

KAKATIYA UNIVERSITY, WARANGAL - 506 009
B.Sc. PROGRAMME
Under CBCS System
Scheme wef A.Y: 2019-20

FIRST YEAR

SEMESTER - I

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS101	AECC-1	Environmental Science	2	2	10	40	-	50
BS102	FL-1A	English	4	4	20	80	-	100
BS103	SL-1A	Second Language	4	4	20	80	-	100
BS104	DSC-1A	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS105	DSC-2A	Optional– II	4	4	20	80	25	125
		Optional – II LAB	1	3				
BS106	DSC-3A	Optional – III	4	4	20	80	25	125
		Optional – III LAB	1	3				
TOTAL:			25	-	110	440	75	625

SEMESTER – II

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS201	AECC-2	Basic Computer Skills (Taught by: Computer Science)	2	2	10	40	-	50
BS202	FL-2B	English	4	4	20	80	-	100
BS203	SL-2B	Second Language	4	4	20	80	-	100
BS204	DSC-1B	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS205	DSC-2B	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS206	DSC-3B	Optional – III	4	4	20	80	25	125
		Optional – III LAB	1	3				
TOTAL :			25	-	110	440	75	625

KAKATIYA UNIVERSITY, WARANGAL - 506 009
B.Sc. PROGRAMME
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Scheme wef A.Y: 2020-21

SECOND YEAR

SEMESTER - III

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 301	SEC-1	Fundamentals of Nano Technology (Taught by : Physics)	2	2	10	40	-	50
BS 302	SEC-2	Bio Statistics (Taught by : Statistics)	2	2	10	40	-	50
BS 303	FL-3 A	English	3	3	15	60	-	75
BS 304	SL-3 B	Second Language	3	3	15	60	-	75
BS 305	DSC-1C	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 306	DSC-2C	Optional – II	4	4	20	80	25	125
		Optional– II Lab	1	3				
BS 307	DSC-3C	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
TOTAL:			25	-	110	440	75	625

SEMESTER - IV

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS401	SEC-3	Fundamentals of Python (Taught by: Computer Science)	2	2	10	40	-	50
BS402	SEC-4	Remedial Methods of Pollution – Drinking Water & Soil Fertility (Taught by: Chemistry)	2	2	10	40	-	50
BS403	FL-4 A	English	3	3	15	60	-	75
BS404	SL-4 B	Second Language	3	3	15	60	-	75
BS405	DSC-1D	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS406	DSC-2D	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS407	DSC-3D	Optional – III	4	4	20	80	25	125
		Optional– III Lab	1	3				
TOTAL :			25	-	110	440	75	625

KAKATIYA UNIVERSITY, WARANGAL - 506 009
B.Sc. PROGRAMME
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Scheme wef A.Y: 2021-2022

THIRD YEAR

SEMESTER - V

Code	Course Type	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 501	FL-5 A	English	3	3	15	60	-	75
BS 502	SL-5 B	Second Language	3	3	15	60	-	75
BS 503	G.E.	Water Resources Management (Taught by: Any Science Dept.)	4	4	20	80	-	100
BS 504	DSE-1E	Optional – I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 505	DSE-2E	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS506	DSE-3E	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
TOTAL:			25	-	110	440	75	625

SEMESTER - VI

Code	Course Type	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 601	FL-6A	English	3	3	15	60	-	75
BS 602	SL-6 B	Second Language	3	3	15	60	-	75
BS 603	P.W / Optional	Optional: Public Health & Hygiene (Taught by: Zoology / Botany / Biotechnology / Micro Biology)	4	4	20	80	-	100
BS 604	DSE-1F	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 605	DSE-2F	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS 606	DSE-3F	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
TOTAL:			25	-	110	440	75	625

KAKATIYA UNIVERSITY
B.SC I YEAR SEMESTER-I - CBCS
Ability Enhancement Compulsory Course (AECC)

ENVIRONMENTAL STUDIES

(2 hrs./week)

Credits – 2

UNIT - I : Ecosystem, Biodiversity & Natural Resources

(15 hrs.)

1. Definition, Scope & Importance of Environmental Studies.
2. Structure of Ecosystem – Abiotic & Biotic components Producers, Consumers, Decomposers, Food chains, Food webs, Ecological pyramids)
3. Function of an Ecosystem :Energy flow in the Ecosystem (Single channel energy flow model)
4. Definition of Biodiversity , Genetic,Species & Ecosystem diversity , Hot-spots of Biodiversity, Threats to Biodiversity , Conservation of Biodiversity (Insitu & Exsitu)
5. Renewable & Non – renewable resources, Brief account of Forest , Mineral & Energy (Solar Energy & Geothermal Energy) resources
6. Water Conservation , Rain water harvesting & Watershed management.

UNIT – II: Environmental Pollution , Global Issues & Legislation

(15 hrs.)

1. Causes, Effects & Control measures of Air Pollution, Water Pollution
2. Solid Waste Management
3. Global Warming & Ozone layer depletion.
4. Ill – effects of Fire-works
5. Disaster management – floods, earthquakes & cyclones
6. Environmental legislation :-
(a) Wild life Protection Act (b) Forest Act (c) Water Act (d) Air Act
7. Human Rights
8. Women and Child welfare
9. Role of Information technology in environment and human health

❖ **Field Study:**

(5 hours)

- Pond Ecosystem
- Forest Ecosystem

REFERENCES:

- Environmental Studies - from crisis to cure – by R. Rajagopalan (Third edition) Oxford University Press.
- Text book of Environmental Studies for undergraduate courses (second edition) by Erach Bharucha
- A text book of Environmental Studies by Dr.D.K.Asthana and Dr. Meera Asthana



DR. G. SHAMITHA
Chairperson
Board of Studies
Department of Zoology & Sericulture Unit
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KAKATIYA UNIVERSITY
B.Sc. I YEAR SEMESTER-II
Ability Enhancement Compulsory Course (AECC)
Basic Computer Skills

FUNDAMENTALS OF COMPUTERS

Unit-I:

Introduction to Computers: what is a computer, characteristics of Computers, Generations of Computers, Classifications of Computers, Basic Computer organization, Applications of Computers. Input and Output Devices: Input devices, Output devices, Softcopy devices, Hard copy devices. Computer Memory and Processors: Introduction, Memory Hierarchy, Processor, Registers, Cache memory, primary memory, secondary storage devices, magnetic tapes, floppy disks, hard disks, optical drives, USB flash drivers, Memory cards, Mass storage devices, Basic processors architecture.

Unit-II:

Number System and Computer Codes: Binary number system, working with binary numbers, octal number system, hexadecimal number system, working with fractions, signed number representation in binary form, BCD code, and other codes. Boolean algebra and logic gates: Boolean algebra, Venn diagrams, representation of Boolean functions, logic gates, logic diagrams and Boolean expressions using karnaugh map. Computer Software: Introduction to computer software, classification of computer software, system software, application software, firmware, middleware, acquiring computer software, design and implementation of correct, efficient and maintainable programs.

Text: ReemaThareja, Fundamentals of Computers.

