size of Block .C Preprocessor-Directives - Macros - Working with Several Files - Command Line Arguments.

Text Book

- Bala Gurusamy.E," *Programming in ANSI C"*, 6th Edition, Tata McGraw-Hill, New Delhi, 2012.

Reference Books

- Herbert Schildt.H, "*C The Complete Reference",* 4th Edition, Tata McGraw-Hill Edition, New Delhi, 2000.
- Byron S. Gottfried,*" Programming with C"*, 4th Edition, Tata McGraw Hill Edition, New Delhi, 2006.
- Brian W. Kernighan and Dennis M.Ritchie, *"The C Programming Language"*, 2nd Edition, Prentice hall of India Pvt.ltd, New Delhi, 2005.

UCAM108/UCSM107 FUNDAMENTALS OF COMPUTER SCIENCE

Semester :I **Credit : 4**
Category :Core II **Hours/Week : 5**
Class &Major:I BCA **Total Hours :65**

Objectives
To enable the students

- Obtain basic knowledge about Computer Classification and Applications.
- Acquire knowledge on Number Systems and Elements of Computer Architecture
- Inculcate knowledge on Internet and E-Mail.

UNIT- I INTRODUCTION 13 Hrs

Introduction To Computers - Characteristics of Computers - Evolution of Computers- Generation of Computers - Classification of Computers - The Computer System- Applications of Computers.

UNIT- II PROGRAMMING LANGUAGES 13 Hrs

Introduction - Evolution of Programming Languages- Classification of Programming Languages - Generations of Programming Languages - Features of a Good Programming Language- Selection of a Programming Language.

UNIT- III NUMBER SYSTEMS 13 Hrs

Introduction - Decimal Number System - Binary Number System - Complements - Signed and Unsigned Number Representations - Fixed-Point Representation of Numbers - Floating-point Representation of Numbers - Binary Coded Decimal (BCD) - Gray Code - Excess-3 Code - ASCII Code - EBCDIC Code - Bits, Bytes, and Words - Octal Number System - Hexadecimal Number System.

UNIT –IV FUNDAMENTALS OF COMPUTER ARCHITECTURE 13 Hrs

Introduction- Central Processing Unit (CPU) Memory- Communication between Various Units of a Computer System- The Instruction Format- Instruction Set- Processor Speed- Multiprocessor Systems. Primary Memory Introduction- Memory Hierarchy- Random Access Memory (RAM)- Types of RAM- Read Only Memory (ROM)- Types of ROM. Secondary Storage Introduction- Classification of Secondary Storage Devices- Magnetic Tape- Magnetic Disk- Optical Disk- Magneto Optical disk. Input Devices - Output Devices.

UNIT -V INTERNET AND E-MAIL **13 Hrs**

Introduction - Internet Access - Internet Protocols - Internet Addressing - World Wide Web - Web pages and HTML - Web Browsers - Searching the Web - Internet Chat - Overview of Electronic Mail - Internet - E-Commerce and E-Business.Computer Program Introduction- Developing a Program- Algorithm- Flowchart- Psedocode (P-Code)

Text Book

- Alexis Leon and Mathews Leon, *"Fundamentals of Information Technology",* Vikas Publishing House Pvt. Ltd, 2009

Reference Books

- Dennis P. Curtin ,Kim foley, Kunal Sen and Cathleen Morin - *"Information Technology - the breaking wave"*, Tata-McGraw Hill Publications, 2005 Seventeenth Reprint., (ISBN 0-07- 463558-1)..
- Alexis Leon And Mathews Leon. *"Fundamentals of Information Systems"* co-published by Vijay Nicole Imprints Pvt Ltd, 2004.

UCAM109/UCSM108 ADVANCED COMPUTER SCIENCE

Semester	**: I**	**Credit**	**: 4**
Category	**:Core II**	**Hours/Week**	**: 5**
Class & Major	**:I BCA**	**Total Hours**	**:65**

Objectives

To enable the Students

- Obtain knowledge on Object Oriented Programming concepts.
- Understand the basics of Microprocessor and Compiler.
- Acquire knowledge on Information Security and Open Source Software.

UNIT - I INTRODUCTION TO OBJECT ORIENTED CONCEPTS **12 Hrs**

Principles of Object Oriented Programming: Basic concepts of OOP - Benefits of OOP - Object Oriented Language Applications of OOP. Classes and Objects - Constructors and Destructors - Type Conversions – Method Overloading – Inheritance - Exception Handling.

UNIT - II MICROPROCESSOR **12 Hrs**

Introduction to Microprocessor – Microcontroller - 8085 Microprocessor and Architecture - Opcode fetch - Machine cycle - Memory read machine cycle - Memory write machine cycle - IO read machine cycle - IO Write machine cycle - Execution time of the instruction cycle.

UNIT - III INTRODUCTION TO COMPILERS **11 Hrs**

Compilers – Analysis of source program – The Phases of compilers – Cousins of Compilers – The grouping of phases – Analysis of Source Program.

UNIT - IV INFORMATION SECURITY **15 Hrs**

Introduction to Information Security - Components of an Information System - Balancing Information Security and Access - The Systems Development Life Cycle - The Security Systems Development Life Cycle - Security Professionals and Organization.

UNIT - V OPEN SOURCE SOFTWARES **15 Hrs**

Introduction to Open sources – Need of Open Sources – Advantages of Open Sources – Application of Open Sources. Open Source Operating Systems : LINUX – Introduction: MySQL - PHP – Python.

Text Books

- Michael E Whitman and Herbert J Mattord, "*Principles of Information Security"*, 4th Edition, Course Technology, Cengage Learning, 2012.
- Rasmus Lerdorf and LevinTatroe, "*Programming in PHP"*, Reilly, 2012
- Ramesh.S.Goankar, "*Microprocessor Architecture, Programming & Applications with 8085",* Fifth Edition, Penram International, 2011.

Reference Books

- Alfred V.Aho, Ravi Sethi, Jeffery D.Ullman, "*Compilers, Principles and Techniques and Tools"*, Addison-Wesley, New Delhi, 2006.
- Herbert Schildt, "*The Complete Reference C++*", Fifth edition, Tata McGraw-Hill Publishing, New Delhi, 2015.

UCAR105/ UCSR109 PROGRAMMING IN C – PRACTICAL

Semester :I **Credit : 2**
Category :Core Practical 1 **Hours/Week : 3**
Class & Major :I BCA **Total Hours : 39**

Objectives

To enable the Students

- Implement the basic concepts of C Programming language.
- Develop programs by using Control Structure, Arrays, Functions, Pointers and Files
- Design, build, Execute and Debug C programs.

V. Arithmetic and Trigonometric Operations **6 Hrs**

4. Perform Arithmetic Operations
5. Solve Quadratic Equations.
6. Find the largest and smallest number.

VI. Looping **6 Hrs**

4. Pascal Triangle
5. Armstrong Number Checking
6. Decimal to Binary Conversion

VII. Arrays and functions. **18 Hrs**

5. Sorting and Searching
6. Perform the operation of Matrix Manipulation.
   b. Addition and Subtraction. b. Multiplication
7. Perform the operation Recursive and Non-Recursive functions to find
   c. Factorial
   d. Fibonacci
8. Perform the String manipulation(without using string function)
   d. Concatenation
   e. Palindrome Checking
   f. Count the number of vowels, consonants, characters and white spaces in a line

VIII. Structure **3 Hrs**

2. Generate mark sheet processing for set of students using Structure

V. Pointers and Files **6 Hrs**

1. Perform Arithmetic Operation using Pointer.
2. Copies the contents of one file to another file using command line arguments.

UCAM205/ UCSM206 DATA STRUCTURES

Semester :II **Credit : 6**
Category :Core III **Hours/Week : 6**
Class & Major :I BCA **Total Hours :78**

Objectives
To enable the Students

- Impart the basic concepts of data structures.
- Understand basic concepts about stacks, queues, Lists, trees and graphs.
- Understand the concepts of searching and sorting techniques.

UNIT- I INTRODUCTION **15 Hrs**

Introduction – Classification of Data Structure – Operations on Data Structures – Abstract Data Type – Algorithms – Different Approaches to Design an Algorithms – Time and Space Complexity – Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis.

UNIT- II STACKS, QUEUES AND LINKED LISTS **16 Hrs**

Stacks: definition – Array representation of stacks – Evaluation of a postfix expression –Transforming infix expressions into postfix expressions. **Queues:** definition – array representation of queues – circular queues.

Linear Lists: linked lists – Representation of linear lists in memory – Traversing a linked list – Searching a linked list – Insertion into a linked list – Deletion from linked list – Circular linked lists – Doubly linked lists.

UNIT- III TREES **16 Hrs**

Introduction and definition of trees – Tree terminology – Binary tree – Representing binary tress in memory – Traversing binary tree: preorder, in-order, post-order traversal – Binary search trees – Searching and Inserting in Binary Search trees – Deleting in a Binary search tree.

UNIT- IV GRAPHS **16 Hrs**

Introduction to Graph, Directed Graphs, Sequential representation of graphs: Adjacent matrix, Path matrix, Linked representations of a Graph, Operations on Graphs: Searching in a Graph, Inserting in a graph, Traversing a graph: Breadth- First search, Depth-First search.

UNIT –V SORTING AND SEARCHING **15 Hrs**

Sorting: Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Merge-Sort. **Searching:** Sequential and Binary Searches, Indexed Search, Hashing Schemes.

Text Book

- Ashok N Kamthane, "*Introduction to data structures in C*", Pearson Education, Indian Print, Dorling Kindersley publications, New Delhi 2012.

Reference Book

- Ellis Horowitz and Sartaj Sahni, "*Fundamentals of data structures",* Galgotia Book Source, 2005.

UCAR204/UCSR206 DATA STRUCTURES – PRACTICAL

Semester : II **Credit : 3**
Category :Core Practical II **Hours/Week : 4**
Class & Major : I BCA **Total Hours : 52**

Objectives
To enable the Students

- Implement basic concepts of linear data structures.
- Develop programs using the Non Linear concept.
- Solve the sorting and searching algorithms.

To implement the Programs

I. Linear Data Structures **16 Hrs**

14. Stack using arrays.
15. Queue using arrays.
16. Single linked list.

II. Non-Linear Data Structures **4 Hrs**

17. Binary tree.
18. Graph Using Adjacency Matrix.

III. Sorting **16 Hrs**

19. Merge sort using arrays.
20. Insertion sort using arrays.
21. Quick sort using arrays.
22. Selection Sort using arrays.

