

**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 – V
Science**



ACADEMIC COUNCIL
BOOKLET – V

MASTER COPY

Science

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DEPARTMENT OF BIO CHEMISTRY

UG: Course profile & revised syllabi of courses offered from IV-VI semesters are presented here.

With effect from 2012-2015 batch onwards

Semester	Part	Category	Course code	Course Title	Contact Hours/Week	Credit	
						Min	Max
IV	I	Language	UTAL403/ UTAL404/ UHIL401/ UFRL401	Basic Tamil-IV/ Advanced Tamil IV/ Hindi-IV/ French-IV	4	2	3
	II	English IV	UNEL405/ UENL406	Basic English IV/ Advanced English IV	4	2	3
	III	Core paper VI	UBCM402	Analytical Biochemistry II	6	5	5
		Core Practical IV	UBCR402	Quantitative Analysis & Electrophoresis Practical	3	3	3
		Allied	UMAA407	Biostatistics	5	5	5
	IV	Internship	UBCI401	Summer Internship	-	-	1
		Value Education			2	1	1
		Non Major Elective			4	2	2
	Soft Skill	USKS401	Life Coping Skills	2	1	1	
V	Extension activity/ Physical education			-	-	2	
TOTAL					30	21	26

V	Part III	Core VII	UBCM501	Enzymes and intermediary metabolism	5	5	5
		Core VIII	UBCM502	Human Physiology	5	5	5
		Core IX	UBCM503	Bioinformatics	4	4	4
		Core practical V	UBCR501	Enzymology Practical	5	5	5
		Extra Credit Provision	UBCR502	Biochemical Experiment	-	-	1
		Allied Optional			5	4	4
	Part IV	Non Major elective			4	2	2
		Soft Skill	USKS501	Job Skills	2	1	1
TOTAL					30	26	27

VI	Part III	Core X	UBCM605	Biotechnology	5	5	5
		Core XI	UBCM606	Advanced Clinical Biochemistry	5	5	5
		Core XII	UBCM603	Molecular Biology	5	5	5
		Core XIII	UBCM604	Comprehensive Viva-Voce	-	1	1
		Core practical VI	UBCR601	Clinical Biochemistry Practical	5	5	5
		Core practical VII	UBCR602	Hematology, Urine analysis & Biochemical analysis	3	2	2
		Major optional	UBCO605 UBCO603 UBCO604	Molecular Endocrinology Immunology Stem Cell Biology	5	4	4
	Part IV	Soft Skill	USKS601	Career Skills	2	1	1
Part V	Extension Activity/ Physical Education			-	-	2	
TOTAL					30	28	30
GRAND TOTAL					180	140	156

ALLIED OPTIONAL

Semester	Part	Category	Course code	Course Title	Hours/Week	Min	Max
V	III	Allied Optional	UBCA501 UBCA502 UBCA503 UBCA504	Immunology Clinical Diagnostics Microbiology Reproductive Biology	5	4	4

NON MAJOR ELECTIVES

Semester	Part	Category	Course Code	Course Title	Hours/week	Min	Max
II	IV	Non major elective	UBCE202	Biomedical Techniques	4	2	2
III	IV	Non major elective	UBCE301 UBCE302	Hormonal Biochemistry Food Microbiology	4	2	2
IV	IV	Non major elective	UBCE401 UBCE402 UBCE403	Nutrition and Health Clinical Nutrition First Aid Management	4	2	2
V	IV	Non major elective	UBCE501	Basics of bioinformatics (Not For Majors)	4	2	2

UBCM402 ANALYTICAL BIOCHEMISTRY-II
(Replaces the syllabus UBCM401 found in academic council booklet II)

Semester: IV
Category: Core paper-VI

Credit: 5
Hours/week: 5
Total Hours: 65

Objectives:

To enable the students

- Learn the practical laboratory techniques for the Biochemical field.
- Understand the theory and background relating to the techniques.
- Develop the problem solving and analytical thinking skills.

Unit-I: MICROSCOPY

12Hrs

Principles, Instrumentation, and applications of light phase contrast, fluorescence, scanning and transmission of electron microscopy, flow cytometry.

Unit-II: PHOTOMETRY

13Hrs

Basic principle of electromagnetic radiation, wavelength, wavenumber, frequency. Absorption and emission spectra. Beer Lamberts law, transmittance. UV- Visible spectrophotometry- Principle, instrumentation and applications in enzyme assay, membrane studies.

Unit-III: DETECTION METHODS

15Hrs

Spectrofluorimetry - Principle, Instrumentation and applications in vitamin assays (riboflavin or thiamine), Enzyme assays-ELISA, Fluorescent probes in the study of protein. Flamephotometry- Flame emission Spectrophotometry- principle, instrumentation and applications in trace elements (Na^+ , K^+ analysis) & principle, instrumentation and applications of atomic absorption spectrophotometry.

Unit-IV: RADIOACTIVE TECHNIQUES

15Hrs

Isotopes, Radioactivity, types of radioactive decay, half life and units of radioactivity. Detection and measurement of radioactivity - methods based upon ionization (GM counter), excitation (scintillation counter). Applications of radioisotopes. Biological hazards and safety measures in handling radio isotopes.

Unit-V: SEQUENCING METHODS

10Hrs

Protein sequencing- Edmans degradation and Dansyl chloride method, enzymatic methods. DNA sequencing methods – chemical cleavage and chain termination method .

Text Books:

- Keith Wilson and John Walker, *Principles and techniques of practical biochemistry*, Cambridge Press, 6th Edition, 2005.
- Upadhyay and Upadhyay Nath, *Biophysical chemistry*, Himalayan Publication, 3rd Edition, 2006.

Reference Books:

- Keith Wilson and Kenneth H. Goulding, *A Biologist's Guide to Principles and Techniques of Practical Biochemistry*, Cambridge University press, 1992.
- Sadasivam .S and A.Manickam, *Biochemical methods*, New age International (P) Ltd Publisher, 2008.
- Dr.P.Asokan, *Analytical Biochemistry*, Chinnaa Publication, 2003.

**UBCR402 QUANTITATIVE
ANALYSIS & ELECTROPHORESIS PRACTICAL**

(Replaces the syllabus UBCR401, Quantitative Analysis and Techniques found in academic council booklet II)

Semester: III & IV

Category: Core practical -IV

Credit: 03

Hours/ week: 03

Total Hours: 39

Objectives:

To enable the students

- Apply the principles of volumetric and electrophoretic techniques in biochemical analysis.
- Develop technical competence.

1. VOLUMETRIC ANALYSIS

a) Estimation of amino acids by formal titration.

- a) Estimation of ascorbic acid by titrimetric method using 2, 6-dichlorophenol indophenol.
- b) Determination of saponification value of edible oil.
- c) Determination of Iodine value of oil.
- d) Determination of Acid number of edible oil.
- e) Estimation of reducing sugar from biological fluids by Benedict's method.
- f) Iodine value of oil.
- g) Estimation of chloride by Mohr's method.

2. ELECTROPHORETIC TECHNIQUE

Separation of Proteins by SDS PAGE and its Staining techniques.

Text Books:

- *David T. Plummer*, "An introduction to practical biochemistry." 1998.

Reference Books

- *J. Jayaraman*, "Laboratory manual in Biochemistry", New Age International Limited Publication.
- *Sadasivam .S and A. Manickam* 3rd edition, "Biochemical Methods", New Age International Limited Publication. 2008.

UBCM503 BIOTECHNOLOGY

(Replaces the syllabus UBCM601 found in academic council booklet II)

Semester: VI

Category: Core paper XI

Credit: 5

Hours/ week: 5

Total Hours: 65

Objectives:

To enable the students

- Understand the use of biological agents such as micro organisms for biotechnology.
- Understand the application of Scientific and Engineering principles in biotechnology.
- Understand the application of biotechnology for Industrial process and products and on environment.

Unit-I: INTRODUCTION

15Hrs

Biotechnology- Definition, Scope, Types. Generation of foreign DNA molecule, Restriction enzymes, their types and target sites, cutting and joining DNA Molecules, Linkers, Adapters, Homopolymers and Enzymes used in genetic engineering.

Unit-II: GENE TRANSFER METHODS

15Hrs

Gene transfer in plants- gene transfer by Agrobacterium, Ti plasmid vectors, mechanism of T-DNA transfer, Virulence genes. Electroporation, Biolistics, Protoplast fusion and regeneration of plant by plant tissue culture – method and applications (esp Pytochemicals from plant cell culture).

Unit-III: ANIMAL CELL CULTURE

10Hrs

Animal cell culture- establishment of cell in culture: requirements for *in vitro* growth; importance of serum. Characteristics of cultured cells; Cell Types- Based on morphology and functional characteristics. Genetic engineering of animal cells: mammalian cell culture for insulin & growth hormone production.

Unit-IV: TRANSGENESIS

15Hrs

Transgenic plants – herbicide resistance, virus resistance and pest resistance. Transgenic animals - methods (micro injection, embryonic stem cell and retroviral) and its applications, basic concepts in embryo transfer, *In vitro* fertilization (IVF), Embryo cloning and Gene therapy, Human genome project-Application.

Unit-V: TECHNIQUES

10Hrs

Principles and techniques of Nucleic acid hybridization, Northern, Southern and Western Blotting, Polymerase Chain Reaction (PCR), DNA finger printing, Restriction Fragment Length Polymorphisms (RFLP) and Random Amplified Polymorphic DNA (RAPD).

Text Books:

- U. Satyanarayana, *Biotechnology*, Books & Allied.(P) Ltd ,2007.
- R.C. Dubey, *A Text Book of Biotechnology*, S.Chand & Co, 2008.

Reference Books:

- T.A Brown, *Gene Cloning and DNA Analysis*, Blackwell Publishing Co., 2006.
- Keith Wilson and John Walker, *Principles and techniques of Biochemistry and Molecular Biology*, Cambridge University Press, 6th Edition, 2006.
- R.Sasidhara, *Animal Biotechnology*, MJP publishers, 2006.

UBCM606 ADVANCED CLINICAL BIOCHEMISTRY
(Replaces the syllabus UBCM602 found in academic council booklet II)

Semester: VI
Category: Core paper XII

Credit: 5
Hours/ week: 5
Total Hours: 65

Objectives:

To enable the students

- Understand the diagnostic and therapeutic methodologies available for selective diseases and disorders.
- Gain knowledge in clinical biochemistry.

Unit-I: BIOLOGICAL SPECIMEN

12Hrs

Specimen collection, preservation of blood, urine, CSF, Bile, saliva and feces. Transport of specimens, anticoagulants, and preservatives for blood and urine.

Unit-II: GLUCOSE HOMEOSTASIS- COMPLICATIONS, DISORDERS

13Hrs

Glucose homeostasis, Diabetes mellitus, Hypoglycemia, Metabolic complications, GTT & its significance, glycosylated Hb, Glycosuria, Glycogen storage diseases, galactosemia, fructosuria, ketoacidosis.

Unit-III: LIPIDS- DISORDERS

15Hrs

Plasma lipids and lipoproteins, hypo and hyper lipoproteinemias, atherosclerosis, lipidosis, fatty liver, Obesity and Cardiovascular diseases- Hypertension, Atherosclerosis, Myocardial infarction, Congestive heart failure.

Unit-IV: INBORN ERRORS OF METABOLISM

15Hrs

Clinical manifestation of phenylketonuria, tyrosinemia, albinism, alkaptonuria, homocystinuria, Cystinuria, Cystinosis, Maple syrup urine disease, Hartnups disease, Gout.

Unit V: CLINICAL DIAGNOSTICS

15Hrs

Assessment and clinical manifestation of renal, hepatic, pancreatic, gastric and intestinal function. Bilirubin metabolism and Jaundice and its types. Prenatal detection of inborn disorders of metabolism in the foetus.

Text Books:

- Harold Varley, *Practical Clinical Biochemistry*, CBS Publication, 1998.
- Chatterjea MN, Rana Shinde, *Textbook of Medical Biochemistry*, Jaypee Publications, 7th edition, 2008.

Reference Books:

- Devlin, Thomas. M, *Textbook of Biochemistry with Clinical Correlations*, John Wiley and Sons Publishers, 2005.
- P.D. Mayne *et al*, *Clinical Biochemistry in Diagnosis and Treatment*, Arnold International, 1994.

UBCO603 MOLECULAR ENDOCRINOLOGY
(Replaces the syllabus UBCO601 found in academic council booklet II)

Semester: VI
Category: Major Optional

Credit : 4
Hours/ week: 5
Total hours: 65

Objectives:

To enable the students

- Understand hormonal influence in human physiology.
- Determine the familial and medical history relevant to endocrine problems.

Unit-I: INTRODUCTION **15Hrs**

Hormones- definition, classification, biosynthesis, characteristic features. Hormone receptors- Features and structure, regulation of receptor levels. Mechanism of hormone action. Signal transduction.

Unit-II: TROPIC HORMONES **15Hrs**

Secretion, Biological action, and regulation of growth hormone, Adreno corticotropic hormone, Prolactin, Gonadotropic hormone, Follicle stimulating hormone, Leutinizing hormone, Antidiuretic hormone and oxytocin. Hyper and Hypopituitarism Disorders- Dwarfism, Gigantism, Acromegaly, Cushing's disease and diabetes insipidus.

Unit -III: THYROID HORMONES **15Hrs**

Biosynthesis, Secretion, transport, regulation and Biological action of thyroid stimulating hormones, Thyroxine. Disorders: Hyperthyroidism & Hypothyroidism disorders- Cretinism, Myxoedema and Hashimoto's diseases, Graves's diseases, Exopthalmos, Toxic Goitre and Non- Toxic Goitre.

Unit -IV: GLUCOSE HORMONES **10Hrs**

Synthesis, regulation, biological action of Insulin, Glucagon, Somatostatin and insulin growth factor. Disorders - Diabetes Mellitus, Hypoglycemia.

Unit -V: GLUCOCORTICOIDS AND MINERALOCORTICOIDS **10Hrs**

Glucocorticoids and Mineralocorticoids- Synthesis, secretion, transport, biological effects, metabolism and excretion. Gonadal hormones- Biological action of androgens and estrogens.

Text Books:

- Lohar, S.Prakasa, *Endocrinology – Hormones & human health*, MJP Publishers, 2006.
- Devlin, Thomas. M, *Textbook of Biochemistry(with clinical correlation)*, John Wiley & sons publishers, 4th edition, 1992.

Reference Books:

- Austin and Short, *Mechanism of hormone action*.1920.
- Robert. K. Murray *et al* Appleton and Lange Stanford, Connecticut, *Harper's Biochemistry*, 25th edition, 2005.

UBCO604 STEM CELL BIOLOGY

Semester : VI
Category : Major Optional

Credit :4
Hours/ week :5
Total hours : 65

Objectives:

To enable the students

- Understand physiology of stem cells at cellular level.
- Understand the culture of stem cells.
- Identify the diagnosis and management of diseases and disorders with stem cells.

Unit-I: INTRODUCTION TO STEM CELLS

15Hrs

Stem cell- definition, kinds of stem cells- embryonic and adult stem cells. Characteristics of stem cells. Totipotent, unipotent, oligopotent and pluripotent cells.

Unit-II: GROWTH INDUCING AGENTS

10Hrs

Role of bone marrow in cell synthesis, Growth Factors- types and their role in cell development.

Unit –III: CELL LINES

12Hrs

Cell line- types, commonly used cell lines and selection of cell lines; maintenance of cell culture; subculture- monolayer culture, criteria for subculture of monolayer, technique; suspension cultures.

Unit –IV: EMBRYONIC STEM CELLS & ETHICAL REGULATION

13Hrs

Stem cell culture – embryonic stem cells, methods to produce differentiated cells, maintenance of stem cells. Stem cell bank.

Unit –V: APPLICATIONS OF STEM CELLS

15Hrs

Human embryonic stem cell research- Parkinson's disease, Diabetes, heart muscle repair. Applications of stem cells in study of tissue differentiation, molecular signals and testing of new drugs.

Text Books:

- U. Satyanarayana, *Biotechnology*, Books & Allied.(P) Ltd ,2007.
- V.Kumaresan *Biotechnology*, Saras publication, Nagercoil revised edition, 2009.

Reference Books:

- R.W Old, S.B Primrose, *An Introduction to Genetic Engineering*, Blackwell Science, 2003.
- R.Sasidhara, *Animal Biotechnology*, MJP publishers, 2006.

UBCE402 CLINICAL NUTRITION

Semester: IV
Category: NON MAJOR ELECTIVE

Credit: 4
Hours/week: 4
Total Hours: 52

Objectives:

To enable the students

- Understand the importance of nutrition and apply it to reduce the nutritional disorders.
- Interpret the clinical findings in the laboratory for various disease.

Unit-I: HEALTH & NUTRITION

10Hrs

Diet in Health -dietary requirement of carbohydrates, Proteins, Lipids, vitamins, micronutrient & macronutrient, Recommended allowance for children, adolescents and adults.

Unit-II: BLOOD CELL DISORDERS

10Hrs

Anaemia-Iron deficiency anaemia, microcytic & macrocytic anaemia, hereditary anaemia,-sickle cell & Thallasemia - clinical features, diagnosis & dietary management.

Unit-III: GASTROINTESTINAL DISORDERS

10Hrs

Diet in disease-fever, fatty liver, peptic ulcer, constipation, gall stone, gastro intestinal disorders- clinical features, diagnosis & dietary management

Unit-IV: SYSTEMIC DISORDERS

12Hrs

Clinical features, causes, diagnosis & dietary management in Diabetes Mellitus, Cardiovascular disease and Atherosclerosis.

Unit-V: RENAL DISORDERS

10Hrs

Renal disorders- kidney stones, Glomerular nephritis, Chronic & acute renal failure, Causes, clinical features, Diagnosis, & dietary management.

Text Books:

- Swaminathan. M, *Essentials of Food & Nutrition*, BAPPCO, Bangalore, 2003.
- Dr. Jyothi Singh, *Handbook of Nutrition and Dietetics* Lotus Press, New Delhi, 2008.

Reference Books:

- Allan Caw. Robert. A. Cowan Denis St. J. Oreilly. Michael Stewart. James Sheperd, An illustrated color Text, *Clinical Biochemistry, Elseiver Health Sciences*, 5th edition, 2013.
- Patrecia Trueman, *Nutritional Biochemistry*, MJP publishers, 3rd edition, 2009
- *Chatterjee Rana Shindae*, Text book of Medical Biochemistry, *Jaypee publishers* 7th edition, 2008.

UBCE403 FIRST AID MANAGEMENT

Semester : IV
Category : Non Major Elective

Credit : 2
Hours/week : 4
Total Hours : 52

Objectives:

To enable the students

- Know the basic of first aid.
- Understand the importance of first aid methods.
- Choose the correct first aid technique to handle the emergency health hazards.

Unit-I: BASICS OF FIRST AID

10hrs

First aid-Definition, Aim of first aid, key skills required for first aid, types of first aid, conditions that often required first aid, procedure to follow when giving first aid, basic first aids (any 10),importance of first aid, common first aid myths.

Unit-II: FIRE HAZARDS

12hrs

First aid for fire accident-types of fire accident, safe operating of fire extinguishers, first aid for burns, minor injuries, fainting, drowning, safe operating of fire extinguishers, first aid kit- definition, content (drugs &equipment),steps to create a home first aid kit, importance of first aid kit.

Unit-III: PHYSICAL INJURIES

11hrs

First aid for sports injuries-types of sports injuries, first aid for broken bones, fracture & Dislocation, cuts, severs bleeding, spinal injury, nose bleeding strains & sprains (Rest,Ice,Compression & Elevation- RICE method).

Unit-IV: CARDIOVASCULAR PROBLEMS

11rs

First aid for shock & cardiopulmonary resuscitation-causes of heart attack, signs and symptoms of heart attack, anaphylaxis, chest injuries, hyperventilation, breathing problem, stroke, first aid at work place.

Unit-V: OTHER INJURIES

8hrs

First aid for other problems-insect bites & stings, chemical splash in the eye, snake bites, first aid at home for babies.