References

1. V.Rajaraman, 6th Edition Fundamentals of Computers, NeeharikaAdabala.
2. Anita Goel, Computer Fundamentals.

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA

B.Sc. Programme under CBCS

With effect from the A.Y: 2019

Skill Enhancement Course- I

II Year

(Common to all Science Courses)

SEMESTER – III

FUNDAMENTALS OF NANO TECHNOLOGY

Theory: 2 Hours/Week; Credits: 2 Marks: 50 (Internal: 10; External: 40)

UNIT I:

Background to Nanotechnology:

Scientific revolution, molecular and atomic size, emergence of Nanotechnology, Challenges in Nanotechnology, Carbon age :(new forms of carbon graphene sheet to CNT)

Nucleation:

Macroscopic to microscopic crystals and nanocrystals, large surface to volume ratio, top-down and bottom-up approaches, self-assembly process, grain bounda volume in nanocrystals, defects in nanocrystals, surface effects on the properties.

UNIT- II:

Nano materials and properties:

Types of Nanostructure: one dimensional (1D), two dimensional (2D), three dimensional (3D) Nanostructured materials, Quantum dots, Quantum wire, Quantum sheet structures.

Carbon nanotubes (CNT), Metals (Au, Ag), Metal oxides(TiO₂,Zno), semiconductors (Si, Ge, CdS, ZnSe), Ceramics and composites, Biological system, DNA, RNA, Lipids, Size dependent properties, mechanical, physical and chemical properties.

Applications of Nanomaterials:

Molecular electronics and nano electronics, Quantum electronic devices, CNT based transistor and Field emission Display, biological applications, Biochemical sensor, Membrane based water purification.

Reference books:

1. Nanotechnology: Basic science and emerging technologies, M.Wilson, K.Kannangara, G. Smith, Overseas Press India PVT.LTD,NEW DELHI:
2. The chemistry of Nanomaterials: Synthesis, properties & applications. C.N.R.Rao, A.Muller, Wiley
3. Nano structures and Nano materials: Synthesis, properties and applications by Guozhong Cao, Imperial College press.
4. Hari Singh Nalwa, Handbook of nanostructured materials &nanotechnology optical properties.
5. Nano fabrication towards biomedical applications, C.S.S.R.Kumar, Wiley-VCH Verlag GmbH & Co, Weinheim.

KAKATIYA UNIVERSITY
B.Sc. PROGRAMME
Under CBCS System wef A.Y: 2020-21
Second Year : : Semester- III

BS-302 / SEC-2: BIO STATISTICS

[2 HPW, #Credits: 2, Marks: 50 (Internal:10, External:40)]

Unit-I

Descriptive and Relational Statistics: Data collection and tabulation, Graphical representation of data, Measures of central tendency (Mean, Median and Mode) with simple applications, Measures of dispersion (Range, Quartile Deviation, Mean Deviation, Standard Deviation, Standard error and Coefficient of variation) with simple applications, Concept of Skewness and Kurtosis.

Concept of correlation, computation of Karl-Pearson correlation coefficient, Spearman' s rank correlation coefficient and Simple linear regression with simple applications,

Unit-II

Probability and Inferential Statistics: Basic concepts and Basic terms of probability, Mathematical, Statistical and Axiomatic definitions of probability Conditional probability and independence of events, Addition and multiplication theorems (Statements only) with simple applications. Statements and applications of Binomial, Poisson and Normal distributions.

Concepts of Population, Sample, Parameter, Statistic, Null and Alternative hypotheses, Critical region, two types of errors, Level of significance. Tests of significance based on goodness of fit, means, variances using χ^2 test, t-test, F-test and analysis of variance (ANOVA).

References:

1. Irfan Ali Khan and Atiya Khanum: Fundamentals of Bio Statistics, Ukaaz Publications, HYD.
2. V. K. Kapoor and S. C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
3. V. K. Kapoor and S. C. Gupta: Statistical Methods, Sultan Chand & Sons, New Delhi.

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
B.Sc. Programme under CBCS
With effect from the A.Y: 2019
Skill Enhancement Course- III
II Year
(Common to all Science Courses)
SEMESTER – IV

Fundamentals of Python

Theory: 2 Hours/Week; Credits: 2 Marks: 50 (Internal: 10; External: 40)

Unit – I

Introduction to Python Programming: How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations (Operators, Type conversions, Expressions), More about Data Output. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops. Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists,

Unit – II

Tuples- operations on tuples, Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Dictionaries and Sets: Dictionaries, Sets- operations on sets and Dictionaries. Functions: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions- Generating Random Numbers, Writing Our Own Value-Returning Functions, The math Module, Storing Functions in Modules. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

Text Book:

Tony Gaddis, Starting Out With Python (3e)

References:

1. Kenneth A. Lambert, Fundamentals of Python
2. Clinton W. Brownley, Foundations for Analytics with Python
3. James Payne, Beginning Python using Python 2.6 and Python 3
4. Charles Dierach, Introduction to Computer Science using Python
5. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3

KAKATIYA UNIVERSITY, WARANGAL
B.Sc. Programme
Under CBCS System wef A.Y: 2020-21
Second Year :: Semester - IV
BS-402/ SEC-4 (Common to all Science Courses)

Remedial Methods of Pollution - Drinking Water & Soil Fertility

[2HPW, #Credits: 2, Marks:50 (Internal:10, External:40)]

(Taught by: Chemistry Department)

UNIT I: Remedial Methods for Pollution:

Prevention and control of air pollution: Ozone hole - Causes and harm due to ozone depletion, Effect of CFC's in Ozone depletion and their replacements, Global Warming and Green-house effect, Precaution measures to control global warming, Deleterious effect of pollutants, Endangered monuments, Acid rain, Precautions to protect monuments, Sources of Radiation pollution, Chernobyl accident and its consequences. Radiation effect by usage of cell phones and protection tips, Deleterious effects of cell phone towers and health hazards.

Sources of water pollution: (i) Pollution due to pesticides and inorganic chemicals, (ii) Thermal pollution (iii) Ground water pollution (iv) Eutrophication.

Methods for control of water pollution and water recycling: Dumping of plastics in rivers and oceans and their effect on aquatic life, Determination of (i) Dissolved oxygen and (ii) Chemical Oxygen demand in polluted water, Illustration through charts (or) demonstration of experiments,

Sources of soil pollution: (i) Plastic bags (ii) Industrial and (iii) Agricultural sources, Control of soil pollution, Environmental laws in India, Environmental benefits of planting trees.

UNIT II: Drinking Water and Soil Fertility Standards and Analysis:

Water quality and common treatments for private drinking water systems, Drinking Water Standards: 1. Primary drinking water standards: Inorganics, Organics and Volatile Organic Chemicals, 2. Secondary drinking water standards: Inorganics and Physical Problems, Water testing, Mineral analysis, Microbiological tests, Pesticide and Other Organic Chemical Tests, Principle involved in Water Treatment Techniques: (i) Reverse Osmosis (ii) Disinfection methods such as Chlorination, Ultraviolet light, ozonation etc... (iii) Chemical oxidation and iv) Ion exchange (water softeners). Visit to nearby drinking water plants and interaction at sites.

Introduction to Soil Chemistry: Basic Concepts. Effect of P^H on nutrient availability, Macronutrients and their effect on plants, Carbon, Hydrogen, Oxygen, Nitrogen and Phosphorus, other macronutrients, Calcium, Magnesium and Sulfur, Micronutrients and their effect on plants, Boron ($B_4O_7^{2-}$), Copper (Cu^{2+}), Iron (Fe^{2+} , Fe^{3+}), Manganese (Mn^{2+}), Molybdenum (MoO_4^{2-}), Zinc (Zn^{2+}), Cobalt (Co^{2+}), Chlorine (Cl^-) and others. Determination of soil nitrogen by Kjeldahl method, Illustration through charts and demonstration of experiment, Visit to nearby agricultural farms and interaction with farmers, Discussion with farmers on the use of 'Soil Analysis Kits'.