IV. Searching **16 Hrs**

23. Linear search using arrays.
24. Binary search using arrays.
25. Depth first search.
26. Breadth first search.

UCAE207 DATA SCIENCE USING R

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4P**
Class & Major : I UG **Total Hours : 52**

Objectives
To enable the Students

- Implement sorting and searching algorithms using R
- Perform data exploratory analysis using R

LAB EXERCISES

1. Implement the following sorting algorithms **9 Hrs**
   a. Selection sort
   b. Insertion sort
   c. Bubble Sort
2. Implement the following searching algorithms **9 Hrs**
   a. Linear search
   b. Binary search
3. Implement the following Data Exploratory Analysis **34 Hrs**
   a. Save and Load the Data
   b. Import from and Export to .CSV Files
   c. Import and Export Data from Databases
   d. Read and Write data using Excel Files
   e. Explore Individual and Multiple Variables from Data Set
   f. Visualization of Data Set

e-Resources

- https://www.udemy.com/r-programming-from-a-to-ztm-practical-and-concise/
- https://thepracticalr.wordpress.com/
- https://www.ed.youth4work.com
- www.programmingr.com/examples
- https://www.coursera.org/learn/r-programming
- https://www.analyticsvidhya.com/blog/.../complete-tutorial-learn-data-science-scratch

UCAE208 CYBER FORENSICS

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4T**
Class & Major : I UG **Total Hours : 52**

Objectives
To enable the Students

- Demonstrate data recovery from hardware
- Understand various software threats
- Learn the working of surveillance tools

UNIT- I TYPES OF COMPUTER FORENSICS **10 Hrs**

Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services.

UNIT- II DATA RECOVERY **12 Hrs**

Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

UNIT - III ELECTRONIC EVIDENCE **10 Hrs**

Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events – Networks.

UNIT- IV THREATS **10 Hrs**

Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies.

UNIT - V SURVEILLANCE **10 Hrs**

The Future – Arsenal – Surveillance Tools – Victims and Refugees – Advanced Computer Forensics

Text Books

- Majid Yar, *Cybercrime and Society*, Sage Publications, 2013.
- Chad Steel, *Windows Forensics*, Wiley India, 2006.

Reference Books

- John R. Vacca, *Computer Forensics*, Firewall Media, 2005.
- Sunit Belapure and Nina Godbole, *Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives*,Wiley, 2011.
- Marjie T Britz, *Computer Forensics and Cyber Crime: An Introduction*, Pearson Education India, 2011.

UCAE209 PyMOL

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4P**
Class & Major : I UG **Total Hours : 52**

Objectives

To enable the Students

- Understand the installation steps of PyMOL
- Implement simple PyMOL Commands
- Write Python Script to interact PyMOL

Lab Exercises

1. Install PyMOL
2. Load Protein from public structure repository (pdb format) using Load and Fetch commands.
3. Change the color of a protein chain
4. Change the view of a protein (Rotate and Move) using Rota and Move Commands.
5. Save an Image
6. Selecting parts of an object
7. Write simple Python script to rotate a molecule.
8. Write a simple Python code interacts with PyMOL to show animated molecule.

e-Resources

- https://pymol.org/
- *https://sourceforge.net / Browse/ Graphics/ Graphics / 3D Modeling*
- https://pymolwiki.org/index.php/Practical_Pymol_for_Beginners
- https://pages.jh.edu/pfleming/bioinform/files/PyMOL_Tutorial.pdf
- https://ist.mit.edu/pymol/all

UCAE210 QLICK VIEW

Semester : II **Credit : 2**
Category : NME **Hours/Week : 4P**
Class & Major : I UG **Total Hours : 52**

Objectives
To enable the students

- Learn Business Intelligence Solution
- Understand the Data Visualization Technique using Qlick View.
- Apply Qlick View function for Data Projection

Lab Exercise

1. Install Qlick View
2. Load data from different sources in Qlick View
3. Apply Visualization techniques
    a. Gauge Chart
    b. Waterfall Chart
    c. Cyclic and Drill Groups
4. Apply Data Transformation
    a. Loading Cross Table
    b. Loading Inline Table
    c. Loading data from already stored data in Qlick View (Resident Load)
    d. Joins, Concatenation of tables
    e. Use of Mapping Tables

5. Apply aggregate function
6. Apply Access restriction (Section Access)

e-Resources

- https://www.loc.gov/acq/devpol/electronicresources.pdf
- www.iconresources.com/new/irt_bi.htm
- https://www.analyticsvidhya.com/learning-paths-data.../qlikview-learning-path
- https://www.qlik.com/us/services/training
- https://www.udemy.com/qlikview-for-beginners-by-techstuffy

III and IV Evaluation Components of CIA

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
I	III	Core I	UCAM107	Programming in C	Assignment	Problem Solving
	III	Core II	UCAM108	Fundamental of Computer Science	Number Conversion	Assignment
	III	Core III	UCAM109	Advanced Computer Science	Assignment	Assignment
	III	Core Practical I	UCAR105	Programming in C-Practical	DPA	Viva-voce
II	III	Core III	UCAM205	Data Structures	Assignment	Problem Solving
	III	Core Practical II	UCAR204	Data Structures - Practical	DPA	Viva-voce

III and IV Evaluation Components of CIA

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
II	IV	NME	UCAE207	R Programming	DPA	Viva-Voce
			UCAE208	Cyber Forensics	Assignment	Case Study
			UCAE209	PyMOL	DPA	Viva-Voce
			UCAE210	Qlick View	DPA	Viva-Voce

COURSE PROFILE: MCA

PSO1 : Understanding of the key concepts of Computer Applications and Computing Principles.

PSO2 : Analysis, Design and Development of problem solving skills in the discipline of computer applications.

PSO3 : Applying the practices and strategies of computer science for software project development to deliver a quality software product and contribute to research in the chosen field and perform effectively.

PSO4 : Application of computing knowledge efficiently and effectively in projects management and progress as a computer professional.

Semester	Category	Course Code	Course Title	Contact/ Week	Credit	
					Min	Max
I	Core I	PCAM103	Mathematical Foundation	4	3	3
	Core II	PCAM108	Marketing Management	5	3	3
	Core III	PCAM110	C Programming	5	4	4
	Core IV	PCAM111	Web User Interface Design	5	3	3
	Core V	PCAM112	Computer Organization and Architecture	4	3	3
	Core Practical I	PCAR105	C Programming –Practical	3	2	2
	Core Practical II	PCAR106	Web User Interface Design Practical	3	2	2
			Library	1	-	-
			Total	**30**	**20**	**20**
II	Core VI	PCAM205	Database Management System	5	4	4
	Core VII	PCAM209	Operations Research	5	4	4
	Core VIII	PCAM207	Object Oriented Programming using C++	4	3	3
	Core IX	PCAM208	Data Structures and Algorithms	4	3	3
	Core Practical III	PCAR203	Database Management System-Practical	3	2	2
	Core Practical IV	PCAR204	Object Oriented Programming using C++ -Practical	3	2	2
	Non Major Elective			5	4	4
			Library	1	-	-
	Service Learning	PCSX201/ PCAX201	Introduction To Information Technology	–	1	1
			Total	**30**	**23**	**23**
III	Core X	PCAM313	Advanced Java Programming	5	4	4

	Core XI	PCAM314/ PCSM113	Data Mining	4	4	4
	Core XII	PCAM311	Operating System	4	4	4
	Core XIII	PCAM315	Computer Networks	4	3	3
	Core XIV	PCAM316	Cloud Computing	5	4	4
	Core Practical V	PCAR306/ PCSR107	Data Mining using Weka Tool - Practical	4	3	3
	Core Practical VI	PCAR307	Advanced Java Programming- Practical	3	2	2
			Library	1	-	-
			Total	**30**	**24**	**24**
IV	Core XV	PCAM412	Big Data Analytics	4	4	4
	Core XVI	PCAM413	Software Engineering	5	4	4
	Core XVII	PCAM414	Open Source Technology	5	4	4
	Core XVIII	PCAM410	Web Technology	5	4	4
	Core XIX	PCAM411	Principles of Compiler Design	4	3	3
	Core Practical VII	PCAR407	Open Source Technology - Practical	3	2	2
	Core Practical VIII	PCAR406	Web Technology -Practical	3	2	2
			Library	1	-	-
			Total	**30**	**23**	**23**
V	Core XX	PCAM512	Android Programming	5	5	5
	Core XXI	PCAM513	Network Security and Cryptography	5	4	4
	Core XXII	PCAM511	Digital Image Processing	5	4	4
	Core XXIII	PCAM514	Soft Computing	4	4	4
	Core XXIV	PCAI501/ PCSI301	Fuzzy Set and System	5	4	4
	Core Practical IX	PCAR504	Android Programming - Practical	3	2	2
	Core Practical X	PCAR505	Mini project	2	2	2
			Library	1	-	-
			Total	**30**	**25**	**25**
VI	Core Project	PCAP601	Project work	30	20	20
			Grand Total	**180**	**135**	**135**

EXTRA CREDIT EARNING PROVISION

Semester	Category	Course Code	Course Title	Contact/ Week	Credit	
					Min	Max
III	Extra Credit	PCAS301	Working Model/ Self Study Paper	-	1	1
IV	Extra Credit	PUSI401	Summer Internship	-	1	1
V	Extra Credit	PCAS501	Application Development/ Paper Presentation	-	1	1
V	Self Study	PCSS301/ PCAS502	R-Programming	2	-	2
V	Self Study	PCSS302/ PCAS503	Rich Internet Applications	2	-	2
VI	Self Study	PCSS401/ PCAS601	Silver Light Applications	2	-	2
VI	Self Study	PCSS402/ PCAS602	Extreme Programming	2	-	2

NON-MAJOR ELECTIVES-PG

Semester	Part	Category	Course Code	Course Title	Contact Week	Credit	
						Min	Max
II	IV	Non – Major Elective	PCAE103	Open Source Programming	5	4	4

EXPERENTIAL LEARNING (Mandatory)

Semester	Category	Course Code	Course Title
IV	Core	PCAM414	Open Source Technology

PCAM110 C PROGRAMMING

Semester :I **Credits : 4**
Category :Core III **Hours/Week: 5**
Class & Major :I MCA **Total Hours : 65**

Objectives:
To enable the students

- Understand basic concepts of the C programming language.
- Design, build, execute and debug C applications.
- Develop variables, arrays, strings, flow control statement, point and disk files in C applications.

UNIT-I INTRODUCTION **10Hrs**

C fundamentals character set-identifier and keywords-data types-constants-variables-Declarations-Basic data types-Enumerated data types-Expressions- operators in C -Library function-managing input and output operations.

UNIT-II LOOPING STATEMENTS **10Hrs**

C Control Structures: Decision making with IF statement-IF….ELSE statement-Nested IF statements-For statements-Do…while statements-while…do statements-GOTO statements-SWITCH statements.

UNIT-III FUNCTIONS **14 Hrs**

C function: Definitions – Prototypes - Passing Arguments - Recursion-Parameters or Arguments to function-Return Values-Prototype of function-Rules of using a function. Storage Classes: Automatic, External, Static, Register Variables - Scope of a variable.

UNIT-IV ARRAYS **15 Hrs**

Arrays-Defining and Processing-Passing arrays to functions-Multidimensional arrays-Arrays and Strings. Structures and Functions-Passing structures to Function-Unions-Bitwise operations.