Text Books:

- *First aid manual* –St. Jhon Ambulance, St. Andrew’s ambulance association, British red cross,9th edition, 2009

Reference Books:

- A. Handal, M.D- *First aid & safety hand book*-American red cross, Little brown company, 1992
- *Jerrold B Leikin, Hand book of first aid & emergency care*-American medical association, Random House Publishing Group, 2000.

UBCA504 REPRODUCTIVE BIOLOGY
(Eligible for all science students)

Semester: V
Category: Allied optional

Credit: 4
Hours/Week: 5
Total Hours: 65

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 and lactation.

Unit-1: Male reproductive system

14 hrs

Male reproductive system- primary sex organs, structure and functions of testis and prostate gland, spermatogenesis, semen and its composition, disorders- hypergonadism & hypogonadism.

Unit-2: Female reproductive system

14 hrs

Female reproductive system- primary sex organs, structure and functions of ovary, ovulation, oogenesis, disorder- Polycystic Ovarian Disorder.

Unit-3: Menstrual cycle

10 hrs

Puberty, Menstrual cycle- Definition, Changes during menstrual cycle- Ovarian and uterine. Regulation of menstrual cycle, Menopause- causes and changes.

Unit-4: Fertilization and Pregnancy

12 hrs

Pregnancy- definition, types, stages and metabolic and changes during pregnancy. Fertilization, infertility in male and female.

Unit-5: Parturition and Lactation

15 hrs

Gestation period, parturition- stages, Placenta- introduction, function. Lactation- milk secretion, milk ejection.

Text Books-

- K. Sembulingam, Prema Sembulingam, “*Essentials of Medical Physiology*”, 2nd edition, 2009.
- Dr. H. D. Singh, “*Handbook of Human Physiology*”, 1st edition, 2007.
- C. C. Chatterjea (Vol I & Vol II), “*Human Physiology*”, Medical Allied Agency, 2006.

References-

- Guyton & Hall, 10th edition, “*Textbook of Medical Physiology*”, Reed Elsevier India private limited, New Delhi 2000.
- Murray *et al.*, “*Harper’s Physiological Biochemistry*”, Tata, Mc Graw Hill Publication Co Limited, New Delhi 2000.
- R.A. Agarwal, Anil K.Srivastava, Kaushal Kumar. S.Chand, “*Animal Physiology and Biochemistry*”, 2008.

DEPARTMENT OF CHEMISTRY

PREAMBLE

UG: Course profile and revised Syllabi of Courses offered from IV-VI Semesters are presented here,

With effect from 2012 – 2015 batch on wards.

PG: Course profile and revised syllabi of courses offered for are presented in this booklet.

I – IV Semesters with effect from 2013-2015batch onwards.
III & IV- semesters for 2012-2014 batch

COURSE PROFILE – B.Sc.(Chemistry)

Semester	Part	Category	Course code	Course Title	Contact hrs/Week	Credits		
						Min	Max	
I	Part-I	Language	UTAL103	Tamil Basic	4	2	3	
			UTAL104	Advance Tamil				
			UHIL101	Hindi				
			UFRL101	French				
	Part-II	English	UENL105	Basic English	4	2	3	
			UENL106	Advance English				
	Part-III		Core I	UCHM103	General Chemistry- I	5	5	5
			Core II	UCHM102	Analytical Chemistry	4	4	4
			Core Practical I	UCHR203	Volumetric Analysis-I	3	-	-
			Allied I	UPHA101	Physics for Chemistry –I	3	3	3
Allied Practical-I			UPHR102	Physics for Chemistry Practical-I	3	2	2	
Part-IV	Soft Skill	USKS101	Communication Skills	2	1	1		
		USKS102	Effective Communication Skills					
		Value Education			2	1	1	
Total					30	20	22	
II	Part-I	Language	UTAL203	Tamil Basic	4	2	3	
			UTAL204	Advance Tamil				
			UHIL201	Hindi				
			UFRL201	French				
	Part-II	English	UENL203	Basic English	4	2	3	
			UENL204	Advance English				
	Part-III		Core III	UCHM201	General Chemistry –II	5	5	5
			Core Practical II	UCHR203	Volumetric Analysis-II	3	5	5
			Allied II	UPHA201	Physics for Chemistry –II	3	3	3
			Allied Practical-II	UPHR202	Physics for Chemistry Practical-II	3	2	2
			Internship	UCHI201	Summer Internship	-	-	1
	Part-IV		NonMajor Elective			4	2	2
Soft Skill			USKS201	Spoken Skills	2	1	1	
			USKS202	Presentation Skills				
		Value Education			2	1	1	
Part-V		Extension Programme / Physical Education			-	1	2	
Total					30	24	28	
III	Part-III	Language	UTAL303	Basic Tamil	4	2	3	
			UTAL304	Advance Tamil				

			UHIL301 UFRL301	Hindi French			
		English	UENL305 UENL306	Basic English Advance English	4	2	3
		Core IV	UCHM301	General Chemistry- III	5	5	5
		Core Practical II	UCHR403	Inorganic Analysis & Preparation	3	-	-
		Allied III	UMAA306	Algebra,differential calclus & Trigonometry	6	5	5
	Part-IV	Non-Major Elective			4	2	2
		Soft Skill	USKS301	Personality Development	2	1	1
		Value Education			2	1	1
Total					30	18	20
Semester	Part	Category	Course code	Course Title	Contact hrs/ Week	Credits	
						Min	Max
IV	Part-I	Language	UTAL403 UTAL404 UHIL401 UFRL401	Basic Tamil Advance Tamil Hindi French	4	2	3
			UENL405 UENL406	Basic English Advance English IV			
	Part-III	Core V Core Practical II Allied IV	UCHM401	General Chemistry –IV	6	5	5
			UCHR401	inorganic Analysis & Preparation	3	5	5
			UMAA406	Integral calculus, Laplace, transform & ordinary differential equation	5	5	5
		Internship	UCHI401	Summer Internship	-	-	1
	Part-IV	Non-Major Elective Value Education Soft Skill			4	2	2
					2	1	1
			USKS401	Life coping Skills	2	1	1
	Part-V	Extension Programme / Physical Education			-	-	2
Total					30	23	28
V	Part-III	Core VI	UCHM501	Inorganic Chemistry I	4	4	4
		Core VII	UCHM502	Organic Chemistry I	4	4	4
		Core VIII	UCHM503	Physical Chemistry I	4	4	4
		Core Practical III	UCHR603	Gravimetric Analysis	2	-	-
		Core Practical IV	UCHR604	Organic Analysis & Preparation	2	-	-
		Core Practical V	UCHR605	Physical Chemistry Practical	3	-	-
	Allied Optional			5	4	4	
Part-IV	Non-Major Elective Soft Skill			4	2	2	
		USKS501	Job Skills	2	1	1	
Total					30	19	19
VI	Part-III	Core I X	UCHM601	Inorganic Chemistry II	4	4	4
		Core X	UCHM602	Organic Chemistry II	4	4	4
		Core XI	UCHM603	Physical Chemistry II	4	4	4
		Core XII	UCHM606	Analytical Chemistry-II	5	5	5

		Major optional	UCHO601 UCHO602	Pharmaceutical Chemistry Polymer chemistry	5	4	4
		Core Practical III	UCHR603	Gravimetric Analysis & Physical constant (melting & boiling point)	2	4	4
		Core Practical IV	UCHR604	Organic Analysis & Preparation	2	4	4
		Core Practical V	UCHR605	Physical Chemistry Practical	2	5	5
		Viva –Voce	UCHM605	Comprehensive Viva-Voce	-	1	1
	Part-IV	Soft Skill	USKS601	Carrer Skills	2	1	1
	Part-V	Extension Programme / Physical Education			-	-	2
Total					30	36	38
Grand Total					180 Hrs	140	155

LIST OF COURSES OFFERED TO OTHER DEPARTMENTS

ALLIED AND ALLIED OPTIONAL COURSES

Semester	Part	Category	Course code	Course title	Contact hrs per week	Credits	
						Max	min
I	III	Allied- I	UCHA101	Chemistry for Biochemistry –I	3	3	3
II	III	Allied- II	UCHA201	Chemistry for Biochemistry –II	3	3	3
III	III	Allied- III	UCHA301	Chemistry for Physics-I	3	3	3
IV	III	Allied-IV	UCHA401	Chemistry for Physics-II	3	3	3
I/II	III	Allied Practical	UCHR202 ^A UCHR402 ^A	Volumetric & Organic Analysis	3	4	4
III/IV	III	Allied Practical	UCHR202* UCHR402*	Volumetric & Organic Analysis	3	4	4
V	III	Allied Optional	UCHA501 UCHA502 UCHA503	Green Chemistry Industrial Chemistry Food Chemistry.	5	4	4

*Allied offered to I-B.Sc., Bio-Chemistry

^A Allied offered to II- B.Sc., Physics

NON MAJOR ELECTIVE COURSES

Semester	Part	Category	Course code	Course title	Contact hrs per week	Credits	
						Max	min
II	IV	Non major elective	UCHE201	Solid Waste Management	4	2	2
			UCHE202	Waste Management	4	2	2
III	IV	Non major elective	UCHE301	Cosmetics & Detergents	4	2	2
IV	IV	Non major elective	UCHE401	Vocational Chemistry	4	2	2
V	IV	Non major elective	UCHE501	Health and Hygiene	4	2	2
			UCHE502	Health Chemistry	4	2	2

UCHM606 ANALYTICAL CHEMISTRY-II

(This replaces the course UCHM604 Applied chemistry found in Academic Council Booklet-II)

Semester : VI

Category : Core XII

Credit : 5

Hours/Week : 5

Total Hours : 65

Objectives:

To enable the students

- Acquire the analytical knowledge on spectroscopic and analytical techniques.
- Apply the chromatographic techniques to separate the substance or compounds.
- Analyze qualitatively the carbohydrate and protein in the substance.
- Understand the leather tanning process and manufacture of milk products.

UNIT-I Thermo analytical methods

15 Hrs

principles involved in thermogravimetric analysis and differential gravimetric analysis – discussion of various components with block diagram – characteristics of TGA and DTA – factors affecting TGA and DTA curves – thermometric titrations. **Electro analytical methods:** Polarography-principle- concentration polarization- dropping mercury electrode- advantage and disadvantage of DME- convection, migration and diffusion currents- illkovic equation(derivation not needed) and its significance- experimental assembly – electrodes – capillary solution- current voltage curve- oxygen wave- influence of temperature and agitation on diffusion layer- polarography as an analytical tool in quantitative and qualitative analysis. Amperometry – principle and uses.

UNIT – II Separation Methods

16 Hrs

solvent extraction

Chromatography techniques -. Column chromatography –Thin layer Chromatography(TLC) Rf value. Paper chromatography - Solvents used and principles - factors affecting Rf value - separation of aminoacid mixtures. Radial paper chromatography.

Instrumental Methods of Chromatography -Ion exchange chromatography - principle - resins - action of resins - experimental techniques - applications - separation of Zn-Mg, Co-Ni, Cd-Zn, Chloride - bromide. Gas chromatography and high pressure liquid chromatography - principles - experimental techniques - instrumentation and applications. and electrophoresis.

UNIT – III

13 Hrs

Spectroscopic Methods

UV- Visible spectroscopy - instrumentation - photocolonmeter and spectrophotometer - block diagrams with description of components .

Infrared spectroscopy - instrumentation - block diagram - source - monochromator – cell- sampling techniques - detector and recorders.

Raman spectroscopy - Raleigh and Raman scattering - stoke's and anti stokes lines - instrumentation block diagram - differences between IR and Raman spectroscopy - mutual exclusion principle - applications - structural diagnosis.

LCMS, GCMS, MSMS (instrumental aspects only)

UNIT – IV Techniques in Leather & Dairy Chemistry

13 Hrs

Structure and compositions of hides, skins and leather. Principles of pre tanning process. Vegetable, mineral and synthetic tanning. Chemistry of chrome tanning. Dyeing of leather. Tannery effluents – Pollution and control.

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 matters – names and functions. Definition and compositions of cream, butter, ghee, ice cream, stabilizer and emulsifier. Milk powder definition and need for making – manufacture of whole milk powder by spray drying process

UNIT – V Carbohydrates and Proteins

8 Hrs

Analysis of carbohydrate: Molisch's test-Anthrone test-Felling's test-Bial's test-Seliwanoff's test-Barfoed's test-Ozalone formation test. Analysis of Proteins: Xanthoproteic test- Biuret test-Millions test-Hopkins-cole test-Sulphur test-Ninhydrin test. End group analysis of Proteins.

Text Books:

- R.Gopalan, "*Elements of analytical chemistry*", Sultan Chand, 2009.
- Y.R.Sharma, "*Organic spectroscopy*", Sultan Chand, 2005.
- Jayashree Ghos, "*Fundamental concepts of Applied Chemistry*", S. Chand Publications, 2000.

Reference Books:

- S.M Khopkar, "*Analytical Chemistry*", New Age International, 2006.
- A.Skog and M.West, "*Fundamentals of analytical chemistry*", Saunders College Publications, 2004.
- Skog, "*Instrumental methods of analysis*", 2008.
- Willard et al, "*Instrumental methods of analysis*", CXBS, 2008.
- B.K. Sharma, "*Instrumental methods of chemical analysis*" God Publications, 2007.
- S .Usharani, "*Analytical Chemistry*", Macmillan, 2008.

UCHR603 GRAVIMETRIC ANALYSIS

(This replaces the course UCHR601 Gravimetric Analysis found in Academic Council Booklet-II)

Semester	:V & VI	Credit	: 4
Category	: Core Practical III	Hours/Week	: 2+2
		Total Hours	: 26 + 26

Objectives:

To enable the students

- Analyze the ions or metals present in the given substance by gravimetric method.
- acquire quantitative skills to get accurate result.

Experiments:

Part I :Gravimetric Estimation

1. Estimation of sulphate as barium sulphate.
2. Estimation of barium as barium sulphate.
3. Estimation of barium as barium chromate.
4. Estimation of lead as lead chromate.
5. Estimation of calcium as calcium oxalate monohydrate.
6. Estimation Zinc or magnesium as oxinate.

Part-II

1. Physical constant(melting & boiling point)

Text Books:

- V. Venkateswaran, R. Veerasawamy & A. R. Kulandaivelu, "Basic Principles of practical Chemistry", S. Chand & Sons Publications, 1998.

Reference Books:

- "Vogel's, "Text book of Quantitative Chemical Analysis", 5th edition, ELBS/ Longman, England, 1989.
- A. O. Thomas – "Practical chemistry" – Scientific book center, Cannanore(1999)
- S. Sundaram – "Practical chemistry" – 3 Volumes – S. Viswanthan(1998)

UCHR604 ORGANIC ANALYSIS AND PREPARATION

(This replaces the course UCHR602 Organic Analysis found in Academic Council Booklet-II)

Semester: V & VI	Credit	: 4
Category: Core Practical-IV	Hours/Week	: 2 + 2
	Total Hours	: 26 + 26

Objectives:

To enable the students

- Analyze the special element and functional group present in the given organic compound.
- Acquire skill to prepare the organic compound.

I) Organic preparations:

1. Oxidation (Benzaldehyde to benzoic acid).
2. Hydrolysis (Methyl salicylate or ethylbenzoate to the acid).
3. Nitration (metadinitrobenzene or picric acid).
4. Halogenation (Parabromoacetanilide from acetanilide).
5. Diazotisation (methyl orange).
6. Acylation (Benzoylation of betanaphthol).

II) Micro Level Organic Analysis:

Reaction of the following functional groups:

Aldehyde, ketone, carboxylic acid (mono and di) , ester, carbohydrate (reducing), phenol, aromatic primary amine, amide, nitro compounds and anilide. Analysis of organic compound containing one functional group and characterization with a derivative.

Text Books:

1. V. Venkateswaran, R. Veerasawamy & A. R. Kulandaivelu, "Basic Principles of practical Chemistry", S. Chand & Sons Publications, 1998.

Reference Books:

1. A. O. Thomas, "Practical chemistry", Scientific book center, Cannanore, 1999.
2. S. Sundaram, "Practical chemistry", 3rd Vol, 1998.
3. Vogel's, "Text book of practical organic chemistry", Longman, 1998

UCHR605 PHYSICAL CHEMISTRY PRACTICAL

(This replaces the course UCHR501 Physical chemistry practical found in Academic Council Booklet-II)

Semester : V & VI

Category : Core Practical-V

Credit : 5

Hours/Week : 3+2

Total Hours : 39 +26

Objectives:**To enable the students**

- Acquire skills through the experimental techniques.
- Interpret the experimental results.

1. Distribution law:

- a) Determination partition coefficient of iodine between carbon tetra chloride and water.
- b) Equilibrium constant of the reaction $KI + I_2 = KI_3$

2. Kinetics :

Determination of the orders of the following reactions.

- a) Acid catalysed hydrolysis of an ester (methyl or ethyl acetate).

3. **Molecular weight of solute** – Rast method using naphthalene, meta dinitrobenzene and diphenyl as solvents.
4. **Heterogeneous equilibria:**
Phenol – water system CST.
5. a) **Effect of impurity** – 1 % NaCl or 2% Succinic acid solutions on phenol determination of the concentration of the given solution.
b) **Determination of the transition temperature of the given salt hydrate.** $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$, $\text{CH}_3\text{COONa} \cdot \text{H}_2\text{O}$, $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$, $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$.
6. **Electrochemistry: Conductivity:**
 - a) Determination of cell constant.
 - b) Conductometric titration of a strong acid against a strong base.
7. **Potentiometric titration**
 - a) **strong acid against a strong base.**
8. **Calorimetric Titration.**
9. **Polarimetric – Inversion of Sugar.**

Text Books:

- V. Venkateswaran, R. Veerasawamy & A. R. Kulandaivelu, “Basic Principles of practical Chemistry”, S. Chand & Sons Publications, 1998.

Reference Books:

- Vogel’s, “Text book of Quantitative Chemical Analysis”, 5 th Edition, ELBS/ Longman, England, 1989.
- O. Thomas, “Practical chemistry”, Scientific book center, Cannanore, 2000.
- S. Sundaram, “Practical chemistry”, 3rd Vol , 1999.

UCHE502 HEALTH CHEMISTRY

Semester : V
Category : Non-Major Elective

Credit : 2
Hours/Week : 4
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 Vitamins & Minerals

10 Hrs

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 Chemistry of drugs

10 Hrs

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, analgesics 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 matters – 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)

COURSE PROFILE M.Sc (Chemistry)

Semester	Category	Course Code	Course Title	Contact hrs/Week	Credits	
					Min	Max
I	Core-I	PCHM104	Organic Chemistry-I	5	4	4
	Core-II	PCHM105	Inorganic Chemistry-I	5	4	4
	Core-III	PCHM106	Physical Chemistry-I	5	4	4
	Core Practical-I	PCHR203	Organic Practical	5	-	-
	Core Practical-II	PCHR204	Inorganic Practical	5	-	-
	Non-Major Elective			5	4	5
Total				30	16	17
II	Core-IV	PCHM204	Organic Chemistry-II	5	4	4
	Core-V	PCHM205	Inorganic Chemistry-II	5	4	4
	Core-VI	PCHM206	Physical Chemistry-II	5	4	4
	Core Practical-I	PCHR203	Organic Practical	5	6	6
	Core Practical-II	PCHR204	Inorganic Practical	5	6	6
	Non-Major Elective			5	4	5
	Service Learning	PCHX201	Vermicomposting	-	1	1
Total				30	29	30
III	Core-VII	PCHM301	Organic Chemistry-III	5	4	4
	Core-VIII	PCHM302	Inorganic Chemistry-III	5	4	4
	Core -IX	PCHM303	Physical Chemistry-III	5	4	4
	Core-X	PCHM304	Research Methodology	5	3	3
	Core Practical -III	PCHR401	Physical Chemistry Practical	5	-	-
	Non-Major Elective	PALE401	Preparatory Course for NET/SLET	5	4	4
Total				30	19	19
IV	Core-XI	PCHM401	Organic Chemistry-IV	5	4	4
	Core-XII	PCHM402	Inorganic Chemistry-IV	5	4	4
	Core-XIII	PCHM403	Physical Chemistry-IV	5	4	4
	Core Practical -III	PCHR401	Physical Chemistry Practical	5	6	6
	Project	PCHP401	Project Work & Viva-Voce	5	4	4
	Value Education	PWSV401	Women's Studies	5	4	4
Total				30	26	26
Total				120	90	92

LIST OF NON MAJOR ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS

Semester	Category	Course Code	Course Title	Contact hrs/Week	Credits	
					Min	Max
I	NME	PCHE101	Consumer Chemistry	5	4	4
		PCHE 102	Industrial Chemistry.		5	5
II	NME	PCHE201	Environmental Science	5	4	4
		PCHE 202	Applied Chemistry.		5	5

PCHM104 ORGANIC CHEMISTRY- I

Semester : I
Category : Core I
Class & Major: I M.Sc Chemistry

Credits : 4
Hours/Week: 5
Total Hours: 65

Objectives

To enable the students

- Know about the structure & reactivity in organic molecules.
- Understand the advanced reaction mechanism in aliphatic compounds.
- Acquire knowledge of Stereo chemical aspects in organic compounds.