KAKATIYA UNIVERSITY, WARANGAL-506 009

B.Sc. Under CBCS System wef A.Y: 2021-22

Third Year : : Semester - V

GENERIC ELECTIVE (Common to all students)

WATER RESOURCES MANAGEMENT

(4 hrs/week) (Taught by ant Science Dept) (Credits:4) (Marks:100)

UNIT-I:

Introduction to water resources management, different types of water resources, water resources and its importance, Global distribution of water. Hydrological cycle, Conservation of water, recycling of water.

Unit-II:

Rain water harvesting, methods of roof top rain water harvesting in urban setting: Direct method - Storing rain water in tanks for direct use; indirect methods - Recharge pits, bore wells/dug wells, Recharge trenches. Over use of surface and ground water and control measures.

UNIT-III:

Importance of water shed and water shed management, Rain water harvesting in rural setting: Check dams, percolation tanks, gabion structure, continuous contour trenches, staggered contour trenches, farm ponds. Surface water and ground water pollution, control measures.

UNIT-IV :

Mission Bhagiratha: Telangana government water grid project for drinking water supply - aims and objectives and method of implementation. Mission Kakatiya: Telangana government project for the restoration of minor irrigation tanks, aims and objectives and method of implementation.

Text books:

- 1) Water Resources, Conservation and Management by Chatterjee, S.N.
- 2) Groundwater hydrology by Todd
- 3) Watershed management by J.V.S.Murthy
- 4) Applied Hydrogeology by Fetter.

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA

B.Sc. Programme under CBCS

With effect from the A.Y: 2019

Optional Paper

(Common to all Science Courses)

III Year SEMESTER – VI

PUBLIC HEALTH AND HYGIENE

UNIT-I: Nutrition, Environment and Health

- 1.1 Classification of foods – Carbohydrates, Proteins, Lipids and Minerals.
- 1.2 Nutritional deficiencies and disorders of Carbohydrates, Proteins, Lipids and Minerals.
- 1.3 Concept, Steps and Applications of Environment and Health Impact Assessment.
- 1.4 Industrial, Agricultural and Urban Health. Environmental Pollution and Associated Health Hazards.

UNIT-II : Communicable and Non-Communicable Diseases

- 2.1 Causes, symptoms, diagnosis, treatment and prevention of Communicable Diseases (Malaria, Filaria, Tuberculosis and AIDS).
- 2.2 Causes, symptoms, diagnosis, treatment and prevention of Non-Communicable Diseases (Hypertension, Coronary Heart Diseases, Diabetes and Obesity).
- 2.3 Symptoms, treatment and prevention measures of Water Borne Diseases (Diarrhea, Typhoid, Hepatitis and Amebiasis).
- 2.4 Symptoms, treatment and prevention measures Air Borne Diseases (COVID-19, Influenza, Whooping cough and Chickenpox).

UNIT-III :Food and Diet Systems

- 3.1 Definition of Food, Types of foods (Texturized foods, Novel foods and Organic foods).
- 3.2 Food safety system and issues; Physical, chemical and microbiological contaminants; The significance of foodborne diseases.
- 3.3 Principles of diet in diseases, Classification of diets according to nutrients.
- 3.4 Etiology, Symptom and Dietary Management in Obesity, Underweight, Hypertension, Diabetes Mellitus, Atherosclerosis.

UNIT-IV : Personal Hygiene and Sanitation

- 4.1 Definition of Hygiene and Sanitation, Personal Hygiene of food handler, Techniques of Washing Hands, Pest control and Garbage Disposal.
- 4.2 Definition of Public Health, Hygiene, Social and Preventive Medicine, Basic aspects of Personal Hygiene and Disposal of Waste.
- 4.3 The Hygiene Practices of the different categories of family members (children, parents and aged members)
- 4.4 Definition of Sanitation, Environmental Sanitation, Sanitation of Food Serving Institution, The importance of proper sanitation practices.

Suggested Readings:

**DEPARTMENT OF ENGLISH
KAKATIYA UNIVERSITY
SYLLABUS FOR I YEAR (I SEMESTER) GENERAL ENGLISH
AT UNDERGRADUATE LEVEL
w.e.f (under CBCS from 2019-2020)**

Text Book Entitled - English for Advancement *for I Year (Sem I & II)* **4 Credits**
Published by *Orient BlackSwan*

UNIT ONE (SHORT FICTION)	TEXT	AN ASTROLOGER'S DAY by R.K.NARAYAN
	GRAMMAR	NOUNS AND PRONOUNS
	VOCABULARY	WORD ROOTS
	READING COMPREHENSION	HAZARDS OF FOOD COLOURING
	PRONUNCIATION	CONSONANTAL SOUNDS
	LANGUAGE SKILLS	TYPES OF LISTENING
	SOFT SKILLS	MOTIVATION AND GOAL-SETTING
UNIT TWO (PROSE)	TEXT	OF STUDIES by FRANCIS BACON
	GRAMMAR	ADJECTIVES
	VOCABULARY	FUNNY SIDE OF ENGLISH
	READING COMPREHENSION	PLEASURES OF IGNORANCE by ROBERT LYND
	PRONUNCIATION	VOWEL SOUNDS
	LANGUAGE SKILLS	CONVERSATION SKILLS
	SOFT SKILLS	TIME MANAGEMENT
UNIT THREE (POETRY)	TEXT	A POISON TREE by WILLIAM BLAKE
	GRAMMAR	ADVERBS
	SPELLING	COMMONLY MISSPELT WORDS

K. Reddy

Eng. M. S. Reddy

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P. Nirmal

WARRANGAL-505 309.

	READING COMPREHENSION	VALUES IN LIFE by RUDYARD KIPLING
	PRONUNCIATION	PHONETIC TRANSCRIPTION
	SOFT SKILLS	EMOTIONAL INTELLIGENCE & SOCIAL CONSCIOUSNESS
UNIT FOUR (DRAMA)	TEXT	THE RISING OF THE MOON by LADY GREGORY
	GRAMMAR	VERBS
	PRONUNCIATION	INTONATION
	READING COMPREHENSION	HAZRATH URS
	LANGUAGE SKILLS	SPEAKING : JAM
	VALUE ORIENTATION	SELF-DISCOVERY

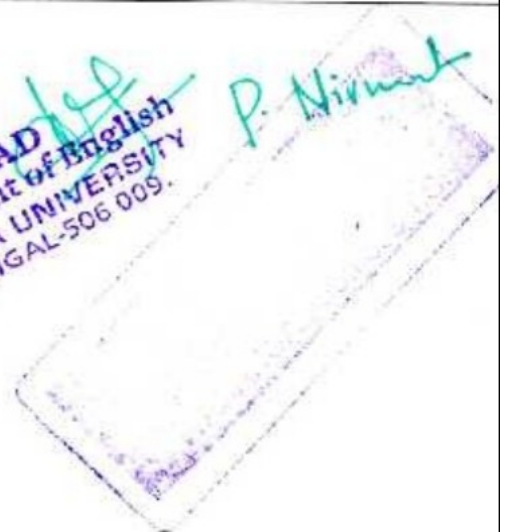
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DEPARTMENT OF ENGLISH
KAKATIYA UNIVERSITY
SYLLABUS FOR I YEAR (II SEMESTER) GENERAL ENGLISH
AT UNDERGRADUATE LEVEL
(under CBCS from 2019-2020)