UNIT- V POINTERS **16 Hrs**

Pointers Declarations – Initialization - Passing Pointers to functions-pointers and arrays-Array of pointers-structures and pointers-Files: Creating, Processing, Opening and Closing data file. Dynamic Memory Allocation – Allocating a Block of memory: Malloc – Allocating Multiple Blocks of Memory – Altering the size of Block .C Preprocessor-Directives-Macros-Working with Several Files-Command Line Arguments.

Text Book

- E.Balagurusamy *"Programming in ANSI C"*, TMG, 2007.

Reference Books

- Gottfried. B.S., *"Programming with C",* 2/e, Schaum Outline series, TMH, 2005.
- Kernighan B.W. and Ritchie D.M, "*The C Programming Language: ANSI C*" Version, Second Edition, and PHI/Pearson Education Pvt.Ltd.
- Somashekara, "*Programming in C"*, PHI, 2006.
- Behrouz A. Forouzan and Richard. F. Gilberg, *"A Structured Programming Approach Using C"*, II Edition, Brooks–Cole Thomson Learning Publications,2007.

E- Resources

- https://www.cs.utah.edu/~swalton/Documents/Computer-Fundamentals.pdf
- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk
- https://www.youtube.com/watch?v=n1cQPwZwTs4

PCAM111 WEB USER INTERFACE DESIGN

Semester :I **Credits :3**
Category :Core IV **Hours/Week :4**
Class & Major:I MCA **Total Hours :52**

Objectives
To enable the students

- Know the UI Design principles, the features of HTML and Scripting.
- Design the webpage using JavaScript.
- Develop Applications in web user interface.

UNIT-I WEB MEDIUM **10 Hrs**

Core web technologies - web browsers - Markup Languages- Style sheet technologies - images -sound - video - programming technologies- client side, server side - network and related protocols - Introduction tostatic, dynamic and active web pages.

UNIT-II HTML **10 Hrs**

Introduction to HTML - Lists - Adding graphics to HTML documents.

UNIT- III TABLES **10 Hrs**

Tables - Linking documents - Frames - Form and its elements.

UNIT - IV JAVASCRIPT **10Hrs**

Introduction to JavaScript - JavaScript in web pages – writing JavaScript with - HTML - Basic programming techniques - operators and expressions - conditional checking - loops - functions - user definedfunctions - dialog boxes.

UNIT- V JAVASCRIPT **12Hrs**

JavaScript DOM: JSSS DOM - understanding objects in HTML- browser objects - web page object hierarchy - handling events - The formobject - built-in objects - user defined objects - cookies - setting a cookie.

Text Books

- Thomas A Powell, "*Web Design - The Complete Reference*", Tata McGraw-Hill, Second Edition, 2003.
- Ivan N. Bayross, "*Web enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP*", 4th Revised Edition, BPB Publications, New Delhi, 2010.

Reference Books

- Thomas A Powell, "The Complete Reference - HTML", Osborne-McGraw-Hill, Third Edition, 2000.
- Gary B. Shelly, H. Albert Napier, Ollie N. Rivers, "*Web Design: Introductory Concepts and Techniques*", Cengage Learning, 2008.

E- Resources

- https://www.cs.utah.edu/~swalton/Documents/Computer-Fundamentals.pdf
- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk
- https://www.youtube.com/watch?v=n1cQPwZwTs4

PCAM112 COMPUTER ORGANIZATION AND ARCHITECTURE

Semester	**: I**	**Credit**	**: 4**
Category	**: Core V**	**Hours/Week**	**: 4**
Class & Major	**: I MCA**	**Total Hours**	**: 52**

Objectives

To enable the students

- **Understand basic concepts of Computer Architecture.**
- **Inculcate Knowledge on digital concepts.**
- **Learn the input and output organization.**

UNIT - I INTRODUCTION **10 Hrs**

Data representation: Data types – Complements – Fixed-point representation – Floating-point representation - Logic gates - Combinational circuits - Flip-flops – Multiplexers – Decoders.

UNIT - II REGISTERS **10 Hrs**

Registers – Shift registers – Binary counters – Register transfer – Bus and memory transfers – Arithmetic micro operations- Logic and shift micro operations - Arithmetic logic shift unit.

UNIT - III CENTRAL PROCESSING UNIT **10 Hrs**

Register and stack organization – Instruction formats – Addressing modes – Data transfer and manipulation – Program control – RISC

UNIT - IV ARITHMETIC PROCESSING **10 Hrs**

Addition, subtraction, multiplication and division of signed-magnitude data Parallel processing: Pipelining – Arithmetic and instruction pipeline – RISC pipeline – Array Processors

UNIT - V INPUT/OUTPUT ORGANIZATION **12 Hrs**

Peripheral devices – I/O interface – Asynchronous data transfer Memory organization: Memory hierarchy – Main memory – Auxiliary memory – Associative memory – Cache memory – Virtual memory

Text Books

- M. Morris Mano and Rajib Mall, *Computer System Architecture*, Pearson Publication, Third Edition, 2017.
- William Stallings, *Computer Organization & Architecture – Designing for Performance*, 9th Edition 2012.

Reference Book

- David A. Patterson and John L. Hennessy, *Computer Organization and Design: The Hardware/Software Interface*, Fourth Edition, Morgan Kaufmann / Elsevier, 2009.

PCAR105 C PROGRAMMING

Semester :I **Credits : 2**
Category :Core Practical I **Hours/weeks : 3**
Class & Major :I MCA **Total Hours : 39**

Objectives

To enable the students

- Develop the students to write a program in C solve the problems

Lab Exercise

1. Program to print Pascal Triangle & Floyd's Triangle.
2. Program to conversion of Number System in c
3. Solution of Quadratic Equations (for all cases).
4. Sorting of names in Alphabetical order.
5. Matrix operations (Addition, Subtraction, Multiplication – using functions.)
6. Finding factorials, generating Fibonacci Numbers using recursive functions.
7. Summation of Series : sin(x), cos(x), exp(x) [Comparison with built-in-functions]
8. String manipulations without using string functions (string length, string comparison, string copy, palindrome checking, counting words and lines in strings (Use function pointers).
9. Program to prepare purchase report using pointers
10. Creation , insertion and deletion in a linked list using Pointers
11. C program for ATM transactions.
12. Book Shop inventory using Structures.
13. Creation and processing of Sequential files for payroll and Mark list preparation (use structures for Record Description).

PCAR106 WEB USER INTERFACE DESIGN – PRACTICALS

Semester :I **Credits : 2**
Category :Core Practical II **Hours/Week : 3**
Class & Major :I MCA **Total Hours : 39**

Objectives
To enable the students

- Understand simple Website design
- Create dynamics website using Scripts

HTML and DHTML **20 Hrs**

1. Designing and formatting the contents of a webpage using basic tags
2. Creating a webpage for displaying the Time-table for current semesterwith 'Table' tags
3. Designing a webpage using Frame tag
4. Designing an application form for opening a SB account using 'form'tag
5. Creating a webpage using audio and video tags

JavaScript **19Hrs**

5. Data validation using JavaScript
6. Writing a simple JavaScript with Conditional and Branching constructs
7. Adding interactivity to a web page (Events)

8. Working with Dialog boxes

9. Adding Scripts to Forms

10. Designing a simple calculator

PCAM205 DATABASE MANAGEMENT SYSTEM

Semester : II **Credit : 4**
Category : Core V **Hours/Week : 5**
Class & Major : I MCA **Total Hours : 65**

Objectives
To enable the students

- Acquire knowledge on basic AND practical skills on RDBMS
- Describes the data storage AND indexing techniques.
- Develop the query Optimization and Transaction management.

UNIT-I INTRODUCTION **10Hrs**

Database System vs. File Systems – View of Data – Data Models – Database Language– Transaction Management – Database Systems Structure – History of Database Systems Database Systems Applications – Entity Relationship Model

UNIT-II RELATIONAL DATABASE **15 Hrs**

SQL – Basic Structure – Set Operations – Complex Queries – Joined Quires – DDL Embedded SQL – Dynamic SQL – Other SQL Functions – Query by Example – Integrity and Security of Searching – Relational Database Design

UNIT- III DATA STORAGE AND INDEXING **15Hrs**

Storage AND File Structure- Disks – DAID – File Organization – Indexing AND Hashing – B+ TREE –B TREE –Static Hashing – Dynamic Hashing – Multiple Key Access

UNIT-IV QUERY EVALUATION AND OPTIMIZATION **10Hrs**

Query Processing- Selection Operation – Sorting – Join Operation – Evaluation of Expressions Query Optimization.

UNIT-V TRANSACTION MANAGEMENT **15Hrs**

Transaction Concept – Static Implementation – Concurrency control Processor – Desertion Handling – Recovery Systems – Recovery with concurrent Transactions – Shadow paging – Buffer Management - Case Studies – Oracle – Microsoft SQL Server

Text Books

- Abraham Silberschartz, Hentry F. Korth and S. Sundharssan, "*Database System Concepts*", 4th Edition, Tata McGraw Hill, 2002.
- Raghu Ramakrishnan AND Johnnesgerhrke, "*Data Base Management Systems*", McGrwaw Hill International Edition, 2000**.**

Reference Books

- Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "*Database System Implementation*"- Pearson Education- 2006.
- Ramez Elmasri and Shamkant B. Navathe, "*Fundamental Database Systems*", Third Edition, Pearson Education, 2006.
- Silberschatz, Korth and Sudarshan, "*Database Management System*", Tata McGraw-Hill Publishing Company, 2005.

E- Resources

- https://www.cs.utah.edu/~swalton/Documents/Computer-Fundamentals.pdf
- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk
- https://www.youtube.com/watch?v=n1cQPwZwTs4

PCAM207 OBJECT ORIENTED PROGRAMMING USING C++

Semester : II **Credit : 4**
Category : Core VII **Hours/Week : 4**
Class & Major: I MCA **Total Hours : 52**

Objectives
To enable the students

- Understand the concept of OOPS.
- Write programs using C++.
- Develop C++ programs and its application.

UNIT-I OOPS **10 Hrs**

Concepts of OOP-Benefits of OOP-Application of OOP-Tokens, Expressions and Control Structures. Functions in C++-Main Function-Function Prototyping-Call by Reference-Return by Reference-Inline Function-Function Overloading-Classes and Objects-Specifying a Class-Defining member function-Nesting of member function-Arrays within a class-Memory Allocation for objects-Static Data members-Static Member Function-Arrays of Objects-Objects as Function arguments-Friendly Function.

UNIT-II CLASSES **10 Hrs**

Constructors and Destructors-Constructors-Parameterized Constructors-Multiple Constructors in a Class-Dynamic Initialization of Objects-Copy Constructor- Dynamic Constructors-Destructors-Operator Overloading and Type Conversions.

UNIT-III INHERITANCE **10 Hrs**

Inheritance-Introduction-Defining Derived Classes-Single Inheritance – Making a Private – Member Inheritable-Multilevel, Multiple, Hierarchical, Hybrid Inheritance – Virtual Base Classes –
Pointers, Virtual Functions and Polymorphism

UNIT-IV I/O OPERATIONS **11 Hrs**

Managing Console I/O Operations-C++ Streams-C++ Stream Classes-Unformatted I/O Operations -Formatted Console I/O Operations-Managing Output with Manipulators-Working with Files

UNIT-V FILES **11 Hrs**

Introduction-Classes for File Streams-Opening and Closing a File - File Modes - File Pointers and their Manipulators.