UNIT-I Structure And Reactivity

15 Hrs

Effect of structure on reactivity-resonance and field effects, steric effects. Generation reaction and stability of carbocation, carbanion, free radical, carbenes and nitrenes. Quantitative treatment-the Hammett equation and linear free energy relationship, substituent and reaction constant, Taft equation. Thermodynamic and kinetic requirement for reactions, thermodynamic and kinetic control reactions Hammonds postulate, Microscopic reversibility. Potential energy diagrams, transition states and intermediates, Methods of determining mechanisms-identification of products and determination of the presence of an intermediate, isotope labelling, isotope effects .

UNIT- II Aliphatic Nucleophilic Substution Reaction

13 Hrs

S_{N1} , S_{N2} and S_{Ni} reactions-mechanism, reactivity-effect of substrate, nucleophile, leaving group and medium. Neighboring group mechanism, nucleophilic substitution at an allylic carbon, aliphatic trigonal carbon, vinylic carbon, ambient nucleophile and substrate.

Reactions-Hydrolysis of epoxides, amides, dehydration of alcohols, trans esterifications, alcoholysis of epoxides, alkylation of onium salts, acyloxy-dehalogenation, alkylation of amines, trans amination, amination of epoxides and alkanes. Darkin reaction, Etard reaction, Stark Enamine reaction, Mannich reaction,Ullmann reaction, Wilsmeiyer reaction.

UNIT-I Elimination Reactions

12 Hrs

E₁,E₂,E₁CB mechanism, reactivity- substrate, attacking base, leaving group and medium. Mechanism and orientation of the pyrolytic and conjugate elimination. Reactions- dehydrohalogenation, dehydrogenation, cleavage of ethers, quaternary ammonium hydroxide, amine oxide. Chugaev reaction, elimination of boranes.

UNIT-IV Stereochemistry-I

14 Hrs

Homotopic, heterotopic- enantiotopic and diastereotopic. Fischer, Newmann and Sawhorse projections and their interconversion. Optical activity-Concept of chirality- biphenyls, allenes and spiranes. R and S notations. E-Z notation of olefins containing one double bond and multiple bond. Stereospecific and stereoselective synthesis with suitable examples, asymmetric synthesis -Racemisation, Resolution, Concept of enantiometric excess, asymmetric induction. Cram's rule.

UNIT-V Carbohydrates

11 Hrs

Classification of carbohydrates, reactions of glucose, fructose, cyclic structure and configuration of monosaccharides - Haworth representation - Fischer projection formula - Structure & reactions of Starch & Cellulose

Text Books

- Jerry March. M.B., *Advanced Organic Chemistry*, 6th edition, John Wiley & Sons, New York, 2007.
- Ernest L. Eliel, *Stereochemistry of Carbon Compounds*, T.M.H Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2005.
- Finar. I.L., *Organic Chemistry, Volume I & II*, 5th edition, ELBS Publication, 2006.

Reference Books

- Francis Carey, *Organic Chemistry*, 3rd edition, McGraw Hill Company, New York, 2004.
- Peter Sykes, *a guide book to mechanism in organic chemistry*, 6th edition, Orient Longman, London, 2003.
- Kalsi. P.S., *Stereochemistry-Conformation & mechanism*, 6th Edn, Newage International publishers, New York, 2005.
- Morrison .R.T, Boyd. R.N and Bhattacharjee .S.K, "Organic Chemistry" 7th edition, Prentice Hall of India, copy right 2011.

PCHM105 INORGANIC CHEMISTRY– I

Semester : I

Category : Core II

Class&Major : I-M.Sc Chemistry

Objectives:

To enable the students

- Acquire knowledge of Periodicity & p-block elements.
- Understand various bonding nature of the compounds.
- Identify the structure of co-ordination complexes.

Credit : 4

Hours/ week : 5

Total Hours : 65

UNIT–I Atomic Structure and Periodic properties

15 Hrs

Atom as nucleus with orbital electrons, concept of wave-functions, quantum numbers, shape of orbitals and their radial distribution functions, electronic configuration of atoms, Aufbau Principle, Pauli Exclusion Principle, and Hund's rule. Slater's rules for the determination of screening constants. Arrangement of elements in Groups in the Periodic Table. s-block, p-block, d-block and f-block elements; periodic properties- ionic radii, ionization potential, electron affinity, electronegativity(Pauling and Mulliken scale).

UNIT-II Chemical bonding-I

12 Hrs

Types of bonds- ionic, covalent, metallic and coordinate bond. MO and VB theory. Concept of hybridization, the extent of d- orbital participation in molecular bonding, bond energy and bond order, concept of resonance, dipole moment. Fajan's rule. Lattice energy –Born Haber Cycle, Born Lande Equation – Kapustinski Equation .

UNIT–III Structure and properties of some p-block Elements

13 Hrs

Synthesis, properties and structures of Boron hydrides (small boranes and their anions, B₁-B₄), 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 (S₄,N₄)compounds, inter halogen compounds, pseudo halogens, noble gas compounds.

UNIT–IV Coordination Chemistry-I

13 Hrs

Werner's Theory, EAN rule, VBT, Crystal Field Theory, crystal field splitting, application of d-orbital splittings 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. MO theory of complexes (quantitative principles involved in complexes with no pi and with pi bonding) and ligand field theories and molecular symmetry, angular overlap model, Jahn Teller effect, electronic spectra of transition metal complexes, Orgel and Tanabe-Sugano diagrams, charge transfer and d-d transitions, nephelauxetic series.

UNIT-V Coordination Chemistry-II

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 valence complexes.

Stepwise and overall stability constant, Irving-Williams series, factors affecting the stability, determination of stability constant – spectrophotometric, solubility, electrochemical, polarographic and Job's method.

Text Books

- Lee J.D., "A New Concise Inorganic chemistry", 3rd Edition, ELBS, New Delhi, 2002.
- James E. Huheey, *Advanced Inorganic Chemistry*, Harper & Collins, New York, Fourth Edition, 2005.

Reference Books

- Basolo F & Pearson R.G, *Mechanism of Inorganic Reaction*, McGraw Hill, New Delhi, 1998.
- Shriver D.F, Atkins P.W, Langford C. H., *Inorganic Chemistry*, ELBS, New Delhi, 1990.
- Jolly W.L., *Modern Inorganic Chemistry*, Second Edition, McGrawHill, New Delhi, 1991.

PCHM106 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.
- Understand the basis of Quantum chemistry & photo chemistry.

UNIT-I Classical Thermodynamics

14 Hrs

Thermodynamics of systems of variable composition – partial molar properties – chemical potential, relationship between partial molar quantities - Gibbs-Duhem 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-II 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-III Chemical 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 – Hammett 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-IV 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-V Introduction to Photochemistry

12Hrs

Absorption & Emission of Radiation – Frank Condon 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 Efficiency 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 sensitized reactions.

Text Books

- Rajaram .J & Kuriacose .J.C, *Thermodynamics for Students of Chemistry*, LalNagin Chand, NewDelhi, 1986.
- Atkins P.W., *Physical chemistry*, Sixth Edition, Oxford University Press, 1998.
- Rohatgi.K.K, Mukerherjee, *Fundamentals of Photochemistry*. Wiley Eastern Ltd, New York, 2004.

Reference Books

- Moore .W.J, *Physical Chemistry*, Orient Long man,London,1972.
- McClelland. B.C, *Statistical Thermodynamics*, Chapman& Hall,London,1973.

PCHR203 ORGANIC PRACTICAL

Semester : I & II

Category : Core Practical –I

Class & Major: I-M.Sc Chemistry

Objectives:

To enable the students

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

Credit : 6

Hours/Week : 5+5

Total Hours : 130

I.Extraction

1. Isolation of lactose from milk(Demo)
2. Isolation of caffeine 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 interconversion

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 an oil.(demo)

V. Chromatographic Separations (demo).

1. Column Chromatography- Separation of Anthracene and Picric acid from anthracene 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 Book

- Dr.Gnanaprasam.N.S and Ramamoorthy.G, “Organic Chemistry Lab Manual”, S.Viswanathan printers & Publishers Pvt.Ltd., 2008.

Reference Books

- Thomas .A.O, *Practical Chemistry*, Scientific Book Center, Cannanore, 1999.
- Vogel’s, *Text Book of Practical Organic Chemistry*, Longman, London, 199.

PCHR204 INORGANIC PRACTICAL

Semester	: I & II	Credit	: 6
Category	: Core Practical -II	Hours/Week	: 5 +5
Class&Major	: I-M.Sc Chemistry	Total Hours	: 130

Objectives:

To enable the students

- Gain the knowledge of 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. Sodium Bis(Thiosulphato) Cuprate(II)
4. Tris(thiourea)Copper(I)chloride

III. Estimation of metal ions by Volumetric and Gravimetric 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 Books

- Ramanujam. V, *Inorganic Semi Micro Qualitative Analysis*, The National publishing Company, New Delhi, 1998.

Reference Books

- Thomas A.O, *Practical Chemistry*, Second Edition, Scientific Book Center, Cannanore, 1999.
- Venkateswaran. V, Veerasawamy & Kulandaivelu.A. R, “*Basic principles of Practical Chemistry*”, S. Chand & Sons publications, New Delhi, 1998.

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

- Gain knowledge in advanced reaction mechanism in aromatic compounds.
- Know about the chemistry of Harmones.
- Apply the gained knowledge from terpenoids to extract it 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, Vonbrowne 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, Friedel 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 simple 1,2-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 Book

- Ernest L.Eliel, *Stereochemistry of Carbon Compounds*, T.M.H Edition, TataMcGraw-Hill Publishing Company, NewDelhi, 2005.
- Jerry March, *Advanced Organic Chemistry*, 6th edition, John Wiley & Sons, New York, 2007.
- Finar .I.L, *Organic Chemistry*, Volume I & II, 5th edition, ELBS Publication, 2006.

Reference Books

- Kalsi P.S, “*Stereochemistry-Conformation & mechanism*”, 6th Edn, Newage Interanational publishers, Newyork, 2005.
- Mukerjee .S.M and Singh .S.P, “*Organic reaction mechanism*”, McMillan India Ltd., Chennai, 2007.
- 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

- Understand the bonding of inorganic & organo- metallic compounds.
- Know about the arrangements of ions in the structure from various solid substances.
- Know about the photochemistry of inorganic compounds & structure and function of bio-inorganic compounds.

UNIT- I Chemical Bonding -II

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, CdI₂, Perovskite, rutile, fluorite and antiferite, zinc blende and wurtzite.

UNIT –IV Photochemistry of Inorganic Compounds 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 B₁₂ role of sodium, potassium, calcium, zinc and copper; fixation of nitrogen cycle. Anti- cancer drugs and their mechanism of action,

Textbooks

- 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, 2004.

Reference Books

- Purcell. K.F & Kotz. J.C, *Inorganic Chemistry*, W.B.Saunders Co, USA, 2004.
- 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, 1990.

PCHM206 PHYSICAL CHEMISTRY - II

Semester	: II	Credit	: 4
Category	: Core-VI	Hours/ week	: 5
		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 Kinetics of Electrode Process**13 Hrs**

Essential of electrode reactions – current density – over potential, Tafel equation, Butler-Volmer equation. Standard rate constant (K_0) and Transfer Co-efficient(α), exchange current. Irreversible Electrode process- criteria for irreversibility, Information from irreversible wave. Determination of kinetic parameters by Koutecky and Giling'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 geometric 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*, Affiliated EastWest Press, NewDelhi,1999.
- Chandra.A.K, "Fundamentals of Quantum chemistry", Kluwer Academic publishers, 2004.
- Cotton. F.A, *Chemical Applications of Group theory*, John Wiley, NewYork,

Reference Books

- Thinham.N., *Group Theory & Quantum Mechanics*, McGrawHill Book Company, NewYork, 1999.
- Crow D.R, *Principles & Applications to Electrochemistry*, Chappman& Hall,2002.
- Laidler .R.J, *Chemical Kinetics*, Harber & Row, NewYork, 2005.

PCHX201 VERMICOMPOSTING**Semester : II****Credit : 1****Category : Service Learning****Total Hours : 40hrs****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-biodegradable Common 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**8 Hrs**

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.

References

- Thompson. P.M, Das .S.A, K.C.. Bioresource Technology, 1998.
- Nancarrow, Loren and Janet Hogan Taylor. *The Worm Book* Ten Speed Press, 1998.
- Logsdon, Gene. *Worldwide Progress in Vermicomposting* Biocycle, October, 1994.

PCHM301 ORGANIC CHEMISTRY- III**Semester : III****Credits : 4****Category : Core VII****Hours/Week : 5****Class&Major : II-M.Sc Chemistry****Total Hours: 65****Objectives****To enable the students**

- Understand the various spectroscopic methods to interpret the structure of the compounds
- Apply the gained knowledge from Alkaloids to extract it from natural products.

UNIT-I UV and IR Spectroscopy**13 Hrs**

UV-Visible spectroscopy: Types of electronic transitions, Chromophores & Auxochromes, Factors influencing positions & intensity of absorption bands, Absorption spectra of dienes, polyenes & unsaturated carbonyl compounds, Woodward – Fischer rules.

IR spectroscopy – vibrational frequencies & factors affecting them, identification of functional groups, intra & intermolecular Hydrogen bonding, Finger Print Region, Far IR region, Metal Ligand Stretching vibrations.

UNIT-II NMR Spectroscopy

15 Hrs

Nuclear Spin, Magnetic moment of a nucleus, Nuclear energy levels in the presence of Magnetic field relative populations of energy levels, Macroscopic magnetization – Basic principles of NMR experiments – CW & FT NMR – ^1H NMR – Chemical Shift & Coupling constant – Factors influencing Proton Chemical Shift & Vicinal Proton – Proton Coupling constant, ^1H NMR spectra of simple organic molecules such as $\text{CH}_3\text{CH}_2\text{OH}$, CH_3CHO etc., AX & AB spin system – Spin decoupling – Nuclear Overhauser effect – Chemical exchange. ^{13}C NMR – Proton decoupled & Half Resonance ^{13}C NMR – Factors affecting ^{13}C chemical shift, ^{13}C NMR spectra of simple organic molecules.

UNIT-III Mass Spectrometry

13 Hrs

Instrumentation – Resolution, EI and CI methods – Base peak, isotopic peaks, metastable peak, parent peak, determination and use of molecular formula, recognition of molecular ion peak – FAB. Fragmentation–General rules – Pattern of fragmentation for various classes of compounds, McLafferty rearrangement. Importance of metastable peaks.

UNIT-IV Heterocyclic Compounds

12 Hrs

Nomenclature of heterocyclic compounds having not more than one hetero atoms such as Oxygen, Nitrogen & Sulphur. Synthesis, reactivity and applications of the following heterocycles. Pyrazoles, Oxazoles, Pyridazines, Pyrimidine & Pyrazines. Identification of organic compounds like 1,3,5,-trimethyl benzene, cinnamaldehyde, pyridine, isopropyl alcohol, acetone, n-propylamine, benzylbromide & phenylacetone by spectroscopic methods.

UNIT-V Alkaloids

12 Hrs

Occurrence, Nomenclature, Classification and isolation of alkaloids - General methods of Structural elucidation. Structural elucidation of Papaverine, Cocaine, Morphine and Conine.

Text Books

- Finar .I.L, *Organic Chemistry*, Vol-I&II, Fifth Edition, ELBS Publication, 2006.
- Kemp.W, *Organic Spectroscopy*, McMillan Ltd., 2001.
- Silverstein.R.M, G.D.Bassler & Monson, *Spectrometric Identification of Organic Compounds*, John Wiley & Sons, New York, 2004.

Reference Books

- Dyer.J, *Applications of Organic Spectroscopy*, Prentice & Hall of India Pvt Ltd., New Delhi, 1980.
- Mukerjee.S.M & Singh.S.P, *Organic Reaction Mechanism*, McMillan India Ltd., Chennai, 1990.
- Gurdeep R. Chatwal, “Organic chemistry of Natural products”, Volume I & II Himalaya Publishing House, New Delhi, 2009

PCHM302 INORGANIC CHEMISTRY- III

Semester : III
Category : Core VIII
Class&Major : II-M.Sc Chemistry
Objectives

Credit : 4
Hours/week : 5
Total hours : 65

To enable the students

- Know about the application of Nuclear Chemistry in various fields
- Understand the properties & applications of f-block elements.
- Interpret the spectra for Inorganic compounds.

UNIT-I The Chemistry of Lanthanides and Actinides

12Hrs

Lanthanides and actinides - Occurrence, isolation Position in the periodic table, lanthanide contraction, oxidation state, color, spectral, magnetic characteristics, coordination numbers, stereochemistry, nuclear and non-nuclear applications.

UNIT-II Nuclear Chemistry-I

10 Hrs

Subatomic particle, isotope, isotone, isobar, nuclear forces, meson theory of nuclear forces, stability of the nucleons-N/P ratio and stability belt, liquid drop model, shell and combined model of the nucleus. Mass defects and Binding energy. Natural and artificial radioactivity. Radioactivity disintegration, Group displacement law, radioactive series, Trans uranium element.

UNIT-III Nuclear Chemistry-II

13 Hrs

Nuclear transmutation, classification of nuclear reactions- elastic, inelastic, spallation, capture, fission and fusion reaction, Q-value of nuclear fission, mechanism and fission bomb. Nuclear fusion-Mechanism, stellar energy and Hydrogen bomb. Modes of radioactive decay – detection and determination of activity by Cloud Chamber and Geiger Muller Counter. Nuclear reactors – Fast Breeder reactors, particle accelerators, Cyclotron and Synchrotron. Neutron Activation Analysis, isotopic dilution analysis, Dosimetry.

UNIT- IV Applications of Electronic and Microwave Spectroscopy

15 Hrs

Electromagnetic radiation, quantum mechanical approach - transition probabilities: Einstein coefficient, energies of atomic and Molecular transitions, Selection rule, Morse potential energy diagram, electronic transitions, polarized absorption spectra. Nature of absorption spectra, of transition metal complexes Basic concept, rotation spectra of simple inorganic compounds, Classification of molecules, rigid rotor model, effect of isotopic substitution on transition frequencies & intensities non rigid rotor, Stark effect nuclear and electron spin interaction.

UNIT- V Applications of Infrared Spectroscopy

15 Hrs

Molecular vibrations, force constants, Molecular vibrations and absorption of Infrared radiations Raman Spectroscopy, polarized Raman lines, Use of symmetry considerations to determine the no. of lines in IR and Raman Spectra, Spectra of gases, applications of Raman and Infrared spectroscopy. Selection rule in Inorganic structure determinations, Hydrogen bonding and infrared spectra, metal ligand and related vibrations

Text books:

- Arniker .H.J, “Nuclear chemistry”, wiley Eastern Co, II Edition , 2000.
- Wahid U.Malik, G.D.Tuli & R.D.Madan, “Selected Topics in Inorganic Chemistry”, S.Chand & Company Ltd., New Delhi,2010.
- Nakamoto. K, Infrared and Raman Spectra of Inorganic and Coordination Compounds, (5th edn.), John Wiley (1997).