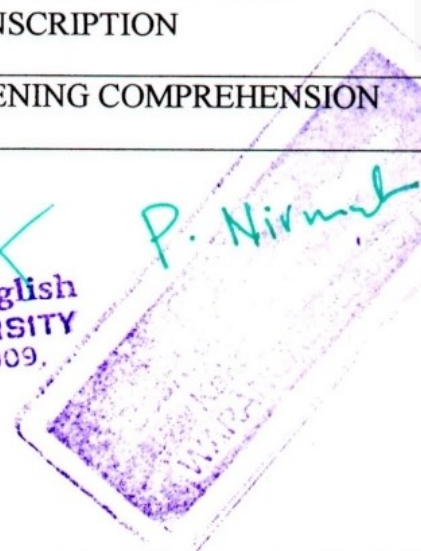
UNIT ONE (SHORT FICTION)	TEXT	WITH THE PHOTOGRAPHER by STEPHEN LEACOCK
	GRAMMAR	PREPOSITIONS
	VOCABULARY	PREFIXES AND SUFFIXES
	READING COMPREHENSION	SPORTS, POLITICS AND DEMOCRACY by ARIO BIMO UTOMO
	PRONUNCIATION	STRESS
	LANGUAGE SKILLS	INTRODUCING ONSELF IN FORMAL AND INFORMAL SITUATIONS
	SOFT SKILLS	LATERAL THINKING
UNIT TWO (PROSE)	TEXT	A TREATISE ON GOOD MANNERS AND GOOD BREEDING by JONATHAN SWIFT
	GRAMMAR	CONJUNCTIONS
	VOCABULARY	SYNONYMS
	READING COMPREHENSION	THE ECONOMIC POWER OF LANGUAGE by GABRIELLE HOGAN-BRUN
	PRONUNCIATION	STRESS AND PRACTICE IN PHONETIC TRANSCRIPTION
	LANGUAGE SKILLS	LISTENING COMPREHENSION

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 WARANGAL-506 009.

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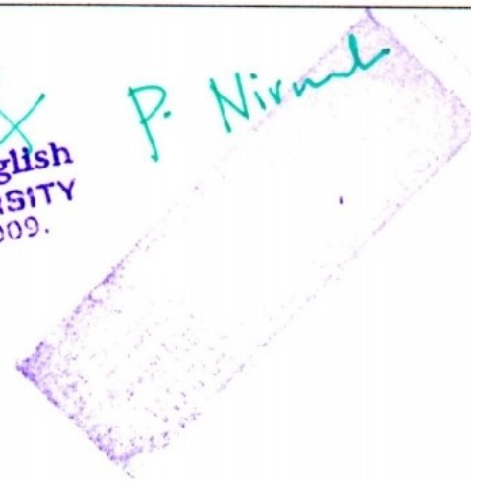
	SOFT SKILLS	ATTITUDE
UNIT THREE (POETRY)	TEXT	ODE ON SOLITUDE by ALEXANDER POPE
	GRAMMAR	KINDS OF SENTENCE
	SPELLING	PLURALS
	READING COMPREHENSION	JADAV PAYENG: THE FOREST MAN OF INDIA
	PRONUNCIATION	ASSIMILATION
	SOFT SKILLS	TEAM WORK
UNIT FOUR (DRAMA)	TEXT	A MARRIAGE PROPOSAL by ANTON CHEKOV
	GRAMMAR	COMMON MISTAKES
	PRONUNCIATION	ELISON
	READING COMPREHENSION	HOW I BECAME A PUBLIC SPEAKER? by GEORGE BERNARD SHAW
	LANGUAGE SKILLS	PRESENTATIONS
	VALUE ORIENTATION	SELF-CONFIDENCE

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WARANGAL-506 009.

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KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (Under CBCS 2020 – 2021 onwards)
B.A/B.COM/BBA/B.SC ENGLISH II YEAR
SEMESTER – III

PAPER – III: ENGLISH

Theory: 3 Hours/Week; Credits: 3 Marks: 100 (Internal: 20; External: 80)

Prescribed Textbook entitled: English for Excellence
Published by Orient BlackSwan

UNIT I: GENDER EQUALITY

1. “Achieving Gender Equality in India: What Works, and What Doesn’t” by Smriti Sharma
2. “They Shut me up in Prose” by Emily Dickinson
3. Prepositions
4. Phrasal Verbs

UNIT II: GENDER ROLES

1. “The Wonder Story of Kalpana Saroj” by Rakhi Chakraborty
2. “The Kitchen” by Vimala
3. Voice
4. Technical Vocabulary

UNIT III: ENDING VIOLENCE AGAINST WOMEN

1. “What is my Name?” by P.Sathyavathi
2. “Voice of the Unwanted Girl” by Sujatha Bhatt
3. Connectives
4. Idioms

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (Under CBCS 2020 – 2021 onwards)
B.A/B.COM/BBA/B.SC ENGLISH II YEAR
SEMESTER – IV

PAPER – IV: ENGLISH

Theory: 3 Hours/Week; Credits: 3 Marks: 100 (Internal: 20; External: 80)

Prescribed Textbook entitled: English for Excellence
Published by Orient BlackSwan

UNIT I: RENEWABLE AND NON-RENEWABLE RESOURCES

1. Jadav Payeng
2. “The Tame Bird was in a Cage” by Rabindranath Tagore
3. Reported Speech
4. Commonly Confused Words

UNIT II: ECOSYSTEMS AND ENVIRONMENTAL POLLUTION

1. “Climate Change and Global Warming” by Michael Shafer
2. “A Requiem for Earth” by O.N.V.Kurup
3. Conditionals
4. Suffixes

UNIT III: CONSERVATION AND BIODIVERSITY

1. “The Ungrateful Man: A Conversation between Trees ” by Swathi Shenoy
2. “The Felling of the Banyan Tree” by Dilip Chitre
3. Common Errors
4. Collocations

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA

DEPARTMENT OF ENGLISH

Under Graduate Courses (Under CBCS 2021-2022 onwards)

GENERAL ENGLISH III-YEAR, V- SEMESTER

B.A., B.COM., B.Sc., B.B.A., ~~B.C.A.~~, B.A(L).

PAPER - V: ENGLISH

COMMUNICATION SKILLS

English through Human Values and Ethics

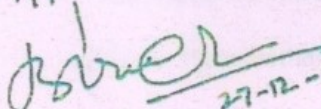
Theory: 3 Hours/Week; Credits: 3 Marks: 75 (Internal: 15; External: 60)

Unit 1	PROSE	Tolerance is a Moral Virtue – Rivka T. Witenberg
	POEM	How Happy is the Little Stone – Emily Dickinson
	LANGUAGE	Paragraph Writing
Unit 2	PROSE	When Cities were Nature's Haven – Harini Nagendra
	POEM	Where the Mind is Without Fear – Rabindranath Tagore
	LANGUAGE	Note-making
Unit 3	PROSE	Why we Love Holiday Rituals and Traditions – Dimitris Xygalatas
	POEM	Sonnets are Full of Love – Christina Rossetti
	LANGUAGE	Public Speaking

PRESCRIBED TEXTBOOK: *English for Career: A Course book for Undergraduate Learners*


Eds. K. Purushotham, M. Rajeshwar and R. Meghana Rao. Published by Orient Blackswan.2021.