Text Book

- Balagurusamy. E ,"*Object Oriented Programming with C++*" TMH Publishing.2009.

Reference Book

- Robert Lafore , *Object Oriented Programming with C++*, Galgotia, TMH Publishing, 2007.

E- Resources

- https://www.cs.utah.edu/~swalton/Documents/Computer-Fundamentals.pdf
- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk
- https://www.youtube.com/watch?v=n1cQPwZwTs4

PCAM208 DATA STRUCTURES AND ALGORITHMS

Semester :II **Credit : 3**
Category :Core VIII **Hours/Week : 4**
Class & Major :I MCA **Total Hours : 52**

Objectives

To enable the students

- Understand the concepts of data structure
- Write programs with data structures concepts using C++
- Develop algorithm in data structure and its application.

UNIT-I ARRAYS **11 Hrs**

Introduction to Data structures – Overview – Types – Primitive and Non- Primitive Data structures and Operations. Arrays – Types – Strings – Array of Structures – Sparse and Dense Matrices – Row – Major and Column – Major Arrays – Pointers and Arrays – Array of pointers – Pointers and Strings. Recursion – Types – Rules – Recursion Vs.Iterations – Towers of Hanoi – Advantages and Disadvantages.

UNIT-II STACKS OPERATIONS **10 Hrs**

Stacks – Operations – Pointers and Stack – Representation of Arithmetic Expressions – Infix, Prefix and Postfix Notations – Evaluation of Postfix Expression – Conversion of Expression – Applications.Queues – Operations – Disadvantages –Implementation – Types and Applications.

UNIT-III LINKED LIST **10 Hrs**

List operations – Linked list – Memory Allocation and De-Allocation – Operations – Singly Linked List – Linked List with and without Header – Operations – Circular Linked List – Doubly Linked list – Circular Doubly Linked list – Applications. Storage Management – Allocation Techniques – Storage Allocations – Storage Release Compaction – Garbage Collections.

UNIT-IV TREES **10 Hrs**

Trees - Terms – Binary Trees – Types – Representation – Operation and Traversal – Conversion of Expression – Binary Search Tree – Threaded Binary Tree – B- Tree – B+ Tree, Graph – Terminologies – Representation – Traversal – Spanning Trees.

UNIT-V SORTING AND SEARCHING **11 Hrs**

Sorting – Methods: Insertion – Selection – Bubble – Quick – Tree – Merging List – Heap – Radix – Partition Exchange. Searching – Linear and Binary Search – Hashing Method – Hashing Function – Division – Mid-Square – Folding – Length - Dependent – Digit Analysis method.

Text books

- Horowitz.E. , Sahni. S. and Mehta, "*Fundamentals of Data Structures in C++*", Galgotia-2007.
- Samanta D , " *Classic Data Structures*" , PHI, 2005

Reference books

- Gregory L.heileman, *"Data Structures,Algorithms and Object Oriented Programming"* Mc Graw Hill International Editions –2006
- Jean-Paul Tremblay and Paul G Sorenson, "*An Introduction to Data Structures with Applications*" 2 edn,Tata Mc Graw ,Hill Publishing Company Ltd.New Delhi:2007.

E- Resources

- https://www.cs.utah.edu/~swalton/Documents/Computer-Fundamentals.pdf
- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk
- https://www.youtube.com/watch?v=n1cQPwZwTs4

PCAR203 DATABASE MANAGEMENT SYSTEM-PRACTICALS

Semester	**: II**	**Credit**	**: 2**
Category	**: Core Practical III**	**Hours/Week**	**: 3**
Class & Major: I MCA		**Total Hours**	**: 39**

Objectives

To enable the students

- Enable the students to know about simple queries and how to interact with database.

SQL

1. Simple queries using DDL, DML and DCL
2. SQL Aggregate functions
3. SET operations
4. Views
5. Multiple Tables and Nested Queries.
6. JOIN operations

PL/SQL

7. PL/SQL Block
8. Function
9. Procedures
10. Triggers
11. Cursors.

PCAR204 OBJECT ORIENTED PROGRAMMING USING C++ PRACTICALS

Semester	**: II**	**Credit**	**: 2**
Category	**: Core Practical IV**	**Hours/Week**	**: 3**
Class & Major : I MCA		**Total Hours**	**: 39**

Objectives

To enable the students

- Write programs using Object Oriented Concepts
- Implement Data Structures algorithm using C++.

Lab Exercise

1. Functions and overloading
2. Constructors and Destructors
3. Inheritance and Virtual Functions.
4. File operations
5. Implement PUSH, POP Operations of Stack Using Arrays.
6. Implement Add, Delete Operations of Queue Using Pointers.
7. Postfix Expression Evaluation.
8. Addition of Two Polynomials using Arrays and Pointers.
9. Binary Tree Traversal Using Linked List (In-order, Pre-order, Post-order).
10. DFS.

PCAM313 ADVANCED JAVA PROGRAMMING

Semester : III **Credit : 4**
Category : Core X **Hours/Week : 5**
Class & Major : II MCA **Total Hours : 65**

Objectives
To enable the students

- Acquire the knowledge on Object Oriented Concepts, Applet and Database Connectivity.
- Gain knowledge on Servlets, JSP and Java Bean.

UNIT - I INTRODUCTION **10 Hrs**

Classes and objects – Inheritance – Packages and Interfaces – Exception Handling – overloading methods – method overriding.

UNIT - II APPLET & AWT **15 Hrs**

Multithreaded Programming – Synchronization – Applets class – AWT classes – Windows fundamentals – Frame windows – Working with graphics – AWT controls – Layout Managers.

UNIT- III DATABASE ACCESS **10 Hrs**

Overview of the JDBC Process - JDBC Concepts - JDBC Driver types – Database Connection- JDBC/ODBC Bridge – Statement Objects – The Connection Interface – Result Set – Interacting with the database - Transaction Processing.

UNIT - IV JAVA SERVER PAGES **15 Hrs**

Java Server Pages (JSP) – JSP tags – Components of a JSP page – Expressions –Scriptlets – Directives – Declarations – Working with JSP – JSP and JDBC – JQuery – AJAX.

UNIT - V JAVA BEAN AND SERVLETS **15 Hrs**

Java Beans – Advantages of Java Beans – Application Builder Tools – BDK – JAR Files – Introspection – Developing a simple bean – Using bound properties. **Java Servelts – Initialization – Development – Reading Client Data – Reading HTTP Request Headers – Cookies – Session Tracking – Database Connections.**

Text Books

- Herbert Schildt, '*The Java Complete Reference'*, Ninth Edition, Tata McGraw Hill, New Delhi, 2014.
- Phil Hanna, *Instant Java Servlets,* Fourth Edition, Tata McGraw Hill, New Delhi, 2000.

Reference Books

- Deitel and Deitel , '*Java How to program*' , 4th Edition, Prentice Hall , 2001.
- Gary Cornell and Cay S. Horstmann, '*Core Java Vol 1 and Vol 2*', Ninth Edition, Sun Microsystems Press, 2014.

PCAM314/PCSM113 DATA MINING

Semester : I **Credits : 4**
Category : Core III **Hours/weeks : 5**
Class & Major: II MCA **Total Hours : 65**

Objectives
To enable the students

- Gain knowledge in Data wareshouse and Datamining Techniques
- Analyze patterns in Data
- Depth Knowledge in Classification and Clustering algorithms.

UNIT- I DATA WAREHOUSE **12 Hrs**

Data Warehousing - Operational Database Systems vs Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries and Tools.

UNIT- II DATA MINING AND DATA PREPROCESSING **13 Hrs**

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT- III ASSOCIATION RULE MINING **13 Hrs**

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint – Based Association Mining.

UNIT- IV CLASSIFICATION AND PREDICTION **14 Hrs**

Classification vs Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT- V CLUSTERING **13 Hrs**

Cluster Analysis - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – ConstraintBased Cluster Analysis – Outlier Analysis.

Text Books

- Jiawei Han and Micheline Kamber *"Data Mining Concepts and Techniques",*Second Edition,Elsevier, Reprinted ,2011.
- K.P. Soman- ShyamDiwakar and V. Ajay, *"Insight into Data mining Theory and Practice"*,Easter Economy Edition, Prentice Hall of India,2006.

Reference Books

- G. K. Gupta, *"Introduction to Data Mining with Case Studies",* Easter Economy Edition 2012.

PCAM311 OPERATING SYSTEM

Semester : III **Credit : 4**
Category : Core XII **Hours/week : 5**
Class &Major: II MCA **Total Hours : 65**

Objectives:
To enable the students

- Define the process and memory management in OS.
- Analyse the various algorithms in CPU Scheduling.
- Apply the scheduling algorithms to avoid deadlock in LINUX OS.

UNIT – I INTRODUCTION **10 Hrs**

Definition of OS- Types of computer system- Computer system structures: I/O structure- Storage Structure – Operating System Structure: System Components – Services – System Calls – System programs – System Design and Implementation.

UNIT – II PROCESS MANAGEMENT **12 Hrs**

Process Concepts–Process Scheduling–Operating on process–co-operating processes – Inter Process communications CPU scheduling – Multithreading Models – Threading issues – Overview - Multithreading Models.

UNIT – III CPU SCHEDULING AND PROCESS SYNCHRONIZATION **15 Hrs**

Scheduling Concepts - Criteria–Scheduling algorithm–Multiple-processor scheduling-Real time scheduling–Algorithm Evaluation – Process synchronization: Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – System model.

UNIT – IV DEADLOCKS AND MEMORY MANAGEMENT **13 Hrs**

Characterization–Deadlock characterization – Methods for handling deadlocks-Deadlock Prevention–Avoidance– Detection –Deadlock Recovery- Memory management: Swapping – Paging – Segmentation-Segmentation with paging- Demand paging–Page replacement–Thrashing.

UNIT – V FILE SYSTEM INTERFACE AND LINUX 15 Hrs

File Concept – Access Methods – Directory Structure - Allocation methods – Free-space management– Disk scheduling – Disk management – Swap-space management – RAID Structure- Linux: History- Design Principles – Kernel Modules – Process management – Scheduling – Memory Management- File systems – Security.

Text Book

- Silberschatz, Galvin and Gagne, *Operating System Concepts*, John Wiley & Sons Inc, Sixth Edition, 2003.

  Unit I : Chapter 1,2,3

  Unit II : Chapter 4,5

  Unit III : Chapter 6,7

  Unit IV : Chapter 8,9,10

  Unit V : Chapter 11, 12, 20

Reference Books

- Andrew S. Tanenbaum, Operating *system Design and Implementation*, PHI,2005.
  Milan Milankovic, *Operating System*, McGraw Hill,2003.
- H M Deital, P J Deital and D R Choffnes, *Operating Systems*, Pearson Education, 2004.
- Sumitabha Dos, *UNIX concepts and applications*, 4th edition, Mc-Graw Hill, 2006.