Reference books:

- Maheshwar Sharma & Madhuri Sharma, “Nuclear chemistry”, Ane Books Pvt. Ltd, 2009.
- Pavia. Lampman, Kriz, Vyvyan, “Introduction to Spectroscopy”, 4th ed., cengage learning, 2009.
- Singh. G, “Chemistry of Lanthanides and Actinides”, Discovery publishing house, 200

PCHM303 PHYSICAL CHEMISTRY-III

Semester	: III	Credit	: 4
Category	:Core IX	Hours/Week	: 5
Class&Major	: II M.Sc Chemistry	Total Hours	: 65

Objectives:**To enable the students**

- acquire the fundamental knowledge in the spectroscopy
- Know about the function of the catalysts and its surface action and apply it for research work.

UNIT-I Surface Chemistry**13 Hrs**

Kinetics of surface reactions: Physical and chemical adsorption–adsorption isotherms–types of adsorption isotherms–Langmuir adsorption isotherm . B.E.T theory for multilayer adsorption–measurement of surface area – Mechanism of heterogeneous catalytic reactions. Adsorption coefficient and its significance.

UNIT-II Catalysis**13 Hrs**

Acid Base catalysis – mechanism of acid-base catalysed reaction – Catalysis by enzymes – rate of enzyme catalysed reactions – effects of substrate concentration, pH and temperature on enzyme catalysed reactions – inhibition of enzyme catalysed reactions.

UNIT–III Fundamentals of Spectroscopy

10 Hrs

Electromagnetic radiation, wave length, wave number, frequency, energy, Interaction of radiation with matter , absorption laws, measurement of absorption intensity, chromophore, auxochrome, absorption and intensity shifts, types of absorption bands and emission spectroscopy.

UNIT–IV Electronic Spectroscopy

14 Hrs

Electronic spectra of molecules: Born-Oppenheimer approximation, Franck-Condon Principle, selection rules, dissociation energy and dissociation products, per dissociation, spectrum of molecular hydrogen. Emission spectroscopy: fate of electronically excited molecules-dissociation, reemission, fluorescence, phosphorescence, emission spectra of molecules.

UNIT-V Rotational and Vibrational Spectroscopy

15 Hrs

The rotation of molecules, rotational spectra-rigid diatomic molecule, intensity of spectral lines, selection rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors. Polyatomic molecules-linear, symmetric and asymmetric top molecule. Stark effect.

Vibrating diatomic molecule: energy of diatomic molecules as simple harmonic oscillator- energy levels, vibrational transitions, selection rules; anharmonic oscillator-energy levels, selection rules, vibrational transitions. - Diatomic vibrating rotator: Born-Oppenheimer approximation, vibration of polyatomic molecules-fundamental vibrations, linear molecules, symmetric top and asymmetric top molecules.

Text books

- Banwell .C. N and McCash E. M., Fundamentals of Molecular states – Jablonski diagram – Radiative & Non- Radiative processes –Fluorescence, Chemiluminescence & Spectroscopy, 4th ed., Tata McGraw Hill, New Delhi, 2007.
- Atkins .P and J. de Paula, Physical Chemistry, 7th ed., Oxford University Press, Oxford, 2002.

Reference Books

- Raman. K. V, Gopalan .R and Raghavan. P. S, Molecular Spectroscopy, Thomson and Vijay Nicole, Singapore, 2004.
- Drago .R. S, Physical Methods in Chemistry; Saunders: Philadelphia, 2008.
- Gabor A. Somorjai Yimin Li, “Introduction to Surface chemistry and Catalysis”, 2nd ed., John Wiley & Sons, 2010

PCHM304 RESEARCH METHODOLOGY

Semester : III Credits : 3
Category : Core-X Hours/Week : 5
Class&Major : II M.Sc Chemistry Total hours : 65

Objective

To enable the students

- Understand the basic of research and utilization of it in future.
- Gain knowledge about the conventions of writing thesis.
- Apply the internet, e-sources and software in chemistry for thesis writing.

UNIT-I Literature Survey 13 Hrs

Nature and importance of research - aims, objective, principles and problems - selection of research problem - survey of scientific literature - primary and secondary sources - citation index for scientific papers and journals - patents.

UNIT-II Statistical Treatment of Analytical Data 13 Hrs

Statistical treatment of finite samples - the students test and F test - Criteria for rejection of an observation - the Q test, significant figures and computation rules - data plotting - least square analysis.

UNIT-III e- Resources 13 Hrs

Internet source- e Books, e- Journals, Special Website- Information and retrieving Chemical compound search.

UNIT-IV Chem Software 13 Hrs

Chem Spinks, Chem draw, Chem Window

UNIT-V Scientific Writing 13 Hrs

Conventions of writing - the general format - page and chapter format - use of quotations and footnotes - preparation of tables and figures - referencing - appendices - Revising editing and evaluating the final product - proof reading - Meanings and examples of commonly used abbreviations.

Text book

- Suresh Chandra, Mohit kr. Sharma, "Research Methodology", Alpha science, Oxford, 2013.

Reference book

- Anderson. J, Durston .H.M and Poole. M, "Thesis and assignment writing:", Wiley Eastern Ltd., (1970).

PCHR401 PHYSICAL CHEMISTRY PRACTICAL-I

Semester	: III & IV	Credit	: 6
Category	: Core Practical -III	Hours/Week	: 5+5
Class&Major	: II M.Sc Chemistry	Total Hours	: 130

Objective:

To enable the students

- Understand some theoretical concepts by experimental methods
- Interpret the results in accurate manner

Phase rule

- Binary system of Naphthalene & Biphenyl
- Binary system of Naphthalene & M-dinitrobenzene
- Three component System(CH_3COOH , H_2O & CHCl_3)

Kinetics

- Hydrolysis of Ester
- KI Vs $\text{K}_2\text{S}_2\text{O}_8$
- I_2 Vs CH_3COCH_3 (By Calorimetric method)
- Comparison of Strength of two Acids.

Partition Co-efficient

- Instability constant ($\text{KI}_3 = \text{KI} + \text{I}_2$)
- Strength of KI

Potentiometry

- Mixture of acids Vs Strong base
- FAS Vs $\text{K}_2\text{Cr}_2\text{O}_7$
- Determination of dissociation constant of weak acid
- Sparingly soluble salts BaSO_4 (concentration cell)

Conductometric

- Mixture of acids Vs NaOH
- Verification of Onsager's theory
- Degree of dissociation & dissociation constant of a weak electrolyte
- Determination of solubility of a sparingly soluble salts

Polarimeter

- Inversion of Sucrose

Text book

- Alexander Findlay and Kitcher. J.A, "Practical physical chemistry", Longmans, Green, 2010.

Reference book

- Shoemaker .D.P and Garland .C.W, "Experiment physical chemistry", 8th ed., Mc Graw- Hill, New York, 2009.

PCHM401 ORGANIC CHEMISTRY- IV

Semester : IV
Category : Core XI
Class&Major : II-M.Sc Chemistry

Credits: 4
Hours/Week : 5
Total Hours : 65

Objectives

To enable the students

- understand Pericyclic and Photochemical reactions.
- Applt the knowledge in rearrangements, reagents and stereochemistry of the reaction.

UNIT-I Photochemistry

15 Hrs

Absorption of Electromagnetic Radiation-Excited state,Types- Quantum yield - Jablonski diagram- Energy transfer and Photo sensitization- Inter system crossing- photochemical reactions-photo enolisation, cis-trans isomerisation, photo oxidation, sigmatropic, cope rearrangement, Norrish type I & II reactions.

UNIT-II Pericyclic Chemistry

13 Hrs

Introduction of pericyclic reactions - Conservation of molecular orbital Symmetry - Methods to explain Pericyclic reactions – Electrocyclic reactions (FMO Approach) - Cycloaddition – Cheletropic reactions - Sigmatropic Rearrangement - Correlation Diagram method

UNIT-III Molecular Rearrangement

12 Hrs

Introductory concept of rearrangements, migrating aptitude, memory effect. Pinacol – Pinacolone, Wager- Meerwein, , Favorski, Baeyer – Villiger, Wolf, Stevens (in cyclic systems) Von Richter rearrangements, Hoffman, Curtius, Lossen, Schmidt, Beckman,Benzil-Benzilic, Benzidine , Fries and cope rearrangement.

UNIT-IV Reagents for Oxidation and Reduction.

13 Hrs

CrO₃, peracids, Osmiumtetroxide, DDQ, Seleniumdioxide, DCC, DMSO, aluminium triisopropoxide, Diazomethane, LAH, NaBH₄, organoboranes, , NBS, LTA, Wittig reagent.

UNIT-V Retrosynthesis

12Hrs

An introduction to retero synthesis – Synthons, Synthetic equivalent, Umpolung-Target molecule, Functional group interconversion, Disconnection approach – One group disconnection – Disconnection of alcohols, olefins and ketones – Logical and illogical disconnection, Two group disconnection- 1,2 - 1,3 – 1,4- 1,5 and – Deoxygenated skeletons and dicarbonyls. Retero Diels Alder reaction , Reterosynthesis .

Text books

- Kalsi P.S, “Organic Reactions and their Mechanisms”, Third revised edition, New Age international Private Ltd, 2010.
- Jerry March, *Advanced Organic Chemistry*, 6th edition, John Wiley & Sons.NewYork, 2007.
- Ahluwalia .V.K, *Organic Reaction Mechanism*, 4th edition, Narosa Publishers,2011.

Reference books

- Coyle .J.D, *organic photo chemistry*-Wiley,1985
- Aggarwal. O.P, “ Reaction and Reagents in organic chemistry”, 4th edition, Goyle publications, 1998.
- Gaikwad .N.J, Chaudari R.Y, Patil V.R., *Retrosynthetic analysis and synthesis of drugs*, Nirali prakashan Publication.

PCHM402 INORGANIC CHEMISTRY – IV

Semester	: IV	Credit	: 4
Category	: Core XII	Hours/week	: 5
Class&Major:	II-M.Sc Chemistry	Total hours	: 65

Objectives

To enable the students.

- Understand the basic concept of supramolecular and green chemistry
- Acquire skill to interpret the spectra of NMR,EPR and NQR for inorganic compounds.

UNIT – I Applications of NMR Spectroscopy

15 Hrs

Chemical shift ,Spin Multiplicity, Coupling constant, Spin- spin splitting , Dependence of J on dihedral angle – Vicinal and geminal coupling constants , Karplus equation , long range coupling constants, ring currents, diamagnetic anisotropy, high resolution NMR spectra of simple molecules. Basic theory of FT–NMR, Relaxation , Broad band decoupling, Off resonance decoupling and chemical shifts of common functional groups, DEPT spectra, Identification of small compounds based on NMR data. 2D Techniques:1H – 1H COSY, 1H – 13C COSY –and NOESY.

UNIT–II Applications of EPR Spectroscopy

12 Hrs

Electron spin resonance: g value– factors affecting the magnitude of g- values , hyperfine structure, ESR of organic free radicals, ESR of inorganic ions, ESR of simple free radicals in solutions.

UNIT-III Applications of NQR and Mossbauer Spectroscopy**14 Hrs**

NQR Spectra of transition metal complexes, metal hyperfine anisotropic spectra. Zero-field splitting, applications. Massbauer-Principles, isomer shift, quadrupole effect of magnetic field, Magnetic hyperfine interactions, Applications of the technique to the studies of (i) bonding and structures of Fe^{2+} and Fe^{3+} compounds including those of intermediate spin, (ii) Sn^{+2} and Sn^{+4} compounds, nature of M-L bond, coordination number, structure and (iii) detection of oxidation state.

UNIT-IV Supramolecular Chemistry**12Hrs**

Metallocenes- Electronic structure and bonding in ferrocene- synthesis – physical and spectroscopic properties of metallocenes- reactions and applications of metallocenes- multiple decker sandwich complexes- application of metallocenes in polymers- non-linear optics- medicine- molecular recognition– catalysis.

UNIT-V Green Chemistry**12 Hrs**

Introduction –Needs and Principles of Green chemistry-Planning of Green synthesis in a chemical lab-Reactions of Green Chemistry- Acyloin condensation using Co Enzyme,thamime-Aldol condensation of Silyl Enol Ethers in Aqueous media-Bonbier reaction under Sonication-Application-PTC Catalysed synthesis of flavones - preparation of green chemistry-6-hydroxy Carbonyl-3,5-diphenyl-2-cyclohexanone-Solvent less reactions-Microwave reactions-Enzymatic Transformations-Sonification reactions. Sustainable living-Wind Mill, solar energy.

Text Books

- Parish. R. V, *NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry*, EllisHorwood, New York (1990).
- Ahluwalia .V.K and Varma, “Text book of Green Chemistry”, 3rd ed., Ane Books Pvt. Ltd.2013

Reference Books

- Drago .R. S, *Physical Methods in Chemistry*, Saunders College Publishers (1977).
- Banwell. C. N & McCash. E. M, *Fundamentals of Molecular Spectroscopy*, Tata McGraw-Hill, New Delhi (2006).
- Gokel. W, “Advances in Supramolecular Chemistry”, Vol.7, Jai press INC,2000

PCHM406 PHYSICAL CHEMISTRY-IV**Semester : IV****Credit : 4****Category :Core XIII****Hours/Week : 5****Class&Major : II M.Sc Chemistry****Total Hours : 65****Objectives:****To enable the students**

- Understand the principles of magnetic and Quadrupole resonance spectroscopy and mass spectrometry.
- Apply the the knowledge of electroanalytical techniques in industries.

UNIT-I Principles of Magnetic Resonance Spectroscopy **15 Hrs**

Theory of NMR spectroscopy: nuclear spin and magnetic nuclei, nuclear magnetic moment, behavior of a bar magnet in a magnetic field, the NMR transition, relaxation mechanisms. Parameters of NMR- measuring the chemical shift , shielding and deshielding of magnetic nucleus, FT and two dimensional NMR spectroscopy - FIDs, Fourier transformation of ^{13}C , ^{19}F , ^{31}P NMR-range of chemical shift values.

Electron paramagnetic resonance spectroscopy: theory of EPR spectroscopy, the position of ESR absorption, g –factor, hyperfine splitting , double resonance in ESR, techniques in ESR.

UNIT - II Principles of Quadrapole Resonance Spectroscopy **15 Hrs**

Principle of NQR spectroscopy: nuclear charge distribution and quadrapole moment , quadrapole nucleus and its interaction with electric field gradient , nuclear orientations, the asymmetry parameter , quadrapole transitions in spherical and axially symmetric fields, quadrapole energy levels, field gradient. NQR spectra: effect of magnetic field on the spectra, relationship between electric field gradient and molecular structure.

Principles of Mössbauer spectroscopy: Doppler shift , recoil energy, experimental technique- sources, absorber, calibration.- Mössbauer spectra: isomer shift , quadrapole splitting, magnetic hyperfine interaction, chemical applications- isomer shift and quadrapole splitting in iron complexes.

UNIT –IV Macromolecules **12 Hrs**

Polymerization in homogeneous and heterogeneous phases- Kinetics of polymerization (Ionic and Addition)-kinetics of copolymerization- Mechanism of Polymerization- Chain Initiation- Propagation - Termination-Transfer -Inhibition and Retardation. Properties of polymers : Molecular weight of polymers - Mw, Mn determination - Light Scattering, Ultra centrifuge - Gel Permeation Chromatography.

UNIT- IV Principles of Mass Spectrometry **10 Hrs**

Basic Principles and theory – Instrumentation – Limitation and modification - Molecular ion – metastable ion – General fragmentation Modes – determination of molecular formula - McLafferty rearrangement – nitrogen rule

UNIT-V Electro Analytical Techniques **13 Hrs**

Polarography – theory, apparatus, DME, diffusion, Kinetic and catalytic currents, current-voltage curves for reversible and irreversible systems, Qualitative and quantitative application to inorganic systems. Amperometric titrations- theory, apparatus, types of titration curves, biamperometry, applications. Cyclic Voltammetry – theory, instrumentation, application to inorganic systems.

Text books

- Banwell .C. N and McCash .E. M, Fundamentals of Molecular Spectroscopy, 4th ed., Tata McGraw Hill, New Delhi, 2007.
- Drago. R. S, Physical Methods in Chemistry; Saunders: Philadelphia, 2008.
- Allen J. Bard and Israel Rubinstein, “Electroanalytical chemistry”, vol.22, Marcel Dekker, 2004.

Reference Books

- Atkins. P and J. de Paula, Physical Chemistry, 7th ed., Oxford University Press, Oxford, 2002.
- Raman .K. V, Gopalan .R and Raghavan .P. S, Molecular Spectroscopy, Thomson and Vijay Nicole, Singapore, 2004.
- Weil .J. A, Bolton .J. R and Wertz .J. E, Electron Paramagnetic Resonance; Wiley Interscience: 1994.
- Jiang .P.N, “Electro analytical chemistry Research development”, Nova science publishers, Inc, 2007.

PCHE101 CONSUMER CHEMISTRY

Semester : I
Category : Non-Major Elective
Class&Major : I PG

Credit : 4
Hours/Week : 5
Total Hours : 65

Objectives:

To enable the students

- Impart the knowledge of chemistry of daily consumer products and needs.
- Provide the basic knowledge of chemistry involved in leather & Sugar industries.
- Instill the knowledge of chemistry involved in batteries & dairy chemistry.

UNIT-I Batteries and Capacitors

13 Hrs

Primary batteries – Principles (Anode, Cathode, Electrolyte and its electrochemistry) . Daniel Cells - Dry Cells – Alkaline primary batteries-button cells. Secondary Batteries – Lead acid batteries (tubular and sealed) Ni-Cd batteries. Application of primary and secondary batteries Capacitors – principles, function and its applications.

UNIT –II Leather Chemistry

13 Hrs

Introduction – Composition of Leather - Tanning process – pretanning process (soaking, wetting , Liming and pasting , Deliming , Bating, Pickling , Depickling .) Types & classification of- vegetable tanning - Mineral Tanning - synthetic Tanning – Principles, process, application , of Dyeing and dye fixation –Treatment of tannery effluents – Activated sludge treatment .

UNIT–III Soaps and Detergents

13 Hrs

Soap: Definition – General consideration in soap making – manufacture of soap – toilet and transparent soaps. **Dyes:** Definition – classification of dyes – Based on chemical constitution

– and Mode of Applications – Examples for each Class - uses .**Detergents:** Definition – classification of face active agents – anionic detergents - - cationic detergents – shampoo – raw materials.

UNIT-IV Sugar Chemistry and Bio-Technology

13 Hrs

Sugar Chemistry :Cane Sugar- manufacture of white crystalline sugar-extraction of juice from fibre-lime defection process-clarification by sulphanation and carbonisation-crystallisation-sugar manufacture flow diagram.

Biotechnology:Definition-environmental biotechnology – biotransformation – biodegradation-synthesis of bioorganic acids-citricacid–uses of citric acid. Bioremediation-types, approaches, advantages, disadvantages.

UNIT-V Dairy Chemistry

13 Hrs

Definisation-composition-pasturisation-sterllisation-homogenisation-components of milk-milk products(cream, butter, ghee, ice-cream, milk powder & kova)-grades of milk(Ultra heat treatment)- skimmed milk,cream milk.

Text Books

- Sudha P.N., Dinesh Karthik .A, *Industrial Chemistry*, Supra Associates, Vellore, 2008.
- Sudha P.N, *Applied Chemistry*, Supra Associates, Vellore, 2008.

Reference Books

- Puri, Sharma, Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., Jalanthar, 2004.
- Jayashree Ghosh, *Fundamental Concepts of Applied Chemistry*, S.Chand, New Delhi,2008.

PCHE102 INDUSTRIAL CHEMISTRY

Semester : I

Credit : 5

Category : Non-Major Elective

Hours/Week : 5

Class&Major : I PG

Total Hours : 65

Objectives:

To enable the students

- Impart the knowledge of chemistry involved in preparation of paints, pigments & dyes.
- Enlighten students about the chemistry involved in ceramics for polymer industries.
- Provide the knowledge of chemistry involved in drugs, glasses & composites.