Approved


27-12-2021
Dr. B. Krishnaiah

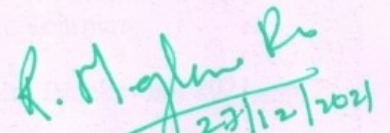
EXTERNAL MEMBER

Dr. B. KRISHNAIAH
Assistant Professor
Department of English
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University of Hyderabad
Hyderabad-500 046.

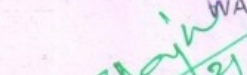

Ms. P. Nirmala


HEAD
Department of English
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Warangal-506 009.


27/12/2021


27/12/2021
Dr. R. Meghana Rao

Chairperson
Board of Studies In English
Kakatiya University
WARANGAL-506 009.


27/12/21


27/12/2021

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
DEPARTMENT OF ENGLISH

Under Graduate Courses (Under CBCS 2021-2022 onwards)

GENERAL ENGLISH III-YEAR, VI- SEMESTER

B.A., B.Com. B.Sc., B.B.A., B.A(L).

PAPER - VI : ENGLISH

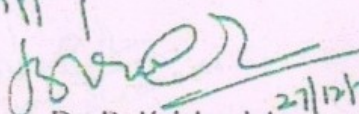
COMMUNICATION SKILLS
English for Employability skills

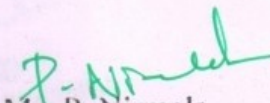
Theory: 3 Hours/Week; Credits: 3; Marks: 75 (Internal: 15; External: 60)

Unit 1	PROSE	Sreelakshmi Suresh
	POEM	For whom the Bell Tolls – John Donne
	LANGUAGE	Official Letters
Unit 2	PROSE	How Work can be Made Meaningful – Katie Bailey
	POEM	Teamwork – Edgar Albert Guest
	LANGUAGE	Job Application Letters and Curriculum Vitae
Unit 3	PROSE	How the Corona-virus Sparked a Wave of Innovation – Sreevas Sahasranamam
	POEM	See it through – Edgar Albert Guest
	LANGUAGE	Email etiquette

PRESCRIBED TEXTBOOK: *English for Careers: A Course book for Undergraduate Learners*

Eds. K. Purushotham, M. Rajeshwar and R. Meghana Rao. Published by Orient Blackswan, 2021.

Approved

27/12/2021
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27/12/2021


R. Meghana Rao
Chairperson
Board of Studies in English
Kakatiya University
WARANGAL-506 009.
27/12/2021

27/12/2021

C.B.C.S Pattern Syllabus from 2019-2010 onwards
B.A., B.Sc., B.Com. & B.B.A.
2nd Semester IInd Languages - Telugu

Unit -I ప్రాచీన కవిత్వం

- 1) గజేంద్ర మోక్షం-పోతన
- 2) హనుమత్ సందేశం-మొల్ల
- 3) సుభాషితాలు-ఏనుగు లక్ష్మణ కవి

Unit -II ఆధునిక కవిత్వం

- 1) స్నేహలత లేఖ-రాయప్రోలు సుబ్బారావు
- 2) అంతర్నాదం-దాశరథి కృష్ణమాచార్యులు
- 3) ప్రపంచపదులు-డా॥ సి.నారాయణరెడ్డి
- 4) అల్పిదా-కౌముది

Unit -III వచన విభాగం

- 1) యుగాంతం-నెల్లూరి కేశవ స్వామి
- 2) ఎంకన్న - ఆచార్య పాకాల యశోదారెడ్డి
- 3) మామిడి పండు - సురవరం ప్రతాపరెడ్డి
- 4) మా ఊరుపోయింది-దేవులపల్లి వేంకట కృష్ణశాస్త్రి

Unit -IV ఛందస్సు

ఉత్పలమాల, చంపకమాల, శార్దూలం, మత్తేభం, ఆటవెలది, తేటగీతి, ద్విపద, సీసం, కందం, ఉత్సాహం, తరళం, స్రగ్ధర, మహాస్రగ్ధర, ముత్యాలసరం



KAKATIYA UNIVERSITY, WARANGAL
B.A., B.Sc., B.Com. & B.B.A (CBCS)
Syllabus - 2020
Telugu (Second Language)
3rd Semester

Unit -I ప్రాచీన పద్యభాగం

- | | | |
|--------------------------|---|------------------|
| 1) ధర్మజుని వాక్పాతుర్యం | - | తిక్కన |
| 2) విభీషణ శరణాగతి | - | గోన బుద్ధారెడ్డి |
| 3) గుణనిధి కథ | - | శ్రీనాథుడు |

Unit -II ఆధునిక పద్యభాగం

- | | | |
|--------------------------|---|---------------------------|
| 1) రైతు ప్రశస్తి | - | వానమామలై జగన్నాథాచార్యులు |
| 2) గురుదక్షిణ | - | అంబటి లక్ష్మీనరసింహారాజు |
| 3) గుడిసెలు కాలిపోతున్నై | - | డా॥ బోయి భీమన్న |

Unit -III అలంకారాలు

- శబ్దాలంకారాలు: వృత్త్యసుప్రాస, ఛేకానుప్రాస, లాటానుప్రాస,
అంత్యానుప్రాస, యమకం, ముక్తపదగ్రస్తాలంకారాలు
- అర్థాలంకారాలు: ఉపమ, ఉత్తేక్ష, రూపక, స్వభావోక్తి, ఉల్లేఖ,
అర్థాంతరవ్యాస, శ్లేష, దృష్టాంతాలంకారాలు

పాఠ్యగ్రంథం: తెలుగు అకాడమీ వారి “సాహితీ కిన్నెర” తెలుగు వాచకం


29/8/2020
Chairman
Board of Studies in Telugu
KAKATIYA UNIVERSITY
WARANGAL-506 003 (T.S.)


Head
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Kakatiya University
Warangal-506 003(T.S.)

KAKATIYA UNIVERSITY, WARANGAL
B.A., B.Sc., B.Com. & B.B.A (CBCS)
Syllabus - 2020
Telugu (Second Language)
4th Semester

Unit -I ప్రాచీన పద్యభాగం

- 1) నారద గానమాత్యుర్యం - పింగలి సూరన
- 2) వాగ్దాన భంగం - అసూరి మరింగంటి వేంకట నరసింహాచార్యులు
- 3) నారసింహ శతకం - ధర్మపురి శేషప్ప

Unit -II ఆధునిక పద్యభాగం

- 1) నరుడ నేను, నరుడ నేను - కాళోజీ
- 2) ఆత్మగీతం - దేవరకొండ బాలగంగాధర తిలక్
- 3) దేవరకొండ దుర్గం - డా॥ ముకురాల రామారెడ్డి

Unit -III వచన విభాగం

- 1) అర్థరాత్రి అరుణోదయం - దాశరథి రంగాచార్య
- 2) సి.పి బ్రౌన్ సాహిత్య సేవ - జానమద్ది హనుమచ్ఛాస్త్రి
- 3) మన గ్రామ నామాలు - డా॥ కపిలవాయి లింగమూర్తి
- 4) నివురు తొలగిన నిప్పు - పోల్కంపల్లి శాంతాదేవి
- 5) కొండమల్లెలు - ఇల్లిందల సరస్వతీదేవి

పాఠ్యగ్రంథం: తెలుగు అకాడమీ వారి "సాహితీ కిన్నెర" తెలుగు వాచకం


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Head
Department of Telugu
Kakatiya University
Warangal-506 09(T.S.)