E-Resources

- http://www.w3schools.com/operatingsystem.html/
- https://www.youtube.com/watch?v=7r3Vln4bGLk
- https://www.youtube.com/watch?v=6TxXA3hbX8Y
- https://www.youtube.com/watch?v= y9C4EAqHxvI

PCAM315 COMPUTER NETWORKS

Semester : III **Credit : 3**
Category : Core XIII **Hours/Week : 4**
Class & Major : II MCA **Total Hours : 52**

Objectives
To enable the students

- Understand the concepts of networking systems.
- Acquire the knowledge on various layers and its functions.
- Learn about Networking Protocols

UNIT - I INTRODUCTION TO NETWORKS **11 Hrs**

Network hardware – Network software – Reference Models – Example Networks: Internet – X.25 – ATM Transmission media – Wireless Transmission – Telephone system – ISDN, ATM communication – Satellite communication.

UNIT - II PHYSICAL LAYER **10 Hrs**

The Physical Layer: Guided Transmission Media – Wireless Transmission – Communication Satellites – The Public Switched Telephone Network.

UNIT - III DATA LINK LAYER **11 Hrs**

The Data Link Layer: Data Link Layer Design Issues – Error Detection and Correction –Elementary Data Link Protocols – Sliding Window Protocols.

UNIT - IV NETWORK LAYER **10 Hrs**

The Network Layer: Network Layer Design Issues – Routing Algorithms – Congestion Control Algorithms – Quality of Service – Internetworking.

UNIT- V TRANSPORT LAYER **10 Hrs**

The Transport Layer: The Transport Service (6.1.1,6.1.2,6.1.3) – The Application Layer: DNS – Domain Name System – Electronic Mail – The World Wide Web (7.3.1).

Text Books

- Andrew S. Tanenbaum, '*Computer Networks*', PHI, 5th Edition, 2013.

Reference Books

- Behrouz A. Forouzan, '*Data communication and Networking'*, Tata McGrawHill, 4th Edition, 2006
- William Stallings, '*Data and Computer Communication*', 7th Edition, Pearson Education, 2007.

PCAM316 CLOUD COMPUTING

Semester : III **Credit : 4**
Category : Core XIV **Hours/Week : 5**
Class & Major: II MCA **Total Hours : 65**

Objectives

To enable the students

- Understand cloud computing techniques, best practices in cloud computing.
- Gain knowledge on the current challenges in cloud computing.
- Design and implement cloud-based applications.

UNIT - I UNDERSTANDING CLOUD COMPUTING **10 Hrs**

Cloud Computing – History of Cloud Computing – Cloud Architecture – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services – Types of Cloud Service Development – Software as a Service – Platform as a Service – Infrastructure as a service-Database as a service.

UNIT - II CLOUD COMPUTING TECHNOLOGIES 10 Hrs

Hardware and Infrastructure: Clients – Security – Network – services – Accessing the Clouds: Platforms – WEB applications – WEB APIS – WB Browsers – Cloud Storage: Overview – Storage provides – Cloud Standards: Applications – Client – Infrastructure – Services.

UNIT - III CLOUD COMPUTING APPLICATIONS 10 Hrs

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 - IV VIRTUALIZATION & CLOUD SECURITY 10 Hrs

Virtualization characteristics – Managing virtualization – Virtualization in cloud – Virtualization desktop – Managing desktops in the cloud – Security issues – Storage basics – Storage as a service providers – security – aspects of data security – Data security mitigation – provider data and it's security.

UNIT - V USING CLOUD SERVICES 12 Hrs

Collaborating on Calendars – Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management –Collaborating on Project Management – Collaborating on Word Processing -Collaborating on Databases – Storing and Sharing Files.

Text Books

- Michael Miller, *'Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online'*, Que Publishing, 2008.
- Judith Hurwitz, Bloor Robin, Marcia Kaufman & Fern Halper, *'Cloud Computing for Dummies'* , Wiley India Edition, 2009.

Reference Books

- 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, 2008.
- Anthony T Velte, Toby J Velte, Robert Elsenpeter, '*Cloud Computing a practical approach*', Tata McGraw-HILL,2010.

PCAR306/PCSR107 DATA MINING USING WEKATOOL -PRACTICAL

Semester : I **Credits : 3**
Category : Core Practical II **Hours/Week : 4**
Class & Major : I MCA **Total/Hours : 52**

Objectives
To enable the students

- Understand the concepts in Data mining.
- Apply programming skills in Weka tool.
- Analyze the dataset.

Lab Exercise

Create a Dataset with 'n' number of tuples for the following

1. Student Details
2. Super Market Details
3. Library Details
4. Employee Details
5. Recruitment Details
6. Patient Laboratory Details
7. Social Networking Reviews Details

To implement the Dataset in WekaTool

6. **Preprocessing on Dataset**
7. **Classification Rule Process of Dataset**
    a. J48 Algorithm
    b. ID3 Agorithm
    c. Naïve Bayes Algorithm
8. **Clustering Rule Process of Dataset**
    a. Simple k-means
9. **Association Rule Process on Dataset**
    a. APriori Algorithm
    b. FPgrowth Algorithm
10. **Data Visualiazation**

PCAR307 ADVANCED JAVA PROGRAMMING – PRACTICAL

Semester :III **Credit : 2**
Category :Core Practical VI **Hours/Week : 3**
Class & Major : II MCA **Total Hours : 39**

Objectives
To enable the students

- Develop Java Application and Applet program**.**
- Acquire practical knowledge on Advanced Java programming Concepts.
- Develop knowledge in the network programming on Java Bean, Servlets.

Lab Exercise

1. Overloading and Overriding.
2. Interfaces and Packages.
3. Exceptions handling mechanism.
4. Synchronization such as Thread based class
5. File operations.
6. Applets and AWT.
7. Servlet to display IP address and port number of a server
8. Servlet program using JDBC connection.
9. Servlet program to keep track previous request in session concept.
10. JSP page using Session Java Beans.

PCAM412 BIG DATA ANALYTICS

Semester :IV **Credit : 4**
Category :Core XV **Hours/Week : 4**
Class & Major :II MCA **Total Hours : 52**

Objectives
To enable the students

- Understand the importance of Big Data.
- Analyze the modern data analytical tools.
- Apply algorithm in various real-time applications.

UNIT - I INTRODUCTION TO BIG DATA **10 Hrs**

Introduction to Big Data – Characteristics of big data – Importance of Big data – Applications of Big Data Fraud Detection patterns – Risk patterns for modeling and Management – Big data and the Energy sector.

UNIT - II DATA ANALYSIS **10 Hrs**

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability – Analytic processes and tools – Modern data analytic tools.

UNIT - III HADOOP **10 Hrs**

Introduction to Hadoop – Components of Hadoop – Hadoop Architecture – Applications of Hadoop – Compression – Security – Enterprise integration in hadoop.

UNIT - IV STREAM COMPUTING **11Hrs**

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 - V FRAMEWORKS AND APPLICATIONS **11Hrs**

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 E-Commerce – Big data for blogs.

Text Books

- Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, '*Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data'*, McGraw Hill, 2017.
- AnandRajaraman and Jeffrey David Ullman, '*Mining of Massive Datasets'*, Cambridge University Press, 2012.

Reference Books

- Jay Liebowitz, '*Big Data and Business Analytics',* Auerbach Publications, CRC press 2013.
- EMC Education Services, '*Data Science and Big Data Analytics: Discovering, Analyzing,Visualizing and Presenting Data'*, I edition, 2015.

PCAM413 SOFTWARE ENGINEERING

Semester : V **Credit : 4**
Category : Core XVI **Hours/Week : 5**
Class & Major: II MCA **Total Hours : 65**

Objectives

To enable the students

- Understand the basic concepts of Software Engineering and the various phases in Software development.
- Understand User Conceptual Models and Interface Design
- Specification of participatory design and interactive debugging.

UNIT - I INTRODUCTION AND PROCESS MODEL **11 Hrs**

Introduction to Software Engineering – Software – The changing nature of the software. A Generic view of Process – Software Engineering Layered Technology – A Process Framework – The Capability Maturity Model Integration – Personal AND Team Process Models. Process Models – Waterfall – Incremental – Evolutionary – Specialized process models – Agile Process Models.

UNIT - II ANALYSIS MODEL **12 Hrs**

Requirement Engineering – Initiating the Engineering Process – Eliciting requirements – Building Analysis Model – Data Modeling Concepts – Class Based Modeling Design Engineering – Design Concepts – Design Models – Architectural Design.

UNIT - III DESIGN MODEL **15 Hrs**

Modeling Component – Level Design – Component – Designing Class – Based Components – Conducting Component – Level Design. Performing User Interface Design – Golden Rules – User Interface Analysis AND Design – Interface Analysis – Interface Design Steps – Design Evaluation.

UNIT - IV TESTING METHODS **15 Hrs**

Testing Strategies – A Strategic Approach to Software Testing – Strategic Issues – Test Strategies for Conventional AND Object Oriented Software – Validation Testing – System Testing – The Art of Debugging Testing Tactics – Software Testing Fundamentals – Black Box and White Box Testing – Basis Path Testing – Control Structure Testing.

UNIT– V SOFTWARE QUALITY ASSURANCE **12 Hrs**

Web Engineering – Attributes of Web– Based Systems and Applications – Web Application Engineering Layers – The Web Engineering Process – Web Engineering Best Practices. Quality Management – Quality Concepts – Software Quality Assurance – Software Reviews – Software Reliability.

Text Book

- Roger S. Pressman, *'A Practitioner's Approach Software Engineering',* Sixth Edition, McGraw Hill International Edition, 2009.

Reference Books

- Sommerville I, *Software Engineering*, 5th edition, Addison Wesley, 1996.
- David Gustafson, *Software Engineering*, Schaum's outlines, Tata McGraw – Hill, 2003.
- Waman S. Jawadekar. *Software Engineering: Principles and Practice,* McGraw Hill, 2004.

PCAM414 OPEN SOURCE TECHNOLOGY

Semester	**: IV**	**Credit**	**: 4**
Category	**: Core XVII**	**Hours/Week**	**: 5**
Class & Major	**: II MCA**	**Total Hours**	**: 65**

Objectives

To enable the students

- Understand the concept of Open Source Software.
- Acquire knowledge on PHP
- Develop programs using PHP and MySql

UNIT - I INTRODUCTION TO PHP **10 Hrs**

Creating a Sample Application – Embedded PHP in HTML – Adding Dynamic Content – Accessing form variables – Identifiers - Variable types – Variable Scope. Operators – Precedence and Associativity – Variable functions. Making Decisions with Conditionals – Repeating actions through iteration – Breaking out of a Control Structure or Script.

UNIT - II ARRAYS **13 Hrs**

Array – Array operators – Multidimensional Arrays – String Manipulation and Regular Expressions – Formatting Strings – Functions using substr() – Comparing Strings. Managing the Date and Time: Getting the date and Time from PHP – Converting between PHP and MySQL Date formats – Calculating Dates in PHP – Calculating Dates in MySQL.