UNIT-I**13 Hrs**

Paints: Paint – definition – classification of paints based non their applications – constituents –Requisites of a good paint

Pigments: Definition – composition, characteristics and uses of white lead, Zinc oxide Lithopone and TiO_2 – Blue pigments – Ultra marine blue – characteristics – uses. Red pigments– red lead –characteristics and uses. Green pigments – chrome green, Guigwet’s green and chromium oxide – characteristics and their uses.

Varnishes: Definition – constituents of varnish – characteristics of a good varnish – uses – Japans varnish. Enamel – definition – Types – Ingredients and uses.

UNIT-II**13 Hrs**

Ceramics: Definition, classification of ceramics, general properties of ceramics – permeable (porous) and impermeable (non porous wares) – Basic raw material – Manufacture - applications of colour to pottery.

Glass : Definition – physical and Chemical properties of glass – raw materials – Manufacture - types of glasses.

Cement: Raw materials – Portland cement – composition – types of Portland cement – Manufacture –Uses of Cement – Cement Raw Materials in India – Growth of Cement Industry in India.

UNIT-III**13 Hrs**

Industrial Polymer: Natural rubber , synthetic rubbers rayons protein fiber,Nylons 6,6, polyethylene vinyls,moulding of plastics ,casting of films, calendaring,polypropylene ,polystyrene, polyacrylonitrile, polymethyl methacrylate, polyesters ,resins , composites FRP (Fiber reinforced plastics).

UNIT – IV**13 Hrs**

Drugs: Definition sources of drugs – some important drugs – aspirin – phenacetin – paracetamol – penicillin – chlormycetin – (structure and preparation not necessary)

Organic diagnostic reagents – definition – uses – sodium diatrizoate, phenol red Evans blue, Indigo carmine, methylene blue, xylose, Histamine and sodium benzoate (structure and preparation not necessary) – uses.

Organic pharmaceuticals acids – Definition – preservatives – antioxidants – flavouring agents – coloring agents – sweetening agents - Emulsifying agents and stabilising agents – examples for each class – uses (structure and preparation not necessary)

UNIT – V**13 Hrs**

Refractories : Introduction, Classification – Properties – Manufacture – Fire clay bricks – manufacture –Uses

Adhesives: definition – classification of adhesives – animal glue – preparation- uses – protein adhesives - starch adhesives – preparation – uses.

Enamels: Introduction - Raw Materials – Manufacture and Applications

Explosives: Definition – Classification – Characteristics of explosives – Nitro cellulose, T.N.T. Picric acid, Gun Powder, Cordite and Dynamite.

Text Books

- Charabarthi. B.N ,*Industrial Chemistry*, 1st Edition, Oxford and IBH Publishing. New Delhi,2002.
- Sharma .B.K, *Industrial Chemistry*, 1stEdition, Goel Publication, Meerut. 1983,

Reference Books

- Gowariker .V.P and Viswanathan. N.V,*Polymer Science*, 1stEdition, Wiley Easter Pvt. Ltd., New Delhi, 2001.
- Ghosh, Jayashree ,*Text Book of Pharmaceutical Chemistry*, 3rdEdition, S.Chand & Co. Ltd., New Delhi, 1999.
- Lakshmi. S,*Pharmaceutical Chemistry*, 3rdEdition, Sultan Chand & Sons, New Delhi, 1995.
- Krishnamoorthy, P. Vallinayagan & K. Jaya Subramanian,*Applied Chemistry*, 2ndEdition, Tata MaGraw-HillPublishing Co. Ltd., New Delhi,2001.

PCHE201 ENVIRONMENTAL SCIENCE

Semester :II

Category : Non-Major Elective

Class&Major : I PG

Objectives:

To enable the students

Credit : 4

Hours/Week : 5

Total Hours : 65

- Impart the knowledge of Environmental impact in the society
- Create the awareness of environmental effects & remedial measures.
- Provide the basic knowledge of chemistry involved in environment.

UNIT-I Ecology

13 Hrs

Ecosystem ; Biome & ecosystem ; Energy flow through the ecosystem ; Food chain& webs ; Ecological pyramids ; Biological Magnification Hydrologic Cycle, carbon cycle, oxygen cycle, nitrogen cycle, phosphorus cycle, sulphur cycle,forest ecosystem,

UNIT-II Energy Resourse

13 Hrs

Global Energy Consumption ,Conventional sources of energy for Man- kind, Biomass or Dried organic matter, Fossil Fuels or Coal , Oil and Natural gas, Nuclear energy – NuclearPower Generation ,The Potential of Fusion Reaction, Hydro Electric power. The Dependence of Human Society on Fossil Fuels. Non –Conventional energy sources . Alternative sources of energy for man -kind ,Wind power , Energy from oceans - Tidal Energy,, Energy of waves,hermal energy of oceans. Geo – thermal energy . Direct use of solar energy ,Bio- mass based energy- Bio –gas, petroplants, Dendrothermal Energy. Hydrogen as the future fuel.

UNIT-III Pollution by Hydro Carbon

13 Hrs

Oil spills, Natural oil seeps , Problem Associated with crude petroleum pollution ; -Light and medium Fraction of crude oil . Heavier Fraction , Greases ,Waxes and Tar. Ecological

problems caused by crude Petroleum, Fate of crude petroleum in marine environment, Oil spill Cleaning operations.

UNIT-IV Solid Waste Management

13 Hrs

Management of solid wastes Resistant to Degradation ;(1) Handling of the problem of Leachates (2) Disposal of solid wastes Resistant to Degradation (i) Incineration (ii) Pyrolysis and verification of solid wastes (iii) Microbial Degradation (iv) Sorting and Recycling of solid wastes resistant to degradation.

UNIT – V Science of Environment

13 Hrs

Introduction , Method of Expressing , Pollutant concentration , Particle Dispersion, Stoichiometry, Acid – Base Reaction , Colloids , Mass balance Reactor for waste Treatment, Basics of Microbiology, Environmental Quality Objective, Policies on Development project and their impacts.

Text Books

- Asthana .D.K & Meera Asthana, *Environment: Problems and solutions*, S. Chand & company, New Delhi, 2002.
- Benny Joseph, *Environmental studies*, Tata McGraw Hill, New Delhi, 2002

Reference Book

- *Environmental Studies*, Bharathidasan University Pub, Trichy, 2008.
- Rajamannar, *Environmental Studies*, Evr College Pub, Trichy. 2004
- Kalavathy.S., *Environmental Studies*, Edition 2004, Bishop Heber College Pub, Trichy, 2008.

PCHE202 APPLIED CHEMISTRY

Semester : II
Category : Non-Major Elective
Class & Major : I PG

Credit : 5
Hours/Week : 5
Total Hours : 65

Objectives:

To enable the students

- Provide basic knowledge in chemistry involved in daily life
- Impart the knowledge of food and nutrition
- Instill the knowledge of chemistry in involved in pharma drugs

UNIT-I

13 Hrs

General survey of chemicals used in everyday life. Cosmetics –talcum power, tooth paste, Shampoo, Nail polish, perfumes, Soaps and detergents, - General formation and preparation – hazards of cosmetic use.

UNIT – II **13 Hrs**

Food and nutrition – carbohydrates, proteins, fats, minerals and Vitamins – Definition, sources and their physiological importance – balanced diet. Adulterants – in milk, ghee, oil, coffee powder, tea, asafoetida, chilli powder, pulses and turmeric powder – identifications.

UNIT – III **13 Hrs**

Chemicals in food production – Fertilizers in used in natural sources – Fertilizers – urea, NPK and super phosphates – needs, uses and hazards

UNIT- IV **13 Hrs**

Plastics, polyethene, PVC, Bakelite, Poly esters, resins – properties and applications. Natural Rubber, synthetic rubber- vulcanization – definition and its applications – Color chemicals used in food – soft drinks- and its health hazards.

UNIT – V **13 Hrs**

Pharmaceutical drugs – analgesics and antipyretics – antibiotics – definition, examples and its applications. Antiseptics – disinfectants, definition, examples and applications. Explosives – classification and its examples.

Text Books

- Sharma B.K, *Industrial Chemistry*, 1stEdition, Goel Publication, Meerut.1983.
- Charabarthi B.N., *Industrial Chemistry*, 1stEdition., Oxford and IBH Publishing, New Delhi,2001.

Reference Books

- Gowariker V.P. and Viswanathan N.V, *Polymer Science*, 1stEdition, Wiley Easter Pvt. Ltd., New Delhi, 1997.
- Ghosh, Jayashree, *Text Book of Pharmaceutical Chemistry*, 3rd Ed., S.Chand & Co. Ltd., New Delhi,1999.
- Krishnamoorthy, P. Vallinayagan & K. Jaya Subramanian *Applied Chemistry*, 2nd Ed., Tata MaGraw-HillPublishing Co. Ltd., New Delhi,2001.

RESEARCH DEPARTMENT OF MATHEMATICS

With effect from batch 2012-2015 onwards

Preamble

UG: Course profile, list of courses offered to other departments & the syllabi of revised courses offered in fourth to sixth semesters.

COURSE PROFILE B.Sc. (Mathematics)

Semester	Part	Category	Course code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
I	I	Language	UTAL103/UTAL104/UHIL101/UFRL101	Basic Tamil I/ Advanced Tamil-I/ Hindi-I / French-I	4	2	3
	II	English	UENL105/ UENL106	Basic English-I/ Advanced English-I	4	2	3
	III	Core 1	UMAM101	Algebra and Trigonometry	6	5	5
	III	Core 2	UMAM102	Calculus	6	5	5
	III	Allied	UMAA 109	Mathematical Statistics – I	6	5	5
	IV	Value Education			2	1	1
	IV	Soft Skill	USKS101/ USKS102	Communication skills / Effective communication skills	2	1	1
TOTAL					30	21	23
II	I	Language	UTAL203/UTAL204/ UHIL201/UFRL201	Basic Tamil II/ Advanced Tamil-II/ Hindi-II /French-II	4	2	3
	II	English	UENL205/ UENL206	Basic English II/ Advanced English II	4	2	3
	III	Core 3	UMAM203	Vector Analysis, Laplace transform and Fourier Series	5	5	5
	III	Core 4	UMAM202	Analytical Geometry of 3D	4	4	4

	III	Allied	UMAA 207	Mathematical Statistics – II	5	4	4
	IV	Non Major Elective			4	2	2
	IV	Value Education			2	1	1
	IV	Soft Skill	USKS201/ USKS202	Spoken English/ Presentation skills	2	1	1
	V	Extension Programme/Physical Education			-	1	2
TOTAL					30	22	25
III	I	Language	UTAL303/UTAL304/ UHIL301/UFRL301	Basic Tamil III/ Advanced Tamil-III/ Hindi-III /French-III	4	2	3
	II	English	UENL305/ UENL306	Basic English III/ Advanced English III	4	2	3
	III	Core 5	UMAM302	Differential Equations	4	4	4
	III	Core 6	UMAM303	Statics	4	4	4
	III	Allied	UCSA 303	Mathematical Programming in C	3	3	3
	III	Allied Practical	UCSR305	Mathematical Programming in C Practical	3	2	2
	IV	Non Major Elective			4	2	2
	IV	Value Education			2	1	1
	IV	Soft Skill	USKS301	Personality development	2	1	1
TOTAL					30	21	23
IV	I	Language	UTAL403/ UTAL404/ UHIL401/ UFRL401	Basic Tamil IV/ Advanced Tamil-IV/ Hindi-IV/French-IV	4	2	3

	II	English	UENL405/ UENL406	Basic English IV/ Advanced English IV	4	2	3
	III	Core 7	UMAM402	Graph Theory	4	4	4
	III	Core 8	UMAM403	Dynamics	5	5	5
	IV	Allied	UPHA402	Electronics (for Mathematics Major)	3	3	3
		Allied Practical	UPHR404	Electronics Practical (for Mathematics Major)	2	2	2
	IV	Non Major Elective			4	2	2
	IV	Value Education			2	1	1
	IV	Soft Skill	USKS401	Life Coping skills	2	1	1
	V	Extension programme/ Physical Education			-	-	2
TOTAL					30	22	26
V	III	Core 9	UMAM501	Modern Algebra	5	5	5
	III	Core 10	UMAM505	Sequence And Series	4	4	4
	III	Core 11	UMAM506	Number Theory	4	4	4
	III	Allied	UCSA507	Object Oriented Programming Using C++	3	3	3
		Allied Practical	UCSR508	Object Oriented Programming Using C++	3	2	2
	III	Allied Optional			5	4	4
	IV	Non Major Elective			4	2	2
	IV	Soft Skill	USKS501	Job Skills	2	1	1
TOTAL					30	25	25
VI	III	Core 12	UMAM602	Complex Analysis	5	5	5

		Core 13	UMAM604	Linear Algebra	5	5	5
	III	Core 14	UMAM606	Discrete Mathematics	4	4	4
	III	Core 15	UMAM607	Real Analysis	5	5	5
	III	Core 16	UMAM 608	Operations Research	4	4	4
	III	Major optional	UMAO604	MAT lab for Beginners	3	4	4
MAT lab for Beginners Practical				2			
UMAO 605			Numerical Methods with C++	3	4	4	
			Numerical Methods with C++ practical	2			
III	Comprehensive Viva			-	1	1	
IV	Soft Skill	USKS601	Career Skills	2	1	1	
V	Extension programme/ Physical Education			-	-	2	
TOTAL					30	29	31
GRAND TOTAL					180	140	153

COURSES OFFERED TO OTHER DEPARTMENTS-UG

ALLIED & ALLIED OPTIONAL

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
I		Allied & Allied Optional	UMAA108	Mathematical Methods I	6	5	5
			UMAA102	Algebra, Differential Calculus and Trigonometry	5	5	5
			UMAA204	Fundamentals of Mathematics	5	5	5
			UMAA210	Mathematics for computer Science	6	4	4
			UMAA214	Business Mathematics	4	4	4
			UMAA216	Mathematical Methods II	6	5	5
III			UMAA306/ UMAA102	Algebra, Differential Calculus and Trigonometry	6	5	5
IV			UMAA404	Resource Management Techniques	5	4	4
			UMAA406/UMAA202	Integral Calculus, Laplace transform & Ordinary differential Equation	5	5	5
V			UMAA510	Quantitative techniques for Business	5	5	5
		UMAA512	Discrete Mathematical Structures	5	4	4	

Non-Major Elective

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
II	IV	Non Major Elective	UMAE204	Basic Mathematics for Science	4	2	2
III	IV	Non Major Elective	UMAE304	Numerical Methods	4	2	2
IV	IV	Non Major Elective	UMAE402	Operations Research for Managers	4	2	2
V	IV	Non Major Elective	UMAE504	Basics for TANCET Preparation	5	2	2

UMAM402 GRAPH THEORY

Semester: IV	Credit	: 4
Category: Core VII	Hours/Week	: 4
Class & Major :II B.Sc Mathematics	Total hours	: 52

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 **8 Hrs**

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

Chapter 1: Section 1.1-1.5.

Unit-II PATHS & CYCLES **8 Hrs**

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

Chapter 2: Section 1.6, 1.7, 1.8.

Unit-III TREES **12 Hrs**

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

Chapter 2: Section 2.1, 2.2, 2.3, 2.5.

Unit-IV CONNECTIVITY **13Hrs**

Connectivity – Blocks – Euler tours – Hamiltonian Cycles –The Chinese Postman Problem.

Chapter 3: Section 3.1, 3.2

Chapter 4: Section 4.1, 4.2, 4.3.

Unit-V MATCHINGS & COLORINGS **11 Hrs**

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

Chapter 5: Section 5.1, 5.2

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.
- Robin J.Wilson “*Introduction to Graph theory*”, Fourth edition, Dorling Kindersley (India) Pvt. Ltd., licensee of Pearson Education in South Asia, New Delhi, 2007

UMAM403 DYNAMICS

Semester: IV	Credits	: 5
Category: Core VIII	Hours/Week	: 5
Class & Major: II B.sc Mathematics	Total Hours	: 65

Objectives**To enable the students**

- Understand the basic concepts of Dynamics.
- Identify the reason for dynamic changes in the body.
- Apply laws, principles, postulates governing the dynamics in physical reality.

Unit I: RECTILINEAR MOTION 13 hrs

Work, Conservative field of force, Energy, Power, Simple Harmonic Motion, Harmonic Motion, Simple Harmonic Motion along a Horizontal line, Simple Harmonic Motion along a Vertical Line.

Chapter 11: sec 11.1-11.3, Chapter 12, sec 12.1-12.4.

Unit II: PROJECTILE 16 hrs

Forces on a Projectile, Displacement as a combination of vertical and horizontal displacements, Nature of trajectory, Results Pertaining to the motion of the Projectile, Maximum Horizontal range, Two Trajectories with a given speed and range, Projectile Projected Horizontally-Projectile projected on an inclined plane – Maximum range on an inclined plane.

Chapter 13: sec 13.1, 13.2.

Unit III: IMPACT 12 hrs

Impulsive force, Impact of spheres, Impact of two smooth spheres, Impact of a smooth sphere on a plane, Oblique impact of two smooth spheres.

Chapter 14: sec 14.1-14.5.

Unit IV: CENTRAL ORBITS 12 hrs

Central force, Examples, Central Orbit, Differential equation of a central orbit, Law of a central force, nature of orbit, Examples.

Chapter 16: sec 16.1, 16.2.

Unit V: MOMENT OF INERTIA**12 hrs**

Moment of Inertia of circular ring, Right circular hollow cylinder, circular lamina, solid right circular cylinder, solid sphere, solid right circular cone, spherical shell, Rectangular lamina, Elliptic lamina, perpendicular and parallel axis theorems, Examples.
Chapter 17: sec 17.1.

Text Book

- Duraipandiyar, P., Laxmi Duraipandiyar and Muthamizh Jayapragasam, Mechanics, S.Chand & Co., New Delhi-2006.

Reference Books

- Venkataraman, M.K.: Dynamics, Agasthier Book Depot, Trichy, 1990.
- Chatterjee, P.N., Dynamics, A.Rajahans Publications, 19th Edition, Meerut, 1996.
- Loney, S.I., Elements of Dynamics, Macmillan India, Delhi, 1982.

UMAM505 SEQUENCE AND SERIES**Semester : V****Credit : 4****Category : Core X****Hours/Week : 4****Class & Major: III B.sc Mathematics****Total Hours : 52****Objectives:****To enable the students**

- Understand the various limiting behaviour of sequences and series.
- Analyse the types of sequences and series and apply in various tests.

Unit-I: FUNCTIONS**10 Hrs**

Functions – Real valued functions – Equivalence – Countability and Real numbers – Least Upper Bound.
Chapter I: Sec: 1.4 to 1.7

Unit-II: SEQUENCES**10Hrs**

Definition – Subsequence – Limit of a Sequence – Convergent Sequence – Divergent Sequence – Bounded Sequence
Chapter II: Sec :2.1 to 2.5

Unit-III : SEQUENCES (CONTD)**10 Hrs**

Monotone Sequence - Operations on Convergent Sequence Operations on Divergent Sequence – Limit Superior and Limit Inferior – Cauchy Sequence
Chapter II: Sec :2.6 to 2.10

Unit-IV :SERIES**12 Hrs**

Series : Convergence and Divergence – Series with Non- negative terms – Alternating Series – Conditional Convergence and Absolute Convergence - Rearrangement of Series
Chapter III: Sec: 3.1 to 3.5

Unit-V :SERIES AND METRIC SPACES**10 Hrs**

Tests for Absolute Convergence-Series whose terms form a nonincreasing sequence - Limit of a function of the real line – Metric Space – Limits in Metric Spaces.
Chapter III : Sec: 3.6 & 3.7
Chapter IV: Sec:4.1 to 4.3

Text Book:

- R.Goldberg “*Methods of Real Analysis*”,Oxford & IBH Publishing Co. New Delhi, 2000.