KAKATIYA UNIVERSITY, WARANGAL
B.A., B.Sc., B.Com. & B.B.A (CBCS)
Syllabus - 2021-2022
Telugu (Second Language)
5th Semester

Unit -I **కవితా ప్రక్రియలు**

- 1) పద్యం
- 2) పాట
- 3) వచన కవిత
- 4) మినీ కవితా రూపాలు,
హైకూ, నానీలు మినీ కవితలు
- 5) రుబాయిలు, గజల్

Unit -II **తెలుగు వ్యాసం**

- 6) వ్యాసం నిర్వచనం, లక్షణాలు
- 7) తెలుగు వ్యాస పరిణామక్రమం
- 8) వ్యాస రచనా పద్ధతులు
- 9) వ్యాస రచన భాషా ప్రయోగాలు
- 10) వ్యాసం -వస్తు వైవిధ్యం

Unit -III **వచన సాహిత్యం**

- 11) అధ్యయన-సంస్కృతి
- 12) సాహిత్య అధ్యయనం ప్రయోజనాలు
- 13) ముందుమాట
- 14) పుస్తక సమీక్ష
- 15) జానపద సాహిత్య పరిచయం




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KAKATIYA UNIVERSITY, WARANGAL
B.A., B.Sc., B.Com. & B.B.A (CBCS)
Syllabus - 2021-2022
Telugu (Second Language)
6th Semester

Unit -I సాహిత్య ప్రక్రియల పరిచయం

- 1) నాటకం
- 2) నవల
- 3) కథానిక
- 4) జీవిత చరిత్ర
- 5) ఉపన్యాస కళ

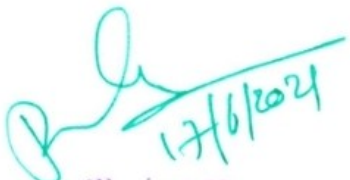
Unit -II జర్నలిజంలో మాళికాంశాలు

- 6) వార్త - నిర్వచనం, లక్షణాలు
- 7) లీడ్ - ఎడిటింగ్
- 8) వార్తా కథనాలు
- 9) అనువాదం
- 10) ఇంటర్వ్యూలు

Unit -III ప్రాజెక్టు పరిచయం

- 11) ప్రాజెక్టు
- 12) అధ్యయనం
- 13) పరికల్పన
- 14) నివేదిక




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WARANGAL

SEMESTER-I

2.1 Differential and Integral Calculus

DSC-1A

BS:101

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The course is aimed at exposing the students to some basic notions in differential calculus.

Outcome: By the time students complete the course they realize wide ranging applications of the subject.

Unit- I

Partial Differentiation: Introduction - Functions of two variables - Neighbourhood of a point (a, b) - Continuity of a Function of two variables, Continuity at a point - Limit of a Function of two variables - Partial Derivatives - Geometrical representation of a Function of two Variables - Homogeneous Functions.

Unit- II

Theorem on Total Differentials - Composite Functions - Differentiation of Composite Functions - Implicit Functions - Equality of $f_{xy}(a, b)$ and $f_{yz}(a, b)$ - Taylor's theorem for a function of two Variables - Maxima and Minima of functions of two variables - Lagrange's Method of undetermined multipliers.

Unit- III

Curvature and Evolutes: Introduction - Definition of Curvature - Radius of Curvature - Length of Arc as a Function, Derivative of arc - Radius of Curvature - Cartesian Equations - Newtonian Method - Centre of Curvature - Chord of Curvature.

Evolutes: Evolutes and Involutes - Properties of the evolute.

Envelopes: One Parameter Family of Curves - Consider the family of straight lines - Definition - Determination of Envelope.

Unit- IV

Lengths of Plane Curves: Introduction - Expression for the lengths of curves $y = f(x)$ - Expressions for the length of arcs $x = f(y)$; $x = f(t)$, $y = \varphi(t)$; $r = f(\theta)$

Volumes and Surfaces of Revolution: Introduction - Expression for the volume obtained by revolving about either axis - Expression for the volume obtained by revolving about any line - Area of the surface of the frustum of a cone - Expression for the surface of revolution - Pappus Theorems - Surface of revolution.

Text:

- Shanti Narayan, P.K. Mittal *Differential Calculus*, S.CHAND, NEW DELHI
- Shanti Narayan *Integral Calculus*, S.CHAND, NEW DELHI

References:

- William Anthony Granville, Percy F Smith and William Raymond Longley; *Elements of the differential and integral calculus*
 - Joseph Edwards , *Differential calculus for beginners*
 - Smith and Minton, *Calculus*
 - Elis Pine, *How to Enjoy Calculus*
 - Hari Kishan, *Differential Calculus*
-

Handwritten signatures in blue ink, including names like "R. Pine", "E. Pine", "H. Kishan", and "A. D. S.", along with a date "1899".

SEMESTER-II

2.2 Differential Equations

DSC-1B

BS:201

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

Unit- I

Differential Equations of first order and first degree: Introduction - Equations in which Variables are Separable - Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form - Linear Differential Equations - Differential Equations Reducible to Linear Form - Exact differential equations - Integrating Factors - Change in variables - Total Differential Equations - Simultaneous Total Differential Equations - Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

Unit- II

Differential Equations first order but not of first degree: Equations Solvable for p - Equations Solvable for y - Equations Solvable for x - Equations that do not contain x (or y) - Equations Homogeneous in x and y - Equations of the First Degree in x and y - Clairaut's equation.
Applications of First Order Differential Equations : Growth and Decay - Dynamics of Tumour Growth - Radioactivity and Carbon Dating - Compound Interest - Orthogonal Trajectories

Unit- III

Higher order Linear Differential Equations: Solution of homogeneous linear differential equations with constant coefficients - Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}, b \sin ax/b \cos ax, bx^k, Ve^{ax}$ - Method of undetermined coefficients.

Unit- IV

Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy - Euler Equation - Legendre's Linear Equations - Miscellaneous Differential Equations.
Partial Differential Equations: Formation and solution- Equations easily integrable - Linear equations of first order.

Text:

- Zafar Ahsan, *Differential Equations and Their Applications*

References:

- Frank Ayres Jr, *Theory and Problems of Differential Equations.*

Handwritten signatures and marks in blue ink at the bottom of the page, including a large signature that appears to be 'Zafar Ahsan' and other illegible signatures.

- Ford, L.R ; *Differential Equations*.
 - Daniel Murray, *Differential Equations*.
 - S. Balachandra Rao, *Differential Equations with Applications and Programs*.
 - Stuart P Hastings, J Bryce McLeod; *Classical Methods in Ordinary Differential Equations*.
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KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (w.e.f. academic year 2019-20 batch onwards)
B.Sc. MATHEMATICS II Year
SEMESTER – III

REAL ANALYSIS

Theory: 5 credits and Tutorials: 0 credits Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

Outcome: After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

UNIT- I

Sequences: Limits of Sequences- A Discussion about Proofs-Limit Theorems for Sequences- Monotone Sequences and Cauchy Sequences -Subsequences-Limit sup's and Limit inf's - Series- Alternating Series and Integral Tests.

UNIT- II

Continuity: Continuous Functions -Properties of Continuous Functions -Uniform Continuity - Limits of Functions

UNIT- III

Differentiation: Basic Properties of the Derivative - The Mean Value Theorem - L'Hospital Rule - Taylor's Theorem.