UNIT - III FUNCTIONS **12 Hrs**

Reusing code – require () and include() – require() for website templates. Functions in PHP: Calling Functions – Calling an undefined Function – Case and function names – Defining own functions – Examining Basic Function Structure – Parameters – Scope – Passing by reference versus Passing by value – return Keyword – Recursion.

UNIT- IV PHP and MySQL **15 Hrs**

PHP Overview – Variables – Data Types – Functions - Array – Directory – File System – Simple XML – String - My SQL Database – MySQL in Web – Connect – Create – Insert – Select – Update – Delete – Web Concepts – Sessions – File Uploading.

UNIT- V XML AND JSON **15 Hrs**

Introduction to XML and JSON – Strength and Limitations of XML and JSON – Applications of JSON – Characteristics of JSON – JSON Syntax – JSON Data Types – JSON Objects – JSON Schema – JSON Comparison with XML – JSON with PHP – JSON with PERL – JSON with Python.

Text Book

- Luke Welling, Laura Thomson, *PHP and MySQL Web Development*, Fourth Edition, Pearson Education, 2010

Reference Books

- Vikram Vaswani, *A Beginner's Guide PHP*, Tata Mcgraw Hill Education, 2007.
- Larry Ullman, *PHP 6 and MySQL 5*, Pearson Education, 2008.

e-Resources

- https://www.tutorialspoint.com/json/json_tutorial.pdf
- https://www.w3schools.com/js/js_json_intro.asp
- https://www.tutorialspoint.com/php/php_and_mysql.htm

PCAM410 WEB TECHNOLOGY

Semester : IV	**Credit :4**
Category : Core XVI	**Hours/Week :5**
Class &Major: II MCA	**Total Hours :65**

Objectives

To enable the students

- Understand the Dot.Net framework.
- Build applications using ASP.Net.
- Develop web applications and connect it to the database using ADO.NET.

UNIT –I C# PROGRAMMING **14 Hrs**

The Philosophy of .NET: An Overview of .NET Assemblies - Understanding the Common Type System, Common Language Specification, Common Language Runtime - The Platform-Independent Nature of .NET - The System.Console Class - System Data Types and C# Keywords - Working with String Data - C# Iteration Constructs - Decision Constructs and the Relational/Equality Operators - Methods and Parameter Modifiers - C# Arrays, the enum Type, the Structure Type, Value Types and Reference Types, C# Nullable Types.

UNIT – II PILLAR OF OOP'S **15 Hrs**

The first Pillar of OOP: Encapsulation - The Second Pillar of OOP: The Details of Inheritance - Programming for Containment/Delegation - The Third Pillar of OOP: C#'s Polymorphic Support - Understanding Base Class/Derived Class Casting Rules - The Master Parent Class: System.Object - Understanding Structured Exception Handling.

UNIT – III ADO.NET **16 Hrs**

Definition of ADO.NET - ADO.NET Data Providers - ADO.NET Namespaces - Abstracting Data Providers Using Interfaces - Creating the AutoLot Database - The ADO.NET Data Provider Factory Model - the Connected Layer of ADO.NET - Working with Data Readers - Database Transactions - Disconnected Layer of ADO.NET - Role of the DataSet - Working with DataColumns, DataRows, DataTables & Data Adapters - The Entity Framework. Understanding the Role of Entity Framework-Building and Analyzing Your First EDM-Programming Against the Conceptual Model-AutoLotDAL Version Four, Now with Entities-Data Binding Entities to Windows Forms GUls-Going Forward with .NET Data-Access APls.

UNIT – IV ASP.NET **10 Hrs**

Visual Studio – Designing a Web Page – Exploring the Anatomy of a web Form – Essentials of HTML – Writing Code – Debugging – Web Form Fundamentals – Web Controls – Error Handling, Logging and Tracking – State Management – Validation Controls – Rich Controls.

UNIT – V MASTER PAGES & THEMES **10 Hrs**

User Controls and Graphics - Styles, Themes, and Master Pages - Website Navigation - ADO.NET Fundamentals - Data Binding - The Data Controls.

Text Books

- Andrew Troelsen, *Pro C# 5.0 and the .NET 4.5 Framework,*Sixth Edition, Apress, New York, 2012.

  Unit I : Chapter 1, 2, 3, 4
  Unit II : Chapter 5, 6, 7
  Unit III : Chapter 21, 22, 23

- Matthew MacDonald, *Beginning ASP.NET 4.5 in C#,*Apress, New York, 2012.

  Unit IV : Chapter 4, 5, 6, 7, 8, 9, 10
  Unit V : Chapter 11, 12, 13, 14, 15, 16

Reference Books

- *.NET 4.5 Programming 6-in-1, Black Book*, DreamTech Press Kogent solutions, 2012
- A.P.Rajshekhar,.*NET Framework 4.5 Expert Programming Cookbook*, Packt Publication, 2013

E-Resources

- http://www.w3schools.com/web.html/
- https://www.youtube.com/watch?v= bFdP3_TF7Ks
- https://www.youtube.com/watch?v= aoFDyt8oG0k

PCAM411 PRINCIPLES OF COMPILER DESIGN

Semester :IV **Credit : 3**
Category :Core XVII **Hours/Week :4**
Class &Major:II MCA **Total Hours :52**

Objectives
To enable the students

- Study the principles of finite automata.
- Analyse the various algorithms in storage allocation techniques.
- Apply DFA and NFA in automata to produce the optimum results.

UNIT – I INTRODUCTION TO COMPILERS **10 Hrs**

Compilers – Analysis of source program – The Phases of compilers – Cousins of Compilers – The grouping of phases A simple one-pass compiler Overview – Syntax Definition – Syntax-directed translation – Parsing – Lexical analysis.

UNIT – II SYMBOL TABLE **12 Hrs**

The role of lexical analyzer – Finite Automata – DFA – Conversion of an NFA into a DFA – Conversion of an NFA to a Regular Expression - From a regular expression to an NFA – Design of a Lexical Analyzer Generator – Optimization of DFA – based pattern matchers.

UNIT - III SYNTAX ANALYSIS **10 Hrs**

The role of a parser – Context Free Grammar – Top-down parsing – Bottom-up parsing – Operator – LR Parsers – Precedence parsing. Syntax-directed translation: Syntax – directed definitions – Construction of Syntax trees – Bottom-up evaluation of S-attributed definitions – Top-down translation – Recursive evaluators.

UNIT - IV TYPE CHECKING **10 Hrs**

Type system – Specification of a simple Type Checker – Type conversions – An algorithm for unification. Run-time environments-Storage Organization-Storage -Allocation Strategies – Symbol Tables – Dynamic Storage allocation techniques.

UNIT –V INTERMEDIATE CODE GENERATION **10 Hrs**

Intermediate languages – Declarations – Back patching – Procedure Calls. Code Generation: A simple code generator – the Dag representation of basic blocks – Peephole optimization – Code Generator generators. Code Optimization: Introduction – Principal sources of optimization – Optimization of basic blocks.

Text Book

- Alfred V.Aho, Ravi Sethi, Jeffery D.Ullman, *Compilers, Principles and Techniques and Tools*, Addison-Wesley, New Delhi, 1999.
  Unit I : Chapter 1, 2
  Unit II : Chapter 3
  Unit III : Chapter 4, 5
  Unit IV : Chapter 6, 7
  Unit V : Chapter 8, 9, 10

Reference Books

- Chattopadhyay Santanu, *Compiler Design*, PHI, New Delhi, 2006.
- Holub Allen, *Compilers in C*, PHI, New Delhi, 1997.

E-Resources

- http://www.w3schools.com/compilers.html/
- https://www.youtube.com/watch?v= j3SCUBsZm4A
- https://www.youtube.com/watch?v=7r3Vln4bGLk

PCAR407 OPEN SOURCE TECHNOLOGY – PRACTICAL

Semester :IV **Credit : 2**
Category :Core Practical VII **Hours/Week : 3**
Class & Major:II MCA **Total Hours : 39**

Objectives:
To enable the students

- Write programs using Open Source Software
- Develop programs using PHP and MySql

Lab Exercise

1. Student Mark sheet using Operators and Decision making Statements.
2. Generate Multiplication Table using Iterations.

3. Implement Arrays.
4. Implement Functions.
5. String Operations.
6. Perform the Following Operations in MySQL.
   (i) Create Database (ii) Drop Database (iii) Select Database
7. Perform the Following Operations in MySQL.
   (i) Create Tables (ii) Drop Tables (iii) Insert Query.
8. Perform the Following Operations in MySQL.
   (i) Select Query (ii) Where Clause (iii) Update Query
9. Connect MySQL Database to Display the Details of Particular Student.
10. Create your own dynamic website using PHP and MySQL.

PCAR406 WEB TECHNOLOGY – PRACTICAL

Semester : IV | **Credit :2**
Category : Core Practical VIII | **Hours/Week :3**
Class &Major: II MCA | **Total Hours :39**

Objectives
To enable the students

- Acquire practical skills in C# programming and Server Side Scripting.
- Develop Web Applications using ADO.NET.

Lab Exercise

1. Programs to implement Encapsulation, Inheritance and Polymorphism.
2. Programs to implement Abstract Class using Inheritance.
3. Programs to implement File Handling and User Defined Exception.
4. Programs to implement String Handling
5. Developing Window Forms using C#
6. Using ADO.Net to handle data, Connecting to a database, firing queries to display Data
7. Online Banking System using .NET Controls
8. Online College Management System using Navigation Controls
9. Online Appointment Booking System
10. Data Controls

PCAE103 OPEN SOURCE PROGRAMMING

Semester : II | **Credit : 4**
Category : Non-Major Elective | **Hours/Week : 5P**
Class & Major: I PG | **Total Hours : 65**

Objectives
To enable the students

- Develop dynamic websites using PHP.
- Develop applications using MySQL and Python
- Understand Linux Shell Script.