Reference Books:

- Tom M. Apostol “ *Mathematical Analysis*”, 2nd Edition, Addison – Wesley New York, 1974.
- Bartle,R.G.and Shebert “*Real Analysis*”,John Wiley and Sons Inc.,New York, 1976.
- Malik,S.C. and Savita Arora “*Mathematical Analysis*”,Wiley Eastern Limited New Delhi,1991.
- Sanjay Arora and Bansi Lal, “*Introduction to Real Analysis*”,Satya Prakashan,New Delhi,1991.

UMAM 506 NUMBER THEORY**Semester : V****Credits : 4****Category : Core XI****Hours/Week : 4****Class & Major : III B.Sc Mathematics****Total Hours : 52****Objectives:****To enable the students**

- Acquire basic knowledge in Number System.
- Apply the properties of various functions of Number System.
- Apply the concepts of Number theory in the field of Algebra and Cryptography.

Unit-I THE FUNDAMENTAL THEOREM OF ARITHMETIC**10 Hrs**

Introduction – Divisibility - Greatest common divisor - Prime numbers – the fundamental theorem of arithmetic - the of series of reciprocals of the primes – the Euclidean algorithm - the greatest common divisor of more than two numbers.
Chapter-1. Section:1.1-1.8.

Unit-II ARITHMETICAL FUNCTIONS**10 Hrs**

Introduction – The mobius function $\mu(n)$ – the Euler totient function $\phi(n)$ – A relation connecting ϕ and μ – A product formula for $\phi(n)$ – the Dirichlet of arithmetical functions – Dirichlet inverses and the mobius inversion formula - Multiplicative functions - Chapter-2. Section:2.1-2.9.

Unit-III DIRICHLET MULTIPLICATIONS**12 Hrs**

Multiplicative functions and Dirichlet Multiplication -The inverse of a completely multiplicative function - Liouville's function - The division function-Generalised convolutions - Formal power series - The bell series of an arithmetical functions - Bell series and Dirichlet multiplication. - Derivatives of arithmetical functions - The Selberg identity . Chapter-2. Section:2.10-2.19.

Unit -VI CONGRUENCES**10 Hrs**

Congruences - Defn and basic properties of congruences – Linear congruence - Reduced residue systems and the Euler-Fermat theorem - polynomial congruences modulo p Lagrange theorem - Application of Lagrange's theorem - Simultaneous linear congruences - The Chinese remainder theorem - applications of the Chinese remainder theorem. Chapter-5. Section:5.1-5.8.

Unit-V QUADRATIC RESIDUES AND DIRICHLET SERIES**10 Hrs**

Quadratic residues and the quadratic reciprocity lemma - Evaluation of $(-1/p)$ and $(2/p)$ - Gauss lemma - The quadratic reciprocity law - introduction - The half-plane of absolute convergence of a Dirichlet series - The function defined by a Dirichlet series - Multiplication of Dirichlet series. Chapter-9. Section:9.3-9.5 Chapter-11. Section:11.1-11.4.

Text Book:

- Tom M.Apostol "*Introduction to Analytic Number Theory*"Springer-Verlag New York 2000.

Reference Books:

- Neal Koblitz, "*A Course in Number Theory and Cryptography*", Springer – Verlag, New York, 1987.
- John Stillwell "*Elements of Number Theory* , Springer – Verlag, New York, 2006.
- Ivan Niven, Herbert S. Zuckerman, Hugh L. Montgomery ,"*An Introduction to the Theory of numbers* ", 5th Edition, Wiley India 2008.

UMAM606 Discrete Mathematics

Semester	: VI	Credits	: 4
Category	: Core XIV	Hours/Week	: 4
Class & Major	: III B.sc Mathematics	Total Hours	: 52

Objectives:

To enable the students

- Know the concepts of automation and Boolean algebra.
- Apply Automata formal Languages in compiling and complexity theory.
- Apply Boolean Algebra in logic circuits.

Unit I - LOGIC 10 hrs

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.

Chapter 9, Sec 9.1-9.8

Unit II - NORMAL FORMS 10 hrs

Replacement process, Functionally Complete sets of Connectives and Duality Law, Normal Forms-Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Normal forms-Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms.

Chapter 9, Sec 9.9-9.12

Unit III LATTICES 10 hrs

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

Chapter 10, Sec 10.1-10.4

Unit IV BOOLEAN ALGEBRA 10 hrs

Boolean Algebras, Boolean Polynomials, Karnaugh Map, Switching Circuits.

Chapter 10, Sec 10.5-10.8

Unit V AUTOMATA THEORY 12 hrs

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.

Chapter 12, Sec 12.1-12.10.

Text Book:

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

Reference Books:

- Sundaresan.V.Ganapathy Subramanian.K.S & Ganesan.K “*Discrete Mathematics*” A.R.Publications, 1996.
- Seymour Lipchitz, Ph.D. Marc Lars Lipson, Ph.D. “*Discrete Mathematics*”, New Delhi, Tata McGraw-Hill Publishing Company Limited 1999.
- Richard Johnsonbaugh, “*Discrete Mathematics*”, Addison Wesley 2001.

UMAM607 REAL ANALYSIS

Semester: VI	Credit	: 5
Category: Core XV	Hours/Week	: 5
Class & Major: III B.sc Mathematics	Total Hours	: 65

Objectives:**To enable the students**

- Understand the concepts of Connectedness, Completeness and Compactness.
- Understand Riemann integration and apply it in problem solving.

Unit-I : CONTINUOUS FUNCTIONS ON METRIC SPACES 14 hrs

Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space - Open Sets – Closed Sets

Chapter V: Sec: 5.1 to 5.5

Unit-II: CONNECTEDNESS, COMPLETENESS 13Hrs

More about open sets – Connected sets - Bounded Sets and Totally Bounded Sets – Complete Metric Spaces

Chapter VI: Sec: 6.1 to 6.4

Unit-III: COMPACTNESS 13Hrs

Compact Metric Spaces – Continuous Functions on Compact Metric Spaces – Continuity of Inverse Functions – Uniform Continuity.

Chapter VI : Sec: 6.5 to 6.8.

Unit-IV: RIEMANN INTEGRATION 13 Hrs

Definition of the Riemann Integral – Existence of Riemann integral(Statement only)- Properties of the Riemann Integral – Derivatives – Rolle’s Theorem – The Law of the Mean – Fundamental Theorem of Calculus.

Chapter VIII : Sec 7.2 to 7.8 (omit 7.3)

Unit-V: IMPROPER RIEMANN INTEGRATION & SEQUENCES OF FUNCTION 12 Hrs

Improper integrals - Pointwise convergence of sequences of functions – Uniform convergence of sequence of functions – Consequences of uniform convergence.

Chapter VII : Sec 7.9 & 7.10

Chapter VIII : Sec 9.1 to 9.3

Text Book:

- Richard Goldberg “*Methods of Real Analysis*”, Oxford & IBH Publishing Co. New Delhi, 2000.

Reference Books:

- Tom M.Apostol “*Mathematical Analysis*”, 2nd Edition, Addison-Wesley publishing Company Inc. New York, 1974.
- Bartle, R.G. and Sherbert “*Real Analysis*”, John Wiley and Sons Inc., New York, 1976.
- Malik, S.C. and Savita Arora “*Mathematical Analysis*”, Wiley Eastern Limited, New Delhi, 1991.
- Sanjay Arora and Bansi Lal “*Introduction to Real Analysis*”, atya Prakashan, New Delhi, 1991.

UMAM 608 OPERATIONS RESEARCH

Semester : VI**Credits : 4****Category : Core XVI****Hours/Week : 4****Class & Major: III B.sc Mathematics****Total Hours : 52****Objectives:****To enable the students**

- Understand the basic techniques of optimization in linear programming problem.
- Employ the techniques in solving business and management oriented problems.
- Compare the optimization method and evaluate the method with best optimized outcome.

Unit-I LINEAR PROGRAMMING PROBLEM**12 Hrs**

Linear Programming problem - Mathematical formulation of the problem - Graphical solution method –Some Exceptional cases- General Linear Programming problem- Canonical and Standard forms of Linear Programming problem- simplex method problem- Computational procedure - simplex Algorithm.

Chapter 2 Section 2.1-2.4

Chapter 3 Section 3.1,3.2,3.4,3.5

Chapter 4 Section 4.1,4.3.

Unit-II DUALITY IN LINEAR PROGRAMMING**08 Hrs**

Artificial Variable techniques - Big - M method, Two phase method- Formulating Dual problem- Duality Theorems – Duality and Simplex Method – Dual Simplex Method.

Chapter 4 Section 4.4.

Chapter 5 Section 5.1,5.3,5.5,5.7,5.9.

Unit-III TRANSPORTATION AND ASSIGNMENT PROBLEM **10 Hrs**

Transportation problem - The Transportation Algorithm - Degeneracy in transportation problem-unbalanced transportation problem. The Assignment problem - The assignment algorithm, Simple problems.

Chapter 10 Section 10.1,10.2,10.3,10.5,10.6,10.8- 10.13,10.15

Chapter 4 Section 11.1 – 11.4.

Unit-IV GAME THEORY **10 Hrs**

Game Theory - Two persons Zero sum game - The maximin minimax principle - Saddle points - Games without saddle points - Mixed Strategies - Graphical solution of $2 \times n$ and $m \times 2$ games - Dominance property.

Chapter 17 Section 17.1 – 17.7

Unit-V QUEUING THEORY, CPM and PERT **12 Hrs**

Queuing Theory - Basic concepts - Steady state analysis of M/M/I system with finite and infinite capacities. Network scheduling by CPM /PERT - project network diagram - Critical path method [CPM] - PERT Computations. Simple problems only.

Chapter 21 Section 21.1 – 21.5(Upto Model III).

Chapter 25 Section 25.1 – 25.7.

Text Books :

- Kanti Swarup, Gupta P.K.and Manmohan , “*Operations Research*”, Sultan Chand & Sons,Delhi ,2010.

Reference Books :

- J.K.Sharma, “*Operations Research: Theory and Applications*”, macmillan,Delhi, 2001.
- Ravindran A., Philips D.T. and Solberg J.J., “*Operation Research*”, John Wiley & Sons.,New York, 1987.
- Taha H.A., “*Operations Research*”, Macmillan publishing Company, New York, 2003.

UMAO 604 MATLAB FOR BEGINNERS

Semester	: VI	Credit	: 4
Category	: Major Optional	Hours/Week	: 5
Class & Major:	III B.sc Mathematics	Total Hours	: 65

Objectives

To enable the students

- Understand the fundamental concepts of MATLAB software.
- Apply the software in the field of calculus and Linear algebra.

Unit I MATLAB BASICS **13 Hrs**

Input and Output-Recovering from problem-Algebraic or Symbolic Computation-Vectors and Matrices- Functions- Managing Variables- Graphics.

Chapter 2 page number 7-26

Unit II SCRIPT FILES IN MATLAB **14 Hrs**

The MATLAB Interface-M-files- Loops – Presenting Results-Fine Tuning M-Files- Programs in Algebra and Arithmetic.

Chapter 3 page number 27-44

Unit III DATA FUNCTIONS AND MATRICES IN MATLAB **14 Hrs**

Data Classes-Functions and Expressions-More about M-Files-Complex Arithmetic-More on Matrices-Doing Calculus with MATLAB.

Chapter 4 page number 45-58.

Unit IV MATLAB GRAPHICS **10 Hrs**

Two dimensional plots-Three dimensional plots-Figure windows.

Chapter 5 page number 59- 68.

Unit V MATLAB GRAPHICS CNTD... **14 Hrs**

Customizing Graphics-Images, Animations and sounds-Programs using Calculus, Graphics and Linear Algebra.

Chapter 5 page number 69-85.

Text Book

- Brian R.Hunt , Ronald L.Lipsman and Jonathan M.Rosenberg “ A Guide to MATLAB” Cambridge University Press , 2006.

UMA0605 NUMERICAL METHODS WITH C++

Semester	: VI	Credit	: 4
Category	: Major Optional	Hours/Week	: 5
Class & Major:	III B.sc Mathematics	Total Hours	: 65

Objectives:

To enable the students

- Understand the basics of C++ programming and Numerical methods.
- Solve the Numerical problems using C++ programming.

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 ITERATIVE METHODS 13 Hrs

Introduction-Beginning an iterative method-The method of successive bisection-The method of false position-Newton-Raphson iterative methods-The secant method-The methods of successive approximation.

Text Book 2 Chapter 3 Section 3.1-3.7

Unit III SYSTEM OF LINEAR EQUATIONS 13 Hrs

Gauss Elimination method-Pivoting methods-Illconditioned equations-Refinement of the solution obtained by Gaussian elimination–Gauss-Seidal iterative Method.

Text Book 2 Chapter 4 Section 4.1-4.6

Unit IV INTERPOLATION, DIFFERENTIATION AND INTEGRATION 15 Hrs

Lagrange interpolation-Difference tables-Truncation errors interpolation-Spline interpolation-Formula for numerical differentiation-Numerical integration.

Text Book 2 Chapter 5 Section 5.1-5.5 Chapter 7 Section 8.2,8.3

Unit V NUMERICAL SOLUTION OF DIFFERENTIAL EQUATION 14 Hrs

Simpson's rule-Euler's method-Taylor series method-Runge-Kutta method-Runge-Kutta fourth order formula-Predictor-corrector method-Higher order differential equations.

Text Book 2 Chapter 8 Section 8.4 Chapter 9 Section 9.2-9.7.

Text Book

- Balagurusamy E. "Object Oriented Programming with C++" , Tata Mcgraw Hill Publishing Company Ltd., New Delhi, 1996.
- Rajaraman.V " Computer Oriented Numerical Methods" Third Edition , Prentice Hall of India Private Limited , New Delhi 2001.

Reference Books

- James M.Ortega Andrew S.Grimshaw, "An introduction to C++ and Numerical Methods" Oxford University press , Newyork, 1999.
- Jain M.K , Iyengar S.R.K and Jain R.K , "Numerical Methods for Scientific and Engineering Computation" , Second Edition , Wilsey Eastern Ltd.New Delhi.
- Froberg C.E, "Introduction to Numerical Analysis" , Second edition Addison-Wesely Publication Company,1992.

UMAA512 DISCRETE MATHEMATICAL STRUCTURES

(All Science departments & BCA except Mathematics)

Semester	: V	Credits	: 4
Category	: Allied Optional	Hours/Week:	5
Class & Major	: III UG	Total Hours	: 65

Objectives:

To enable the students

- Learn about basic concepts of graph theory, coding theory and automata theory.
- Develop the logical skills of applied Mathematics.
- Apply discrete mathematics in real life application such as time table, error correction, automation.

Unit-I LOGIC **13 Hrs**

Statement and Notation, Connectives - Conjunction, disjunction, negation, Statement Formulas and Truth tables, Conditional and Bi-Conditional, Atomic and Compound statements,, Well formed Formulae ,Tautology , Equivalence of Formulae, Duality Law.
Chapter 9: Sec 9.1-9.5, 9.7, 9.8, 9.10

Unit-II NORMAL FORMS **12 Hrs**

Normal Forms- Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Normal Forms- Principal Disjunctive Normal Forms , Principal Conjunctive Normal Forms.
Chapter 9: Sec 9.11, 9.12

Unit-III CODING THEORY **10 Hrs**

Introduction, Hamming Distance, Encoding a Message, Group Codes, Procedure for Generating Group Codes, Decoding and Error Correction, An Example of Simple Error Correcting Code.
Chapter 8: Sec 8.1-8.7

Unit-IV GRAPH THEORY **15 Hrs**

Graph-Basic Definition, Subgraph, Graph Isomorphism, Some special cases of Graphs, Paths, Cycles and Connectedness, Matrix Representation of a Graph, Incidence Graph, Path Matrix
Chapter 11: Sec 11.1, 11.2

Unit-V AUTOMATA LANGUAGES AND COMPUTATIONS **15 Hrs**

Introduction-Finite Automata, Definition of Finite Automation, Representation of Finite Automation, Acceptability of a string by a Finite Automation, Language accepted by a Finite Automation, Non-deterministic Finite Automata, Acceptability of /string by Non- deterministic Finite Automata, Equivalence of FA and NFA, Procedure for finding an FA equivalent to a given NFA.
Chapter 12: Sec 12.1-12.10.

Text Book:

- Dr.Venkatraman.M.K., Sridharan.N.,Chandrasekaran.N., “*Discrete Mathematics*”, The National PublishingCompany, Chennai 2012.

Reference Books:

- Bernard Kolman, Robert C.Busby, Sharon Ross, “*Discrete Mathematical Structures*”, Prentice Hall of India, New Delhi, 2002.
- Narsingh Deo, “*Graph Theory with Applications to Engineering and Computer Science*”, Prentice Hall of India Private Limited, New Delhi, 2001.

UMA504 - BASICS FOR TANCET PREPARATION**Semester: V****Credit : 2****Category: Non Major Elective****Hours/Week : 5****Class & Major: III UG****Total Hours : 65****Objectives:**

- To help students in their studies and to improve their knowledge.
- To prepare the students to face the exacting testing standards of entrance test.

Unit I QUANTITATIVE ABILITY**12 Hrs**

Number System: Number Base system – BODMAS – HCF / LCM. G.P/ A.P: Problems solving for n terms – Average – ratio and proportion – Percentage – Time, Speed and distance – Work and Time – Profit and Loss.

Unit II ANALYTICAL REASONING AND GENERAL INTELLIGENCE**12 Hrs**

Classification type questions – Square, Circular etc., based seating and placing arrangements base puzzles – comparison type question – Sequential order of things – Basic series of numbers – Age Sum – Diagram Identification – Odd one out – Statement Analysis – Blood relationship test.

Unit III ANALYTICAL AND LOGICAL REASONING**8 Hrs**

Selection based on given conditions – family based puzzles – Jumbled problems.

Statement arguments: Statements and two arguments - Statements and three arguments - Statements and four arguments. **Statement Assumptions:** Statements and two assumptions - Statements and three assumptions. **Statement – Courses Of Action:** Statement and two courses of action - Statement and two courses of action

Unit IV AWARENESS OF SOCIO ECONOMIC ENVIRONMENT**10 Hrs**

Theatre – Airlines – Awards and Recognition – Sports – Environmental Standards – Political Science – Companies,Products,Nations Books and authors – Markets.

Unit V COMPUTER AWARENESS

10 Hrs

Operating system and system software: Process Management – Storage Management- I/O Systems. Software engineering methodologies: Software Product And Process- Software Requirements Managements – Requirement Engineering – Elicitation, Analysis, Requirements Developments And Validation. Database Management Systems: Relational Model- Database Designs- Implementation Techniques- Distributed Database-Object Oriented Database , Object Relational Database.

Text Book :

- Dr. Aggarwal.R.S, *Quantitative Aptitude*, S.Chand & Company Ltd, New Delhi, 2012.

Reference Book:

- *MBA Entrance guide* – Career launcher edition, Vikas publication, New Delhi, 2009.
- *MBA Entrance Competition Success Review*, Sura Publications Pvt.Ltd, New Delhi, 1997.
- Ramaswamy .E.S., *TANCET MBA* Anna University, Sura College of Competition, 2009.
- Lal & Jain, *MBA admission test*, Upkar's Publications, 2009.