UNIT- IV

Integration: The Riemann Integral - Properties of Riemann Integral-Fundamental Theorem of Calculus.

Text:

Kenneth A Ross, Elementary Analysis-The Theory of Calculus

References:

- 1] S.C. Malik and Savita Arora, Mathematical Analysis, Second Edition, Wiley Eastern Limited, New Age International (P) Limited, New Delhi, 1994.
- 2] William F. Trench, Introduction to Real Analysis
- 3] Lee Larson , Introduction to Real Analysis I
- 4] Shanti Narayan and Mittal, Mathematical Analysis
- 5] Brian S. Thomson, Judith B. Bruckner, Andrew M. Bruckner; Elementary Real analysis
- 6] Sudhir R., Ghorpade, Balmohan V., Limaye; A Course in Calculus and Real Analysis

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (w.e.f. academic year 2019-20 batch onwards)
B.Sc. MATHEMATICS II Year
SEMESTER – IV

ALGEBRA

Theory: 5 credits and Tutorials: 0 credits Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.

Outcome: On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

UNIT- I

Groups: Definition and Examples of Groups- Elementary Properties of Groups-Finite Groups - Subgroups -Terminology and Notation -Subgroup Tests - Examples of Subgroups.

Cyclic Groups: Properties of Cyclic Groups - Classification of Subgroups Cyclic Groups.

UNIT- II

Permutation Groups: Definition and Notation -Cycle Notation-Properties of Permutations -A Check Digit Scheme Based on D5. Isomorphisms ; Motivation- Definition and Examples - Cayley's Theorem Properties of Isomorphisms -Automorphisms-Cosets and Lagrange's Theorem Properties of Cosets 138 - Lagrange's Theorem and Consequences-An Application of Cosets to Permutation Groups -The Rotation Group of a Cube and a Soccer Ball.

UNIT- III

Normal Subgroups and Factor Groups: Normal Subgroups-Factor Groups -Applications of Factor Groups -Group Homomorphisms - Definition and Examples -Properties of Homomorphisms -The First Isomorphism Theorem.

Introduction to Rings: Motivation and Definition -Examples of Rings -Properties of Rings - Subrings.

Integral Domains: Definition and Examples - Fields Characteristics of a Ring.

UNIT- IV

Ideals and Factor Rings: Ideals -Factor Rings -Prime Ideals and Maximal Ideals.

Ring Homomorphisms: Definition and Examples-Properties of Ring-Homomorphisms.

Text:

Joseph A Gallian, Contemporary Abstract algebra (9th edition)

References:

- 1] Bhattacharya, P.B Jain, S.K.; and Nagpaul, S.R,Basic Abstract Algebra 2]
- Frleigh, J.B, A First Course in Abstract Algebra.
- 3] Herstein, I.N, Topics in Algebra
- 4] Robert B. Ash, Basic Abstract Algebra
- 5] I Martin Isaacs, Finite Group Theory
- 6] Joseph J Rotman, Advanced Modern Algebra

SEMESTER-V

Linear Algebra

(w.e.f. academic year 2019-20 batch onwards)

DSC-V

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The students are exposed to various concepts like vector spaces, bases, dimension, Eigen values etc.

Outcome: After completion this course students appreciate its interdisciplinary nature.

Unit- I

Vector Spaces: Vector Spaces and Subspaces -Null Spaces, Column Spaces, and Linear Transformations -Linearly Independent Sets; Bases -Coordinate Systems -The Dimension of a Vector Space

Unit- II

Rank-Change of Basis - Eigenvalues and Eigenvectors - The Characteristic Equation

Unit- III

Diagonalization: -Eigenvectors and Linear Transformations -Complex Eigenvalues - Applications to Differential Equations.

Unit- IV

Orthogonality and Least Squares : Inner Product, Length, and Orthogonality -Orthogonal Sets -Orthogonal Projections - The Gram-Schmidt Process.

Text:

David C Lay, Linear Algebra and its Applications 4e

References:

- 1] S Lang, Introduction to Linear Algebra
- 2] Gilbert Strang , Linear Algebra and its Applications
- 3] Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence; Linear Algebra
- 4] Kuldeep Singh; Linear Algebra.
- 5] Sheldon Axler; Linear Algebra Done Right

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SEMESTER-VI

(A) Numerical Analysis

(w.e.f. academic year 2019-20 batch onwards)

DSE-VI

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: Students will be made to understand some methods of numerical analysis.
Outcome: Students realize the importance of the subject in solving some problems of algebra and calculus.

Unit- I

Errors in Numerical Calculations - Solutions of Equations in One Variable: The Bisection Method - The Iteration Method - The Method of False Position-Newton's Method - Muller's Method - solution of Systems of Nonlinear Equations.

Unit- II

Interpolation and Polynomial Approximation: Interpolation - Finite Differences - Differences of Polynomials - Newton's formula for Interpolation - Gauss's central differences formulae - Stirling's and Bessel's formula - Lagrange's Interpolation Polynomial - Divided differences - Newton's General Interpolation formula - Inverse Interpolation.

Unit- III

Curve Fitting: Least Square Curve Fitting: Fitting a Straight Line-Nonlinear Curve Fitting.
Numerical Differentiation and Integration: Numerical Differentiation - Numerical Integration: Trapezoidal Rule-Simpson's 1/3rd-Rule and Simpson's 3/8th-Rule - Boole's and Weddle's Rule - Newton's Cotes Integration Formulae.

Unit- IV

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method - Picard's Method - Euler's Methods - Runge Kutta Methods.

Text:

S.S.Sastry, Introductory Methods of Numerical Analysis, PHI

References:

- 1] Richard L. Burden and J. Douglas Faires, Numerical Analysis (9e)
- 2] M K Jain, S R K Iyengar and R K Jain, Numerical Methods for Scientific and Engineering computation
- 3] B. Bradie, A Friendly introduction to Numerical Analysis




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SEMESTER-VI

(B) Integral Transforms

(w.e.f. academic year 2019-20 batch onwards)

DSE - VI

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: Students will be exposed to Integral Transforms. The students also learning the Applications of Laplace Transforms to Differential Equations which arises in Physics and Engineering Problems.

Outcome: Students apply their knowledge to solve some problems on special functions and Differential Equations by using the Integral Transforms.

Unit-I

Laplace Transforms-Definition-Existence theorem-Laplace transforms of derivatives and integrals Periodic functions and some special functions.

Unit- II

Inverse Transformations - Convolution theorem - Heaviside's expansion formula.

Unit- III

Applications to ordinary Differential equations - solutions of simultaneous ordinary Differential equations - Applications to Partial Differential equations.

Unit- IV

Fourier Transforms- Sine and cosine transforms-Inverse Fourier Transforms.

Text:

Vasishtha and Gupta, Integral Transforms, Krishna Prakashan Media(P), Ltd, Meerut (2e)

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SEMESTER-VI

(C) Analytical Solid Geometry

(w.e.f. academic year 2019-20 batch onwards)

DSE - VI

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: Students learn to describe some of the surfaces by using analytical geometry.

Outcome: Students understand the beautiful interplay between algebra and geometry.

Unit- I

Sphere: Definition-The Sphere Through Four Given Points-Equations of a Circle- Intersection of a Sphere and a Line-Equation of a Tangent Plane-Angle of Intersection of Two Spheres-Radical Plane.

Unit- II

Cones and Cylinders: Definition-Condition that the General Equation of second degree Represents a Cone-Cone and a Plane through its Vertex -Intersection of a Line with a Cone.