Lab Exercises

1. Random number generation using Shell Script

2. Executing basic commands using Linux
3. Write a PHP programs to perform control and looping statements.
4. Write a PHP program to handle various String Functions.
5. Create a Home Page about the College using PHP
6. Write a PHP program to validate the form information (Name, Age, Phone No, Aadhar Number, Pincode Number)
7. Create a table in PHP with the required number of fields.
8. Develop simple application to connect with Database.
9. Write a PHP program using forms.
10. Execute DML and DDL commands.
11. Create students feedback form using PHP ad MySql
12. Develop an students mark sheet application using Python

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Core III	PCAM110	C Programming	Program Writing	Problem Solving
	Core IV	PCAM111	Web user interface design	Assignment	User Interface Modeling
	Core V	PCAM112	Computer organization and Architecture	Model Display	Problem Solving
	Core Practical I	PCAR105	C Programming –Practical	DPA	Viva-voce
	Core Practical II	PCAR106	Web user interface design-Practical	DPA	Viva-voce
II	Core V	PCAM205	Database Management System	ER Diagram	Writing Query
	Core VII	PCAM207	Object Oriented programming using C++	Program Writing	Problem Solving
	Core VIII	PCAM208	Data structures and algorithms	Assignment	Problem Solving
	Core Practical III	PCAR203	Database Management System-Practical	DPA	Viva-voce
	Core Practical IV	PCAR204	Object Oriented Programming using C++ -Practical	DPA	Viva-voce
III	Core X	PCAM313	Advanced Java Programming	Program Writing	App Development
	Core XI	PCAM314/ PCSM113	Data Mining	Assignment	Problem Solving
	Core XII	PCAM311	Operating System	Problem Solving	Seminar
	Core XIII	PCAM315	Computer Networks	Model	Seminar
	Core XIV	PCAM316	Cloud Computing	Working Model	Poster Presentation
	Core Practical V	PCAR306/ PCSR107	Data Mining using Weka Tool -Practical	DPA	Viva-voce

	Core Practical VI	PCAR307	Advanced Java Programming-Practical	DPA	Viva-voce
IV	Core XV	PCAM412	Big Data Analytics	Assignment	Report on real time usage of Big data
	Core XVI	PCAM413	Software Engineering	System Modeling	System Testing
	Core XVII	PCAM414	Open Source Technology	Program Writing t	App Development
	Core XVIII	PCAM410	Web Technology	Problem Solving	Web Designing
	Core XIX	PCAM411	Principles of Compiler Design	Problem Solving	Seminar
	Core Practical VII	PCAR407	Open Source Technology - Practical	DPA	Viva-voce
	Core Practical VIII	PCAR406	Web Technology -Practical	DPA	Viva-voce

NON – MAJOR ELECTIVES - PG

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Non – Major Elective	PCAE103	Open Source Programming	DPA	Viva-Voce

DEPARTMENT OF PSYCHOLOGY

PREAMBLE

UG : Course Profile and the syllabi of courses offered in the I and II semesters along with evaluation components III & IV (**with effect from 2018 - 2021 batch onwards)** are presented in this booklet.

COURSE PROFILE B.Sc. (Psychology)

Semester	Part	Category	Course code	Course Title	Hours per week	Credit	
						Min	Max
I	I	Language	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil I/ Advanced Tamil I/ Hindi I / French I	4	2	3
	II	English I	UENL107/ UENL108	General English I/ Advanced English I	5	3	4
	III	Core I	UPSM101	General Psychology I	6	5	5
		Core II	UPSM102	Developmental Psychology I	7	5	5
		Core III	UPSM103	Social Psychology I	6	5	5
	IV	Value Education			2	1	1
				TOTAL	**30**	**21**	**23**
II	I	Language	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil II/ Advanced Tamil II/ Hindi II/ French II	4	2	3
	II	English II	UENL207/ UENL208	General English II/ Advanced English II	5	3	4
	III	Core IV	UPSM201	General Psychology II	5	5	5
		Core V	UPSM202	Developmental Psychology II	5	5	5
		Core VI	UPSM203	Social Psychology II	5	5	5
	IV	Non Major Elective	UPSE201	Psychology for Effective Living	4	2	2
		Soft skill			2	1	1
	V	Extension activity/ Physical Education/NCC			-	1	2
				TOTAL	**30**	**24**	**27**
III	I	Language	UTAL307/ UTAL308/ UHIL301/ UFRL301	Basic Tamil III/ Advanced Tamil III/ Hindi III/ French III	4	2	3
	II	English III	UENL305/ UENL306	General English III/ Advanced English III	5	3	4
	III	Core VII	UPSP301	Experimental Psychology I	6	5	5
		Core VIII	UPSM302	Psychological Statistics	5	5	5
		Core IX	UPSM303	Theories of Personality	5	5	5

	IV	Online Course		NPTEL/ Spoken Tutorial	3	1	2
		Value Education			2	1	1
				TOTAL	**30**	**22**	**25**
IV	I	Language	UTAL405/ UTAL406/ UHIL401/ UFRL401	Basic Tamil IV/ Advanced Tamil IV/ Hindi IV/ French IV	4	2	3
	II	English IV	UENL407/ UENL408	Basic English IV/ Advanced English IV	5	3	4
	III	Core X	UPSR401	Experimental Psychology II	6	5	5
		Core XI	UPSM401	Physiological Psychology	7	5	5
		Core XII	UPSM402	Research Methodology	6	5	5
	IV	Soft skill			2	1	1
	V	Extension activity/ Physical Education/NCC			-	-	2
				TOTAL	**30**	**21**	**25**
V	III	Core XIII	UPSM501	Abnormal Psychology	6	5	5
		Core XI	UPSM502	Educational Psychology	6	5	5
		Core XII	UPSM 503	Positive Psychology	5	5	5
		Core XIII	UPSM 504	Organizational Psychology	6	5	4
		Core XV	UPSM 505	Psychological Testing	5	5	5
		Value education			2	1	1
				TOTAL	**30**	**26**	**26**
VI	III	Core XVI	UPSM 601	Clinical Psychology	6	5	5
		Core XVII	UPSM 602	Counselling Psychology	6	5	5
		Core XVIII	UPSM 603	Human Resource Development	5	5	5
		Core XIX	UPSM 604	Health Psychology	6	5	5
		Core XX	UPSP 601	Project	5	5	5
	IV	Soft skill			2	1	1
	V	Extension activity/ Physical Education/NCC			-	-	2
				TOTAL	**30**	**26**	**28**
				GRAND TOTAL	**180**	**140**	**154**

UPSM101 GENERAL PSYCHOLOGY I

Semester : I **Credit : 5**
Category : Core I **Hours / Week : 6**
Class & Major: I B.Sc. Psychology **Total Hours : 78**

Objectives:
To enable the students

- Gain the knowledge of basic concepts in Psychology.
- To differentiate various methods used in Psychology.
- To determine the causes of behavior.

UNIT-I INTRODUCTION **16 Hrs**

Definition - Psychology as a Science - Perspectives in Psychology: Psychodynamic, Behavioural, Humanistic, Bio-psychological, Evolutionary, Socio-cultural, Cognitive. Behaviour - Genetics and Behaviour - Socio-cultural Bases of Behaviour (Environment): Environment and Behaviour.

UNIT-II METHODS OF ASSESSMENT IN PSYCHOLOGY **16 Hrs**

Goals of Psychological Enquiry - Introspective Method - Observation Method - Experimental Method - Correlation Method - Case Study Method - Clinical Method - Genetic Method - Interview Method - Survey Method - Rating Scales – Checklists – Questionnaires - Psychological Tests - Cross-cultural Method.

UNIT-III SENSATION **16 Hrs**

Sensation – Sensory Thresholds – psychophysical Procedures – Sensory Adaptation – Vision: Basic Functions of the Visual System – Vision and the Brain- Hearing – Touch and other Skin Senses – Smell and Taste – Kinesthesia and Vestibular Sense.

UNIT- IV ATTENTION **15Hrs**

Attention: Definition – Characteristics – Types - Determinants of Attention

UNIT - V PERCEPTION **15 Hrs**

Perception: Principles of Perceptual Organization - Constancies in Perception - Size, Shape, Form, Space, Movement - Depth Perception – Illusions - Plasticity of Perception.

Text Books

- Baron, R.A., *Psychology,* 5th Edition, Pearson India Education Services, Noida, 2018.
- Lahey, B. B., *Psychology: An Introduction,* Tata Mc Graw Hill, New Delhi, 1998.

Reference Books

- Feldman, R. S., *Understanding Psychology,* Tata Mc Graw Hill, New Delhi, 2002.
- Bootzin, R. R., Bower, G. H., Crocker, J., and Hall, E., *Psychology Today,* Mc Graw Hill,

London, 2005.

UPSM102 DEVELOPMENTAL PSYCHOLOGY I

Semester : I **Credit : 4**
Category : Core II **Hours / Week : 7**
Class & Major: I B.Sc. Psychology **Total Hours : 91**

Objectives:

To enable the students

- To understand the human development and development processes along with theories.
- To express the methods of study child development.
- To interpret the stages of physical, cognitive and social development in infancy and childhood.

UNIT- I INTRODUCTION **18 Hrs**

Human Development- Early Approaches to the Study of Human Development, - Ontogeny – Phylogeny - Developmental Processes and Periods - Biological - Cognitive and Socio-Emotional Processes - Influences on Development: Heredity - Environment and Maturation - Major Contextual Influences - Basic Theoretical Issues - Some Characteristics Influenced by Heredity and Environment.

UNIT- II PERSPECTIVES AND METHODS OF STUDIES ON CHILD DEVELOPMENT **18 Hrs**

Perspectives - Psychoanalytic – Learning – Cognitive - Evolutionary/Socio-Biological - Ethological. Methods - Observational Studies – Interview - Experimental Studies - Correlation Studies - Developmental Studies - Cross-sectional Studies - Longitudinal Studies - Sequential Studies - Micro-genetic Studies - Ethnographic Studies - Psycho-physiological Studies -Standardized Tests.

UNIT- III PRENATAL PERIOD **18 Hrs**

Conceiving New Life: Fertilization - Multiple Births - Mechanisms of Heredity:- Genetic code - Determiners of Sex - Patterns of Genetic Transmission - Genetic and Chromosomal Abnormalities -Stages of Prenatal Development - Environmental Influences- Maternal Factors and Fraternal Factors - Parental Care.

UNIT- IV INFANCY AND TODDLERHOOD **18 Hrs**

The Birth Process - The Newborn Baby- Survival and Health- Early Physical Development - Studying Cognitive Development - Language Development - Foundations of Psychosocial Development - Developmental Issues in Infancy - Developmental Issues in Toddlerhood

UNIT- V EARLY CHILDHOOD **19 Hrs**

Physical Development: Aspects of Physical Development- Health and Safety - Cognitive Development- Piagetian Approach- Language and Other Cognitive Abilities- Early Childhood Education -Psychosocial Development: Developing Self- Gender- Business of Early Childhood, Parenting in Families in Trouble -Relationship with Other Children - Emotional development.

Text Books

- Papalia, D. E., Olds,S.W., & Feldman,R.D. *Human Development*. 9th ed. McGraw Hill. New Delhi, 2004

Reference Books

- Santrock, J. W. *Child Development*. 11th ed. Tata McGraw Hill. New Delhi 2007
- Travers, D. *Human Development. Across the Life Span*. 4th ed. McGraw Hill. London:1999.

UPSM103 SOCIAL PSYCHOLOGY I

Semester : I **Credit : 5**
Category : Core III **Hours / Week : 6**
Class & Major: I B.Sc. Psychology **Total Hours :78**

Objectives:

To enable the students

- To identify the influence of social and cultural factors on individual behavior.
- To explain the social problem in terms of various social psychological theories.
- To report the unique features of socio-cultural contexts with respect of india and other countries.

UNIT - I INTRODUCTION **16 Hrs**

Definition - Scientific in Nature – Cognition and Behaviour – Social Relationship – Methods in Social Psychology - Theory in Social Psychology

UNIT - II SOCIAL COGNITION **16 Hrs**

Heuristics – Representativeness – Availability – Status Quo Heuristic – Schemas: Impact of Schemas – Priming – Schema Persistence – Reasoning Metaphor - Automatic and controlled Processing – Potential sources of Errors in Social Cognition – Affect and Cognition.