DEPARTMENT OF PHYSICS

Preamble

U.G: Course Profile, list of courses offered to other departments and the syllabi of courses offered in the fourth, fifth and sixth semesters are presented in this booklet (With effect from batch 2012-2015 onwards)

COURSE PROFILE: B.Sc. (Physics)

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
I	I	Language	UTAL103/ UTAL104/ UHIL101/ UFRL101	Basic Tamil-I / Advance Tamil-I/ Hindi/ French	4	2	3
	II	English	UENL105/ UENL106	Basic English-I/ Advance English-I	4	2	3
	III	Core I	UPHM103	Mechanics	5	5	5
	III	Core-II	UPHM104	Thermal and Statistical Physics	5	5	5
	III	Core Practical-I	UPHR101	Mechanics and Thermal Physics Practical	3	2	2
	III	Allied-I	UMAA102	Algebra, Differential Calculus and Trigonometry	5	5	5
	IV	Value Education			2	1	1
	IV	Soft Skill	USKS101/ USKS102	Communication skills/ Effective Communication skills	2	1	1
TOTAL					30	23	25
II	I	Language	UTAL203/ UTAL204/ UHIL201/ UFRL201	Basic Tamil-II / Advance Tamil-II/ Hindi/ French	4	2	3
	II	English	UENL205/ UENL206	Basic English-II/ Advance English-II	4	2	3
	III	Core –III	UPHM202	Properties of Matter & Acoustics	3	3	3
		Core – IV	UPHM203	Mathematical Physics	3	3	3
	III	Core Practical-II	UPHR202	Properties of Matter and Acoustics Practical	3	2	2
	III	Allied	UMAA202	Fundamentals of Mathematics	5	5	5
	III	Internship	UPHI201	Summer Internship	-	-	1
	IV	NME			4	2	2
	IV	Value Education			2	1	1

	IV	Soft Skill	USKS201/ USKS202	Spoken English /Presentation Skill	2	1	1
	V	Extension programme /Physical education			-	1	2
TOTAL					30	22	26
III	I	Language	UTAL303/ UTAL304/ UHIL301/ UFRL301	Basic Tamil-III / Advance Tamil-III/ Hindi/ French	4	2	3
	II	English	UENL205/ UENL206	Basic English-III/ Advance English-III	4	2	3
	III	Core –V	UPHM302	Optics & Laser Physics	5	5	5
	III	Core practical-III	UPHR302	Optics and Laser Physics Practicals	3	2	2
	III	Allied	UCHA301	Chemistry for Physics I	3	3	3
	III	Allied practical	UCHR302	Volumetric & Organic Analysis I	3	-	-
	IV	NME			4	2	2
	IV	Value Education			2	1	1
	IV	Soft Skill	USKS301	Personality Development	2	1	1
TOTAL					30	18	20
IV	I	Language	UTAL403/ UTAL404/ UHIL401/ UFRL401	Basic Tamil-IV / Advance Tamil-IV/ Hindi/ French	4	2	3
	III	English	UENL405/ UENL406	Basic English-IV/ Advance English-IV	4	2	3
	III	Core – VI	UPHM402	Electricity and Magnetism	5	5	5
	III	Core Practical –IV	UPHR404	Electricity and Magnetism Practical	3	2	2
	III	Allied	UCHA401	Chemistry for Physics – II	3	3	3
	III	Allied Practical	UCHR404	Volumetric & Organic Analysis –II	3	4	4
	III	Internship	UPHI401	Summer Internship	-	-	1
	IV	NME			4	2	2
	IV	Soft Skill	USKS401	Life Coping Skills	2	1	1
	IV	Value Education			2	1	1
	V	Extension Programme/Physi			-	-	2

		cal Education					
TOTAL					30	22	27
V	III	Core – VII	UPHM501	Quantum Mechanics and Relativity	5	5	5
	III	Core – VIII	UPHM505	Basic Electronics	5	5	5
	III	Core –IX	UPHM506	Numerical Methods with C	6	6	6
	III	Core Practical-V	UPHR501	Electronics Practical – I	3	3	3
	III	Allied Optional			5	4	4
	IV	NME			4	2	2
	IV	Soft Skill	USKS501	Job Skills	2	1	1
TOTAL					30	26	26
VI	III	Core-X	UPHM608	Solid State Physics	5	5	5
	III	Core-XI	UPHM606	Atomic & Molecular Physics	5	5	5
	III	Core-XII	UPHM607	Digital Electronics and Microprocessor	5	5	5
	III	Core-XIII	UPHM603	Nuclear Physics	5	5	5
	III	Core Practical –VI	UPHR604	Electronics Practical – II	3	3	3
	III	Core Optional	UPHO601/ UPHO602/ UPHO603	Nanophysics/ Astrophysics/Applied Optics	5	4	4
	III	Viva voce	UHSC601	Comprehensive viva voce	-	1	1
IV	Soft Skill	USKS601	Career Skills	2	1	1	
V	Extension Programme/Physical Education			-	-	2	
TOTAL					30	29	32
GRAND TOTAL					180	140	156

LIST OF COURSES OFFERED TO OTHER DEPARTMENTS

Class and Major	Semester	Category	Course code	Course title	Contact hrs/week	Credit	
						Min	Max
I B.Sc Chemistry	I	Allied I	UPHA101	Physics for Chemistry I	3	3	3
I B.Sc	I	Allied I	UPHR102	Physics for Chemistry	3	2	2

Chemistry				Practical I			
I B.Sc Chemistry	II	Allied II	UPHA202	Physics for Chemistry II	3	3	3
I B.Sc Chemistry	II	Allied II	UPHR203	Physics for Chemistry Practical II	3	2	2
II B.Sc Computer Science	III	Allied I	UPHA303	Digital Electronics	3	2	2
II B.Sc Computer Science	III	Allied I	UPHR303	Digital Electronics Practical	3	2	2
II B.Sc Mathematics	IV	Allied	UPHA402	Electronics (for Mathematics Major)	3	3	3
II B.Sc Mathematics	IV	Allied Practical	UPHR404	Electronics Practical (for Mathematics Major)	2	2	2

ALLIED OPTIONAL

Semester	part	Category	Course code	Course Title	Contact Hrs./week	Credit	
						Min	Max
V	III	Allied Optional	UPHO501	Conservation of Energy	5	4	4
			UPHO502	Laser for Medical Diagnosis	5	4	4
			UINT502	Nano science and its Applications	5	4	4

NON-MAJOR ELECTIVES

Semester	Category	Course code	Course Title	Contact Hrs./week	Credit	
					Min	Max
II	Non Major Elective	UPHE202/ UPHE203	Applied Physics/ Biomedical Instrumentation	4	2	2
III	Non Major Elective	UPHE302/ UPHE303	Physics for Competitive Exam/ Servicing & Maintenance of Home Appliances	4	2	2
IV	Non Major Elective	UPHE401/ UPHE402	Home electrical and Electronic Appliances/ Energy Sources	4	2	2
V	Non Major Elective	UPHE501/ UPHE502	Remote Sensing Techniques/ Communication System & Cell phone Servicing	4	2	2

UPHM402 ELECTRICITY & MAGNETISM

Semester: IV
Category: Core VI

Credit : 5
Hours/week : 5
Total Hours : 65

Objectives:

To enable the students

- understand basic laws & definition of electricity and Magnetism.
- Analyse inter-relationship between Electricity and Magnetism.
- apply the basic ideas to various concept of Electricity & Magnetism.

Unit-I: Electrostatics

13 Hrs

Electrostatic potential- Electric potential as line integral of electric field - Relation between electric potential and electric field in vector form - Poisson's and Laplace's equations – Capacitance - Spherical and cylindrical capacitor- Energy of a charged capacitor - Energy density - Loss of energy due to sharing of charges. Electrometers - Kelvin's attracted disc electrometer.

Unit-II: Current Electricity and Thermo Electricity

11 Hrs

Carey Foster Bridge - Theory - Determination of temperature coefficient of resistance. Calibration of ammeter and voltmeter using a potentiometer - Seebeck, Peltier and Thomson effects- Laws of thermoelectric circuits - Peltier coefficient- Thomson coefficient- Application of thermodynamics to a thermocouple and expressions for Peltier and Thomson coefficients - Thermoelectric diagrams and uses.

Unit- III: Chemical Effects and Magnetic Effects Of Electric Current

13 Hrs

Electrical conductivity of an electrolyte - Faraday's laws of electrolysis - Determination of specific conductivity of an electrolyte (Kohlraush bridge) – Gibbs-Helmholtz equation for the emf of a reversible cell- Calculation of emf of a Daniel cell- Helmholtz Galvanometer - Theory of moving coil Ballistic Galvanometer- Damping correction- Absolute capacitance of a capacitor.

Unit-IV: Electromagnetic Induction and Transient Currents

15 Hrs

Faraday's laws of electromagnetic induction in vector form- Determination of self-inductance by Anderson's bridge method and absolute mutual inductance by BG - Growth and decay of current in a circuit containing resistance and inductance. Growth and decay of charge in a circuit containing resistance and capacitor - Measurement of high resistance by leakage - Growth and decay of charge in a LCR circuit - Condition for the discharge to be oscillatory- Frequency of oscillation.

Unit-V: Magnetic Properties of Materials And Maxwell's Equations

13 Hrs

Susceptibility – Permeability - Intensity of magnetization and their relationship - Properties of dia, Para and Ferro magnetic materials- Langevin's theory of diamagnetism and paramagnetism- Weiss theory of ferromagnetism - Antiferromagnetism and ferrimagnetism. Maxwell's equations - Displacement current - Waves in free space - Poynting vector - Hertz experiment for production of electromagnetic waves.

Text Books:

- R. Murugesan, *Electricity and Magnetism*, S Chand & Co., New Delhi, 8th Edn, 2006.
- M Narayanamurthy & N Nagarathnam, *Electricity & Magnetism*, National Publishing Co., Meerut, 4th Edn. 2007.

Reference Books:

- Sehgal D L, Chopra K L, Sehgal NK, *Electricity & magnetism*, Sultan Chand & Sons, New Delhi, 6th Edn., 2007.
- Brijlal and Subramanian, *Electricity & Magnetism*, Ratan & prakash, Agra, 2006.
- K K Tewari, *Electricity & Magnetism*, S Chand & Co., 3rd Edn. 2001.

UPHR404 ELECTRICITY & MAGNETISM PRACTICAL**Semester: IV****Credit : 2****Category: Core Practical-IV****Hours/week : 3****Total Hours : 39****Objectives:****To enable the students**

- learn Electricity and Magnetism through direct experiments.
- Analyze the experimental errors various techniques of electricity and magnetism.
- Apply these techniques to make error free measurements.

1. Calibration of Low Range Voltmeter-Potentiometer.
2. Calibration of High Range Ammeter-Potentiometer.
3. Field along axis of the coil –Vibration Magnetometer.
4. Figure of a merit –Ballistic Galvanometer.
5. Determination of m and B_H –Tan C Position.
6. Self inductance of a coil –Anderson's Method.
7. Carey Foster's Bridge-Resistance and Specific Resistance.
8. Deflection Magnetometer Using Tan –A and Tan-B

Optional

1. Calibration of High Range Voltmeter-Potentiometer.
2. Calibration of Low Range Ammeter-Potentiometer.
3. Absolute Determination of Mutual Inductance-B.G.
4. Carey Foster's Bridge-Temperature Co-efficient

Text Books:

- .N.Srinivasan, S. Balasubramanian & R.Ranganathan, *The text book of Practical Physics*, Sultan Chand & sons 2006.

Reference Book:

- Prof. A. Ponnusamy & Prof. B. Amalanathan, *Practical Physics*, Bright Publishers.
- C.C. Ouseph, G. Rangarajan, *A text book of practical physics* Viswanathan Publisher- Part I, 1990

UPHM501 QUANTUM MECHANICS AND RELATIVITY**Semester: V****Credit : 5****Category: Core VII****Hours/week : 5****Total Hours : 65****Objectives:****To enable the students**

- make the students understand the basic concepts of Quantum Mechanics and fundamental postulates of Relativity.
- expose the students to the applications of Quantum Mechanics and Relativity.

Unit-I: Foundations of Wave Mechanics**11 Hrs**

Introduction – Inadequacy of classical mechanics – Dual nature of light and matter – De Broglie wavelength – Compton Effect – Experiments of Davisson-Germer and G.P. Thomson – The electron microscope - Heisenberg uncertainty principle- Applications of Uncertainty principle.

Unit-II: Schrodinger Equation**14 Hrs**

Schrodinger equation – Physical interpretation of wave function – Probability current density – Ehrenfest theorem – Eigen function and Eigen value- Eigen value equation – orthogonal eigenfunctions – reality of energy eigenvalue.

Unit-III: Applications of Schrodinger Equation**14 Hrs**

Free particle – Particle in a bound state – Eigen functions and eigenvalues of a particle in a rectangular potential – reflection and transmission co-efficient rectangular potential – particle in 1 –d well of finite depth – Bound states - One dimensional linear harmonic oscillator

Unit-IV: Special Theory of Relativity**13 Hrs**

Frames of references – Inertial frames and non-inertial frames – Galilean transformation – Michelson-Morley experiment – Interpretation of the results – Postulates of special theory of relativity – Lorentz transformation equations – Length contraction – Time dilation – transformation of velocities – Redefining momentum – Variation of mass with velocity – Mass – energy equivalence.

Unit-V: General Theory of Relativity**13 Hrs**

The conflict between Newtonian gravitation and special theory – General theory of relativity- Mach's principle – Definable features of a gravitation theory – Two approaches to general theory – Einstein's equations – A heuristic derivation – Principle of equivalence – Experimental tests of GTR: Gravitational Red shift – Planetary motion – Bending of light.

Text Books:

- P.M. Mathews and K. Venkatesan, *A Text book of Quantum Mechanics*, Tata Mc Graw – Hill, New Delhi, 2005.
- R.Murugesan, *Modern Physics*, S. Chand & Company Ltd., New Delhi, 2008.

Reference Book:

- Narlikar, *Lectures on General theory of Relativity*, Macmillan India Ltd., 2004.
- Ghatak and Loganathan, *Introduction to Quantum Mechanics*, Macmillan India Ltd., 2004.
- Arthur Beiser, *Concepts of Modern Physics*, McGraw Hill Education, 2006.

UPHM505 BASIC ELECTRONICS**Semester: V****Category: Core VIII****Class & major: III B.Sc physics****Objectives:****Credit : 5****Hours/week : 5****Total Hours : 65****To enable the students**

- introduce the various principles of analog electronics and its applications to various electronics instruments.
- provide a theoretical basis for the electronics experiments and the students will be doing in their practical sessions.

Unit-I: Semiconductor Devices**13Hrs**

Classification of solids in terms of forbidden energy gap – Effect of temperature on Fermi level – Semiconductor diode – Characteristics-Zener diode – Working and output characteristics voltage stabilization using zener diode– Transistor construction and working – Types of Biasing – Characteristics in CE ,CB,CC mode.

Unit-II: Rectifiers and Multivibrators**14 Hrs**

Half-wave and Full-wave Bridge rectifiers -Output and efficiency of full wave rectifier. Expressions for efficiency and Ripple factor – Application: Regulated power supply using Zener diode. Multivibrators – Types of multivibrators – Astable, Monostable, Bistable Multivibrator – circuit details and operations.

Unit-III: Circuit Analysis and Oscillators**15Hrs**

Network Analysis – Thevenin's , Norton's and Maximum Power Transfer theorems Wave-shaping circuits: Differentiating circuit – output waveforms – Integrating circuit – Output waveforms - Clipping and Clamping circuits – Types and applications. Fundamental principles of oscillators – concept of positive feedback – Types of oscillators – Hartley, Colpitts, Phase shift and Wien bridge oscillators - their analysis.

Unit-IV: Amplifiers and Power Electronics**13Hrs**

Voltage and power amplifiers – Classification of amplifiers – RC coupled amplifier – Frequency response curve – Power amplifier – Characteristics – Emitter follower. FET,MOSFET UJT and SCR – Construction and working – Output characteristics – parameters of FET – SCR as half and full wave rectifiers.

Unit-V: Operational Amplifiers**10Hrs**

Introduction – Characteristics of an ideal OP-AMP – CMRR – the slew rate – Inverting/Non-inverting Amplifiers - Adder and difference amplifiers - Differential amplifier – Integrator ,voltage follower, comparator.

Text Books:

- V.K. Metha, *Principle of Electronics*, S. Chand & Company Ltd., New Delhi. 2001
- R.S. Sedha, *A Text book of Applied Electronics*, S. Chand & Company Ltd., New Delhi, 2005.

Reference books:

- Theraja, B.L., *Basic Electronics*, S. Chand & Company Ltd., New Delhi, 2005.
- Gaykwad A., *Operational Amplifiers and Linear Integrated circuits*, Printice Hall of India Pvt., Ltd., May 1995.
- Jacob Millman and Christos C. Halkias, *Integrated Electronics*, Tata McGraw – Hill, New Delhi, 1991.

UPHM506 NUMERICAL METHODS USING C

Semester	: V	Credit	: 6
Category	: Core IX	Hours/Week	: 4T+2P
Class & Major	: III-B .Sc Physics	Total Hours	: 52+26

Objectives:**To enable the students**

- Acquire knowledge about fundamentals of C programming.
- Understand the solutions of numerical methods.
- Solve the problems in numerical & differential equations using C programming.

UNIT –I**10 Hrs**

C fundamentals: character set – Identifiers and keywords – data types – constants – variables – declaration – expression – statements. Operators and Expression: arithmetic operators – unary operators – relational and logical operators – assignment operators – conditional operators and library function.

UNIT -II**10 Hrs**

Data input and Output statements: getchar and putchar functions – scanf and printf function – more about scanf and printf functions. Control statements: if-else, while, do-while, for-nested control structure – switch – break –continue- comma operator – goto statement.

UNIT- III**10 Hrs**

Functions: definition – accessing and function – function prototype –passing argument to a function – recursion. Program structure: storage classes – automatic variables – external variables – static variable. Arrays: definition of array – processing array- passing array to function – multidimensional arrays – arrays and strings.

UNIT-IV

11 Hrs

Numerical solution of algebraic and transcendental equations: Least square fitting – curve fitting - The iteration method – Newton – Raphson method –Convergence and rate of convergence –Simultaneous linear algebraic equations - Gauss elimination method – Jordon’s modification – Gauss–Seidel method of iteration .

UNIT-V

11 Hrs

Numerical differentiation and integration: Newton’s forward and backward difference formula to compute derivatives – Numerical Integration: the trapezoidal rule, Simpson’s rule – **Numerical Solutions of ordinary differential equations:** Nth order ordinary differential equations -solutions of Taylor series – Euler’s method – Improved Euler’s method – Runge-Kutta method– second and fourth order – Runge- Kutta method for solving first order differential equations.

Lab exercises:

1. Write a C program to find whether the given number is odd or even.
2. Write a C program to find the largest of three numbers.
3. Write a C program to find the factorial of given number.
4. Write a C program to check whether the given string is palindrome or not.
5. Write a C program to evaluate integrals using Simpson’s and trapezoidal rules.
6. Write a C Numerical integration by Simpson’s rule with algorithm
7. Write a C program to solve Numerical solution of ordinary first order differential equation - Euler’s method.
8. Write a C program to solve Numerical solution of ordinary first order differential equations by the Runge-kutta method.
9. Write a C program to solve Curve fitting - Least square fitting.
10. Write a C program to solve Matrix manipulation - Multiplication Transpose and Inverse.

Text Books

- E.Balagurusamy, *Programming in ANSI C*, Fifth Edition, TMH Publishers, New Delhi, 2011.
- S.S. Sastry “*Introductory Methods of Numerical analysis*”, Fourth Edition, Prentice Hall of India, New Delhi, 2005.

Reference Books

- Ashok N. Kamthane, *Programming in ANSI C and Turbo C*, Fourth Impression, Pearson Education, New Delhi, 2008.
- E. Balagurusamy, *Numerical method*, 25th Reprint, Tata Mc Graw Hill, New Delhi, 2008.

UPHR501 ELECTRONICS PRACTICAL-I

Semester: V	Credit : 3
Category: Core Practical-V	Hours/week : 3
Class & major: III B.Sc physics	Total Hours : 39

Objectives:

To enable the students

- understand the theoretical concepts of electronics by actual experiments.
- design simple electronic circuits and make measurements.
- appreciate the significance of electronics in practical life.

1. VI-Characteristics of Zener Diode.
2. Characteristics of a Transistor in CE configuration
3. Full wave - Bridge rectifier
4. Voltage stabilization using Zener diode.
5. Operational Amplifier as Adder, subtractor, Inverting and Non-inverting amplifier.
6. Operational Amplifier as Integrator, Differentiator, and voltage follower.
7. Differentiating, Integrating, Clipping and clamping circuits.
8. RC coupled amplifier- Frequency Determination.

Optional

1. Half wave bridge rectifier.
2. Junction diode –Characteristics.

Text Books:

- N.Srinivasan, S. Balasubramanian & R.Ranganathan, *The text book of Practical Physics*, Sultan Chand & sons 2006.