UNIT - III SOCIAL PERCEPTION **16 Hrs**

Non-Verbal Communication – Basic Channels – Nonverbal Cues – Recognizing Deception – Attribution – theories of Attribution – Error in Attribution – Impression Formation and Management

UNIT- IV SELF **15Hrs**

Self-Presentation - Self-Knowledge – Personal Identity Versus Social Identity – Social Comparison –Self-Esteem –Prejudice- Concealing our Identity

UNIT - V ATTITUDES **15 Hrs**

Attitude Formation - Attitude Behavior Link - Attitude Change – Science of Persuasion - Resistance to Persuasion - Cognitive Dissonance.

Text Books

- Nyla R. Branscombe and Baron, R. A., *Social Psychology, 14th Edition*, Pearson India Educations Services, Noida, 2017
- Myers, D. G., *Social Psychology,* Seventh Edition, Int. Education,Mc Graw Hill, 2002

Reference Books

- Chaube, S. P., and Chaube, A., *Ground Work for Social Psychology*, Neelkamal, New Delhi, 2007
- Taj, H., *An Introduction to Social Psychology*, Neelkamal, New Delhi, 2007.

UPSM201 GENERAL PSYCHOLOGY II

Semester : II **Credit : 5**
Category : Core IV **Hours / Week : 5**
Class & Major: I B.Sc. Psychology **Total Hours : 65**

Objectives:

To enable the students

- Cite the various theories in psychology
- Explain the various concept in psychology
- Classify the different concept and causes of behavior

UNIT- I STATES OF CONSCIOUSNESS **14 Hrs**

Nature of Consciousness - Natural States of Consciousness - Normal Waking Consciousness - Directed Consciousness - Flowing Consciousness - Divided Consciousness - Fantasy and Daydreaming (1) Sleep: Stages of Sleep - REM and non-REM Sleep (2) Dreams:- Functions and Meaning of Dreaming, Circadian Rhythms - Altered states of consciousness - Characteristics of Altered States Consciousness, (1) Altering Consciousness with Drugs.

UNIT-II LEARNING AND MEMORY **14 Hrs**

Definition - Nature - Theories: Classical Conditioning - Operant Conditioning - Other Forms of Learning: Instrumental Learning - Cognitive Learning - Observational Learning - Skill Learning- Transfer of Learning.

Memory: Human Memory - Model of Memory - Sensory Memory - Short - Term Memory - Long- Term Memory – Kinds of Information Stored in Memory – Memory for Factual Information. Nature and Theories of Forgetting.

UNIT - III THINKING **13 Hrs**

Basic Elements of Thought: Concepts - Prepositions - Images. Concepts: Types of Concepts - Concept Formation – Reasoning - Decision Making - Problem Solving - Creativity. Artificial Intelligence. Language and Development.

UNIT IV INTELLIGENCE **11 Hrs**

Thought Intelligence – Theories of Intelligence- Measurement of Intelligence – Human Intelligence - Group Differences in Intelligence- Emotional Intelligence.

UNIT – V MOTIVATION AND EMOTION **13 Hrs**

Motivation: Theories of Motivation – Hunger – Sexual Motivation – Aggressive Motivation- Achievement Motivation – Intrinsic Motivation.

Emotions: Nature of Emotion – Biological basis of Emotion – External Expression of Emotion – Emotion and Cognition – Subjective Well-being

Text Books

- Baron, R.A., *Psychology,* 5th Edition, Pearson India Education Services, Noida, 2018.
- Lahey, B. B., *Psychology: An Introduction,* Tata Mc Graw Hill, New Delhi, 1998.

Reference Books

- Feldman, R. S., *Understanding Psychology,* Tata Mc Graw Hill, New Delhi, 2002.
- Bootzin, R. R., Bower, G. H., Crocker, J., and Hall, E., *Psychology Today,* Mc Graw Hill, London, 2005

UPSA202 DEVELOPMENTAL PSYCHOLOGY II

Semester	**: II**	**Credit**	**: 5**
Category	**: Core V**	**Hours / Week**	**: 5**
Class & Major	**: I B.Sc. Psychology**	**Total Hours**	**: 65**

Objectives:

To enable the students

- To list the human development along with theories
- To discuss with influence of domains in development of child to old age.
- To classify the various stage in child to old age.

UNIT- I MIDDLE CHILDHOOD **12 Hrs**

Physical Development: Aspects of Physical Development - Health and Safety - Psycho Social Development: The Developing Self - The Child in the Family - The Child in the Peer Group - Mental Health- Developmental Disorders: Behavioral Problems During Childhood - Learning Disabilities – Dyslexia - Mental Retardation - Autism and Attention Deficit Disorder.

UNIT- II ADOLESCENCE **12 Hrs**

Physical and Cognitive Development - Defining Adolescence - Theories of Adolescence -Physical Development - Cognitive Development - Psychosocial Development - Peer Relations - Sexual Behaviour - Sexually Transmitted Infections -Teenage Parent - Illegal Behaviour.

UNIT- III EARLY ADULTHOOD **12 Hrs**

Physical and Cognitive Development: Initiation into Adulthood - Physical Development -Cognitive Development - Patterns of Work - Psycho-Social Development - Marriage and the Family - Personal Development - Sexual Identity and Gender Roles – Sexuality - Nature of Love.

UNIT-IV MIDDLE ADULTHOOD AND LATE ADULTHOOD **12 Hrs**

Middle Adulthood- Physical and Cognitive Development- Physical Development - Cognitive Development -Patterns of Work - Psycho-Social Development- Dealing with Stresses of Adulthood - Marriage and Family Relations - Sex and Love in Middle Adulthood - Personality Development.

Late Adulthood: Physical and Cognitive Development - Aging- Physical Development - Cognitive Development. Psycho-Social Development - Social Development - Personal Development.

UNIT-V OLD AGE **12 Hrs**

Personal - Social and family adjustments - Violence and health problems - Government policy for protection of safety of older people - The Role of spirituality in later life.

Text Books

- Papalia, D. E., Olds,S.W., & Feldman,R.D. *Human Development*. 9th ed. McGraw Hill. New Delhi, 2004

Reference Books

- Santrock, J. W. *Child Development*. 11th ed. Tata McGraw Hill. New Delhi 2007
- Travers, D. *Human Development. Across the Life Span*. 4th ed. McGraw Hill. London:1999

UPSM203 SOCIAL PSYCHOLOGY II

Semester : II **Credit : 5**
Category : Core VI **Hours / Week : 5**
Class & Major: I B.Sc. Psychology **Total Hours :65**

Objectives

To enable the students

- Define the influence of social and cultural factors on individual behavior.
- Interpolate the social problem in teams of various social psychological theories.
- To apply the unique features of socio-cultural context with respect of india and other countries.

UNIT - I CAUSES AND CURES OF STEREOTYPING, PREJUDICE AND DISCRIMINATION **13 Hrs**

Stereotyping: Nature – Origins – Prejudice: Origin of Prejudice –Discrimination – Techniques for Countering its Effects.

UNIT - II LIKING, LOVE, AND OTHER CLOSE RELATIONSHIPS 13 Hrs

Internal Sources of Liking others – Affiliation in Human Existence –Role of Affect – External Sources of Attraction – Power of Proximity –Physical Beauty - Liking Based on Social Interaction –Similarity –Reciprocal Linking or Disliking –Social Skills –Personality and Liking -Close Relationships

UNIT - III SOCIAL INFLUENCE 13 Hrs

Conformity –Social Pressure –Compliance –Principles of Compliance –Tactics Based Friendship or Liking - Tactics Based Commitment or Consistency - Tactics Based Reciprocity and Scarcity -Obedience to Authority –Unintentional Social Influence – Emotional Contagion –Symbolic Social Influence –Modeling.

UNIT- IV PROSOCIAL BEHAVIOUR AND AGGRESSION 13 Hrs

Motivation for Prosocial Behaviour –Responding to an Emergency –Increase or Decrease the Tendency to Help –Crowd funding –Final Thoughts

Perspectives on Aggression –Causes of Human Aggression – Aggression in Classroom and Workplace –Preventing and Controlling Aggression

UNIT - V GROUPS AND INDIVIDUALS 13 Hrs

Group –Social Facilitation –Social Loafing –Coordination ion Groups –Resolving Conflicts -Rules for Judging Fairness –Decision Making by Group –Role of Leadership in Group Settings.

Text Books

- Nyla R. Branscombe and Baron, R. A., *Social Psychology*, *14th Edition*, Prentice Hall, New Delhi, 2017
- Myers, D. G., *Social Psychology*, Seventh Edition, Int. Education,Mc Graw Hill, 2002

Reference Books

- Chaube, S. P., and Chaube, A., *Ground Work for Social Psychology*, Neelkamal, New Delhi, 2007
- Taj, H., *An Introduction to Social Psychology*, Neelkamal, New Delhi, 2007.

UPSM201 PSYCHOLOGY FOR EFFECTIVE LIVING

Semester : II **Credit : 5**
Category : Core VI **Hours / Week : 4**
Class & Major: I B.Sc. Psychology **Total Hours :52**

Objectives

To enable the students

- Gain knowledge on the about Psychology for Effective Living
- Interpolate about the life style that improving Psychology for Effective Living
- Apply the techniques to overcome stress in day to day life

UNIT- I SEEKING SELFHOOD **11 Hrs**

Self concept – core characteristics of self concept – self consistency, self esteem, self enhancement and self verification – self concept and personal growth. Exercise on self image and ideal self.

UNIT- II A HEALTHIER YOU **10 Hrs**

Body image – psychological factors and physical illness – coping with illness. At the end of the unit the students will be given exercise on rating health habits.

UNIT- III TAKING CHARGE OF YOUR LIFE **13 Hrs**

Mastery and personal control – resolve and decision making – decisions and personal growth.Test to measure "how much control you think you have?"

UNIT- IV YOUR FRIENDS AND YOU **13 Hrs**

Meeting people – impression, interpersonal attraction – friendship, self disclosure, loneliness. Test to measure "How shy are you?"

UNIT- V LOVE AND COMMITMENT **13 Hrs**

Love and intimacy – Commitment – adjusting to intimate relationships – divorce and its consequences exercise on "Marital Myths".

Text Book

- Duffy G K, Atwater E (2008). Psychology for Living- Adjustment, growth and Behaviour today. India. Person Education Inc.

Reference Book

- Shelley E. Taylor, 2006, Health Psychology 6th Edition Tata McGraw Hill Education Private Limited, NewDelhi.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core I	UPSM101	General Psychology-I	Assignment	Presentation
	Core II	UPSM102	Developmental Psychology-I	Assignment	Presentation
	Core III	UPSM103	Social Psychology-I	Assignment	Presentation
II	Core IV	UPSM 201	General Psychology-II	Assignment	Presentation
	Core V	UPSM 202	Developmental Psychology-II	Assignment	Presentation
	Core VI	UPSM 203	Social Psychology-II	Assignment	Presentation