Reference Book:

- Prof. A. Ponnusamy & Prof. B.Amalanathan, *Practical Physics*, Bright Publishers.
- C.C.Ouseph, G.Rangarajan, *A text book of practical physics* Viswanathan Publisher- Part I, 1990

UPHM606 ATOMIC AND MOLECULAR PHYSICS

Semester: VI	Credit : 5
Category: Core XI	Hours/week : 5
Class & major: III B.Sc physics	Total Hours : 65

Objectives:

To enable the students,

- acquire basic knowledge in fundamentals of Atomic and Molecular Physics.
- Analyze the particles present in components using various techniques spectroscopy.
- apply the techniques of molecular spectroscopy in research field.

Unit-I: Positive ray analysis & Atomic Models**15 Hrs**

Positive rays - Thompson parabola method –Critical potentials - Frank and Hertz’s experiment- Vector atom model – Quantum numbers associated with the vector atom model - Coupling schemes, Pauli’s exclusion principle - The Stern and Gerlach experiment.

Unit-II: The Photoelectric Effect**12 Hrs**

Photoelectric effect– Laws of photoelectric effect-Lenard’s experiment- Richardson and Compton experiment-Einstein’s photoelectric equation - Experimental verification by Millikan’s experiment - photo electric cell-types and its application.

Unit-III: Atomic Structure**14 Hrs**

Optical spectra - Spectral terms and their notations - Fine structure of sodium D-lines - Zeeman effect- Experiment - Expression for the Zeeman shift - Larmor’s theorem - Quantum mechanical explanation for the normal Zeeman effect - Anomalous Zeeman effect - Paschen Back effect - Stark effect.

Unit IV: Molecular Spectra**10 Hrs**

Introduction - Theory of pure rotational spectra, Theory of rotation-vibration spectra, Raman Effect, Experimental study, Raman Effect in solids, liquids and gases.

UNIT-V: Molecular Spectroscopy (Techniques and Instrumentation)**12 Hrs**

Infrared spectroscopy- Raman spectroscopy- ESR - experimental setup and simple applications. Semiconductor LASER, MASER–applications of LASER in communication, Dye and Semiconductor diode laser.

Text Books:

- R. Murugesan, *Modern physics* S.Chand & Co., 2008.

Reference Books:

- N.Subramaniam and Brij Lal., *Atomic and Nuclear physics*, S.Chand and Co., 2003.
- Colin N. Banwell, *Fundamentals of Spectroscopy*, C.N & McCash, Tata McGraw Hill publishing Co.Ltd. New Delhi, 4th edition, 1994.
- Gupta S.L. Kumar, V. Sharma R.C., *Elements of Spectroscopy*, Pragathi Prakashan, Meerut, 1983.

UPHM607 DIGITAL ELECTRONICS AND MICROPROCESSOR 8085**Semester: VI****Credit : 5****Category: Core -XII****Hours/week : 5****Total Hours : 65****Objectives:****To enable the students,**

- acquire knowledge about the basics of digital electronics and microprocessor.
- develop a simple real time programs using microprocessor 8085.

Unit-I: Fundamentals in Logic Gates

13 Hrs

Number system- binary number system-decimal to binary conversion-binary to decimal conversion-octal number system-hexadecimal number system - Codes - BCD code - ASCII code - Binary arithmetic - Binary addition – subtraction. AND, OR circuits using diodes - NOT using transistors - NAND, NOR and EXOR - functions and their truth tables. NAND & NOR as universal gates.

Unit-II: Boolean algebra and its Simplification

13Hrs

Boolean algebra - De Morgan's theorem and its circuit - Duality theorem, simplification of Boolean equations - Karnaugh map - pairs, quads, octets -Half adder - Full adder - Half subtractor - Full subtractor - Digital comparator - Parity checker.

Unit-III: Data Processing Circuits, Counters and Registers

13 Hrs

Multiplexers - Demultiplexers - Decimal to BCD Encoder -Flip - flops - RS Flip Flop - Clocked RS Flip-flop - D flip-flop - JK flip-flop - JK Master Slave flip-flop. Shift registers - counters - Asynchronous counter - Omitted states - Modulus counters - BCD counter - Up down counter - Synchronous counter- Decade counter - D/A converter - A/D converter .

Unit-IV: Introduction to Microprocessors and Programming techniques

4 Hrs

Introduction to Microcomputers - Microprocessors and Assembly Languages - Microprocessor 8085 – Internal architecture and its operations - - Programming techniques such as looping, counting and indexing - Addressing modes - Data transfer instructions - Arithmetic and logic operations - Dynamic debugging.

Unit-V: Assembly language Programming

2 Hrs

BCD to Binary and Binary to BCD conversions - BCD to HEX and HEX to BCD conversions - ASCII to BCD and BCD to ASCII conversions - BCD to Seven segment LED Code conversions - Binary to ASCII and ASCII to Binary conversions - Multibyte addition - Multibyte subtraction - BCD addition - BCD subtraction - Multiplication and division.

Books for study

- Malvino and Leech, *Digital Principles and Application*, 4th edition, Tata McGraw Hill, New Delhi, 2003.
- Fundamental of microprocessor 8085 by V. Vijayendran, S.Viswanathan Publishers, Chennai (2004).

Books for Reference

- R. S. Gaonkar, *Microprocessor Architecture, Programming and Applications with 8085/8080A*, Wiley Eastern limited -1990.
- Anokh Singh and A K Chhabra, *Fundamentals of Digital Electronics and Microprocessors*, 2nd edition, S Chand & Co. Ltd., New Delhi ,2005.
- V.K. Metha, *Principle of Electronics*, S. Chand & Company Ltd., New Delhi. 2001

UPHM608 SOLID STATE PHYSICS

Semester: V

Category: Core XIII

Class & major: III B.Sc physics

Objectives:

To enable the students

- understand the basic concepts of crystal structure and materials science.
- understand the mechanical properties of metals and electron theory of metals.
- acquire knowledge about X- Rays and XRD techniques.

Credit : 5

Hours/week : 5

Total Hours : 65

Unit-I: Crystal Structure

14 Hrs

Classification of solids – unit cell – Crystal lattice and basis- Seven classes of crystals – Bravais lattice - Miller indices – Symmetry operations – Point groups and space groups – Types of lattice (plane lattice with bcc and fcc). Structure of crystals: simple cubic, hcp, fcc and bcc. Examples: NaCl, Diamond and ZnS structures. Crystal imperfections – Types of imperfections.

Unit-II: Electron Theory of Metals

12 Hrs

Classical free electron theory – Draw backs of classical theory- Quantum theory of free electron- Sommerfeld's model for free electron (1D solids, generalization for 3D solids) - Electron energies in a metal – Band theory of solids - energy gaps – Density of states – Bands in conductors, insulators and semiconductors – Factors affecting electrical resistance of materials.

Unit-III (a) Classification of Materials

13 Hrs

Advanced materials and modern material structure - Types of bonds and their energies – Bond formation mechanism – Ionic and covalent bonds. Ceramics – thermal and electric properties – Uses.

(b) Mechanical Properties of Metals

Elastic deformation - Plastic deformation - Interpretation of tensile stress-strain curves – Yield criteria and macroscopic aspects of plastic deformation - Property variability and design factor

Unit-IV (a) X-Rays and XRD

13 Hrs

X-Rays - Absorption of X- Rays - X-Ray spectra - Diffraction of X-Rays by crystals – Bragg's law- Laue method - Rotating crystal method – Powder photographic method.

(b) Non destructive Testing

Radiographic method – Ultrasonic method. Equipments used for NDT –Electron microscope – Scanning electron microscope (SEM)

Unit-V: Magnetic Materials and Dielectrics

13 hours

Types of magnetic materials - Magnetic permeability, magnetization, susceptibility, electric current in atoms - Bohr magneton – Electron spin - Magnetic moment due to nuclear spin - Quantum theory of paramagnetism – Quantum theory of ferromagnetism, I-H curve. Magnetic moments due to electron spin – Ferromagnetism the domain structure – Soft and hard magnetic

materials. Polarization electronic, ionic, orientation and space charge polarization – temperature and frequency effects – electric break down – ferroelectric materials.

Text Books:

- R. B. Gupta, *Material Science for AMIE*, Umesh Publications, 2001.
- S. O. Pillai., *Solid State Physics*, Wiley eastern Ltd., 2005

Reference Books:

- Kittel C., *Introduction to Solid State Physics*, Wiley Eastern Ltd.,2003
- Raghavan. V, *Materials Science and Engineering a first course*, Prentice Hall of India (pact), 1990.

UPHR604 ELECTRONICS PRACTICAL-II

Semester: VI

Category: Core Practical -VI

Class & major: III B.Sc physics

Credit : 3

Hours/week : 3

Total Hours : 39

Objectives:

To enable the students

- understand the theoretical concepts of electronics by experiments.
 - Execute the simple real time programs using microprocessor 8085.
1. AND, OR, NOT – gates -Verification of truth tables.
 2. Universal Building Block NAND and NOR gates.
 3. Construction of half and full adders using NAND gate–(Truth table Verification)
 4. Construction of RS, JK and D Flip-flop.
 5. Construction of Modulus counters.
 6. Program for code conversion (BCD to Binary, Binary to BCD, BCD to Hex, Hex to BCD, ASCII to BCD and BCD to ASCII) using 8085.
 7. Program for single byte, mutibyte, BCD addition and subtraction using 8085.
 8. Program for multiplication and division using 8085.

Text Books:

- N.Srinivasan, S. Balasubramanian & R.Ranganathan, *The text book of Practical Physics*, Sultan Chand & sons 2006.
- Fundamental of microprocessor 8085 by V. Vijayendran, S.Viswanathan Publishers, Chennai (2004).

Reference Book:

- Ponnusamy & B.Amalanathan, *Practical Physics*, Bright Publishers.
- C.C.Ouseph, G.Rangarajan, *A text book of practical physics* Viswanathan Publisher- Part I,2005
- R. S. Gaonkar, *Microprocessor Architecture, Programming and Applications with 8085/8080A*, Wiley Eastern limited 1990.

UPHA402 ELECTRONICS (FOR MATHEMATICS MAJOR)

Semester: IV

Credit : 3

Category: Allied

Hours/week : 3

Class & Major: II-B.Sc (Maths)

Total Hours: 39

Objectives:

To enable the students

- Acquire knowledge about basics of digital electronics.
- Apply the basics of digital electronics to make simple circuits.

Unit-I: Semiconductor Devices

11Hrs

Semiconductor-types-intrinsic and extrinsic-p-type & n-type semiconductors-properties-pn junction diode- Zener diode characteristics-Zener diode as Voltage regulator.LED and its applications. Photodiode-Characteristics and application.

Unit-II: Transistor and Rectifier

8Hrs

Transistor -characteristics- common base – common emitter, common collector – RC coupled amplifier-filter circuit-half wave rectifier-full wave rectifier-Bridge rectifier- Photo transistor.

Unit-III: Operational Amplifiers

7Hrs

Introduction – Characteristics of an ideal OP-AMP – CMRR– Inverting/Non-inverting Amplifiers - Adder, subtractor, differentiator and integrator.

Unit-IV: Number System

7 Hrs

Number system-analog to digital signals-digital circuit-Number system: binary number system-decimal to binary conversion-binary to decimal conversion-octal number system-hexadecimal number system

Unit –V:Digital Electronics

6Hrs

Logic gates -AND, OR, NOT gate construction using diodes and transistors- NAND and NOR gates – Universal building blocks.XOR gate- Boolean algebra – Demorgan's theorem – verification - Basics of integrated circuit.

Text Books:

- V.K. Metha, *Principle of Electronics*, S. Chand & Company Ltd., New Delhi. 2001
- R.S. Sedha, *A Text book of Applied Electronics*, S. Chand & Company Ltd., New Delhi, 2005.

Reference books:

- B.L.Theraja, *Basic Electronics*. S. Chand & Company Ltd., New Delhi, 2005.
- A.Gaykwad, *Operational Amplifiers and Linear Integrated circuits*, Printice Hall of India Pvt., Ltd., May 1995.

UPHR404 ELECTRONICS PRACTICAL (FOR MATHEMATICS MAJOR)

Semester: IV

Category: Allied Practical

Class & major: II B.Sc physics

Objectives:

To enable the students

- Practice the theoretical concepts of electronics through direct experiments.
- Appraise the significance of electronics in practical life.

1. pn –junction diode characteristics.
2. Zener diode –VI characteristics.
3. Voltage stabilization using Zener diode.
4. Demorgan’s theorem –Verification using gates.
5. NAND and NOR as universal building block.
6. Op-Amp as inverting & non inverting amplifier.
7. Op-Amp as Adder and Subtractor.
8. Op-Amp as Integrator and Differentiator.

Optional

1. Half subtractor and full subtractor.
2. AND and OR gates using diodes.

Text Books:

- N.Srinivasan, S. Balasubramanian & R.Ranganathan, *The text book of Practical Physics*, Sultan Chand & sons 2006.
- C.C.Ouseph, G.Rangarajan, *A text book of Practical Physics*, S .Viswanathan Publisher- Part I, 1990

Reference Book:

- Ponnusamy & B.Amalanathan, *Practical Physics*, Bright Publishers.

UPHE404 ENERGY PHYSICS

Semester: IV

Category: NME

Class & Major: II U.G

Objectives:

To enable the students

- Acquire knowledge about energy sources and their types.
- Understand and analyze the need of energy sources.
- Apply the above knowledge to conserve energy sources in practical life.

Credit : 2

Hours/week : 2

Total Hours: 2

Credit : 2

Hours/week : 4

Total Hours : 52

UNIT – I: Energy Sources**11 Hrs**

Energy –Various forms of energy-energy resources- Renewable and non-renewable energy sources- Comparison between renewable and non-renewable energy sources –availability and statistical data of energy sources.

UNIT – II: Non Conventional Energy Sources**10 Hrs**

Renewable energy sources – Need for non conventional energy sources – solar energy – solar water heater – solar cooker – solar drier – solar cell – wind energy – wind energy conversion system (WECS). Geothermal energy

UNIT-III: Biomass and Tidal energy**10 Hrs**

Biomass energy –Different energy forms of biomass – Biogas generation -Principles Biomass energy - classification - Biomass conversion technologies - photosynthesis –Tidal Energy: ocean thermal energy conversion (OTEC) – energy from waves and tides.

UNIT-IV: Other Conventional Energy Sources**11 Hrs**

Gas electrical Power plant - diesel electric power plant. Nuclear energy- Principle construction and working of nuclear reactor - various types of nuclear reactor -merits and demerits of nuclear energy- Adverse impacts of non-Conventional energy sources –Global warming.

UNIT – V: Energy Consumption and Conservation**10 Hrs**

Conservation of energy – patterns of energy consumption in domestic, Industrial, transportation and agricultural sectors – energy crisis and possible solutions – energy options for the developing countries - energy storage and hydrogen as a fuel

Text Books:

- G.D.Rai “Solar energy utilization” Ed, V.1995.
- Solar energy - M P Agarwal – S. Chand & Co. Ltd.
- Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company

Reference:

- G.D.Rai, “Non Conventional Energy Sources”, Ed. IV 1997.
- Godfrey Boyle, ‘Renewable Energy : Power for a sustainable Future’, Alden Oess Limited – Oxford 1996.
- Jyoti Parikh, “Energy models for 2000 and beyond”, 1997, TATA McGraw Hill Publishing Company, New Delhi.

UPHE 503 COMMUNICATION SYSTEMS AND CELL PHONE SERVICING

Semester: V
Category: Non Major Elective
Class& Major: III U.G

Credits : 4
Hours/Week: 4
Total Hours: 52

Objectives:

To enable the students

- acquire knowledge about communication systems
- measure various problems occur in mobile phone.
- service mobile phone handset

UNIT – I: Radio Transmission Systems **11 Hrs**

Introduction – AM transmitters – FM transmitters – Tuned RF receiver- AM broadcast receivers – FM Super heterodyne receiver- Measurement of Receiver Performance.

UNIT – II: Television Systems **11Hrs**

Television basics –transmission-color television- color TV camera -Color TV Transmission-Color Television receiver-CCD Camera-Television transmitters- Television screens – CRT and LCD

UNIT –III: Fiber Optic Communication Systems **12 Hrs**

Total internal reflection and basics of fiber optic system – Optical Fibers – Types of optical fibers – Optical propagation theory (based on ray Optics) – Attenuation in Optical Fiber– Fiber selection – Fiber sources -Fiber fabrication– Cabling – Fiber connectors – Applications –internet, medicine – Fiber Optic Transmitters and receiver (Block diagram only)

UNIT - IV: Fundamentals of Cell phone **5 Hrs theory+ 3Hrs practical**

Introduction to GSM/CDMA - Concepts of GSM/CDMA Cellular Technologies - Working of GSM - Information of Cell Sites & Base Station -Call processing of a GSM – GPRS.
Practical: Disassembling the cell phone - Battery problems – display – Antenna Problems – Network problems – SIM Card problems – SMD soldering.

UNIT – V: Trouble shooting **7 Hrs theory+3 Hrs practical**

Causes for various problems & troubleshooting of problems in mobile phone - Network Problems - Display Problems - SIM Card Problems- Charging problems - Battery problems - Software Unlocking - Software Flashing - IMEI information.

Practical: Downloads of logos & Ring tones - Problems related to mobile phone handsets - replacement of various components-ICS

TEXT BOOKS:

- Anokh Singh, Principles of Communication Engineering, S. Chand and Company Ltd., First Edition, Reprint 2001.
- Cell Phone Servicing, Prof B.Kanickairaj, Department of Physics, SJC.

Reference Books:

- JK Franz & VK Jain, Optical Communications – Components and Narosa publishing House Pvt. Ltd. I Edition, Reprint 2005.

UINT502 NANO SCIENCE AND ITS APPLICATION

Semester: V

Credit : 4

Category: Interdisciplinary

Hours/week : 5

Class and Major: III UG

Total Hours : 65

Objectives:

To enable the students

- Understand basic ideas of Nanoscience and Nanotechnology.
- Analyze the characterization of Nano materials.
- Apply the Nano technology in various fields.

UNIT – I: Nanoscience and Nanotechnology

13Hrs

Introduction-Nanoscience and nanotechnology- Length, energy, and time scales of Nanoscale systems- Nanoparticle- Nanoclusters –OD Nanostructures (quantum dots), 1 D Nanostructures (quantum wires), Concepts of 2D and 3D nanostructures (quantum wells), Nanotubes-Single walled and Multi walled Nanotubes (SWNT and MWNT)

UNIT – II: Basic properties of Nanoparticles

12 Hrs

Size effect and properties of Nanoparticles – Particle size – Particle shape–Mechanical property – Electrical properties – Magnetic properties – Optical property of Nanoparticle- Top down and Bottom up approach.

UNIT-III: Synthesis of Nanomaterials

15 Hrs

Introduction-precipitative methods-reactive method in high boiling point solvent-hydrothermal and solvothermal methods-gas phase synthesis of semiconductor nano particles-water based gold nano particles synthesis –organic solution based synthesis-sonochemical methods and microwave methods.

UNIT – IV: Characterization and Application of Nanostructured Materials

12 Hrs

- Scanning electron Microscopy (SEM) - Atomic force microscopy (AFM) -UV spectroscopy- X-ray diffraction- Application of Nanomaterials - Nanocatalysis, Nanocomputers, and Nano robots.

Unit-V: Application of Nanotechnology

13 Hrs

Application of Nanotechnology in Agriculture, Medicine, and Biotechnology. Cancer - Characteristics of tumor tissues, current approaches to its cure through nano particles, Site specific drug delivery of chemo-therapeutic agents using nano particles.

Text Books:

- Hari Singh Nalwa, *Nanostructured materials and nanotechnology*, Concise Edition, Editor: Academic Press, USA (2002).
- Charles Poole, *Introduction to nanotechnology*, A Wiley Interscience Publication, 2003

Reference Books:

- A.S Edelstein, *Nanomaterials Synthesis properties and applications*, Editor: A.S Edelstein, IOP Publishing, UK (1996).
- G. Timp, *Nanotechnology*, AIP press, Springer-Verlag. Editor, New York, 1999