Unit- III

The Right Circular Cone-The Cylinder- The Right Circular Cylinder.

Unit- IV

The Conicoid: The General Equation of the Second Degree-Intersection of Line with a Conicoid-Plane of contact-Enveloping Cone and Cylinder.

Text:

Shanti Narayan and P K Mittal, Analytical Solid Geometry (17e)

References:

- 1] Khaleel Ahmed, Analytical Solid Geometry
- 2] S L Loney , Solid Geometry
- 3] Smith and Minton, Calculus

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Rajesh

**B.Sc. (Physics) Semester I-Theory Syllabus
Paper – I: Mechanics**

56 hrs

**(w. e. from academic year 2019-20)
(CBCS)**

Unit – I

1. Vector Analysis (14)

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Greens theorems- simple applications.

Unit – II

2. Mechanics of Particles (07)

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

3. Mechanics of rigid bodies (07)

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope.

Unit – III

4. Central forces (14)


Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

Unit – IV

5. Special theory of relativity (14)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

NOTE: Problems should be solved at the end of every chapter of all units.


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Textbooks

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008.*
2. **Fundamentals of Physics.** Halliday/Resnick/Walker *Wiley India Edition 2007.*
3. **First Year Physics - Telugu Academy.**
4. **Introduction to Physics for Scientists and Engineers.** F.J. Ruche. *McGraw Hill.*
5. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
6. **Theory of relativity - Resnick**

Reference Books

1. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company Edition, 2008.*
2. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005.*
3. **An introduction to Mechanics** by Daniel Kleppner& Robert Kolenkow. *The McGraw Hill Companies.*
4. **Mechanics.** Hans &Puri. *TMH Publications.*


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Question paper pattern

FIRST SEMESTER PRACTICALS

36 hrs
(3 hrs / week)

Practical Paper – I : Mechanics

1. Study of a compound pendulum determination of 'g' and 'k'.
2. Y by uniform Bending
3. Y by Non-uniform Bending.
4. Moment of Inertia of a fly wheel.
5. Measurement of errors –simple Pendulum.
6. 'Rigidity moduli by torsion Pendulum.
7. Determine surface tension of a liquid through capillary rise method.
8. Determination of Surface Tension of a liquid by different methods.
9. Determine of Viscosity of a fluid.
10. Calculation of slope and intercept of a $Y = mX + C$ by theoretical method

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Text and reference books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (PragatiPrakashan, Meerut).
3. "Practical Physics" R.K Shukla, AnchalSrivastava

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Subject: Physics

**B.Sc. Semester II-Theory Syllabus
Paper – II : Thermal Physics
(W.E.F the academic year 2019-2020)**

56 hrs

Unit – I

1. Kinetic theory of gases: (6)

Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

2. Thermodynamics: (8)

Basics of thermodynamics-Kelvin's and Clausius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature-Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.

Unit – II

3. Thermodynamic potentials and Maxwell's equations: (7)

Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

4. Low temperature Physics: (7)

Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type.

Unit – III

5. Quantum theory of radiation: (14)

Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of

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radiation - Planck's law – deduction of Wein's distribution law, Rayleigh-Jeans law, Stefan's law from Planck's law.

Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

Unit – IV

6. Statistical Mechanics: (14)

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles, classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws, Application of B-E distribution to Photons-planks radiation formula, Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.

Textbooks

1. **Fundamentals of Physics.** Halliday/Resnick/Walker.C. *Wiley India Edition 2007.*
2. **Second Year Physics – Telugu Academy.**
3. **Modern Physics** by R. Murugesan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*
4. **Heat and Thermodynamics** by Mark W.Zemansky 5th edition McGraw - Hill
5. **Heat and Thermodynamics** by D.S. Mathur.

Reference Books

1. **Modern Physics** by G. Aruldas and P. Rajagopal, *Eastern Economy Education.*
2. B.B. Laud "Introduction to statistics Mechanics"(Macmillan 1981)
3. F.Reif: "Statistical Physics "(Mcgraw-Hill,1998)
4. K.Haug: "Statistical Physics "(Wiley Eastern 1988)

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II SEMESTER Practicals Paper – II :

42 hrs
(3 hrs / week)

Thermal Physics

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.
4. Heating efficiency of electrical kettle with varying voltages.
5. Determination of Thermo emf
6. Cooling Curve of a metallic body (Null method)
7. Resistance thermometer. To Determine temp coeff resistance
8. Thermal expansion of solids
9. Study of conversion of mechanical energy into heat.
10. Determine the Specific of a solid (graphite rod)
11. Thermistor Characteristics. Calculation of A and B

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Text and reference books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava

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PAPER – III: ELECTROMAGNETIC THEORY

Theory:	4 Hours/Week;	Credits: 4	Marks: 100 (Internal: 20; External: 80)
Practical:	3 Hours/Week	Credits: 1	Marks: 25

UNIT I

Electrostatics

Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application to linear, plane and spherical charge distributions, Conservative nature of electric field 'E', Irrotational field. Electric potential: Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges, Energy density in an electric field, Calculation of potential from electric field for a spherical charge distribution.

UNIT II

Magnetostatics

Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, 'B' due to a straight current carrying conductor, Force on a point charge in a magnetic field, Properties of B, curl and divergence of B, solenoidal field, Integral form of Ampere's law, Applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance, Magnetic force between two current carrying conductors, Magnetic field intensity, Ballistic Galvanometer: Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

UNIT III:

Electromagnetic Induction and Electromagnetic waves

Faraday's laws of induction (differential and integral form), Lenz's law, self and mutual Induction, Continuity equation, modification of Ampere's law, displacement current, Maxwell equations, Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, Poynting's theorem.

UNIT IV:

Varying and alternating currents

Growth and decay of currents in LR, CR and LCR circuits - Critical damping, Alternating current, relation between current and voltage in pure R, C and L-vector diagrams - Power in ac circuits. LCR series and parallel resonant circuit-Q-factor, AC & DC motors-single phase, three phase (basics only).

Network Theorems

Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Suggested Books:

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)
2. Electricity and magnetism by J. H. Fewkes & John Yarwood. Vol. I (Oxford Univ. Press, 1991).
3. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings, 1998).
4. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
5. Electricity and magnetism. By D C Tayal (Himalaya Publishing House, 1988)
6. Electromagnetics by Joseph A. Edminister 2nd ed. (New Delhi: Tata McGraw Hill, 2006).





**PAPER – III: ELECTROMAGNETIC THEORY
PRACTICALS**

1. To verify the Thevenin's Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute method.

Note: Minimum of eight experiments should be performed.

Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books:

1. B. L. Worsnop and H. T. Flint Advanced Practical Physics, Asia Publishing House, New Delhi.
2. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, Kitab Mahal





PAPER – IV:: WAVES AND OPTICS

Theory:	4 Hours/Week;	Credits: 4	Marks: 100 (Internal: 20; External: 80)
Practical:	3 Hours/Week	Credits: 1	Marks: 25

UNIT-I:

Waves

Fundamentals of Waves -Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance.

Longitudinal vibrations in bars- wave equation and its general solution, Special cases: (i) bar fixed at both ends, ii) bar fixed at the midpoint, iii) bar free at both ends, iv) bar fixed at one end, Transverse vibrations in a bar - wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

UNIT II:

Interference

Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light.

Interference by division of wave front: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using biprism – change of phase on reflection – Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non-reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D_1, D_2 lines and thickness of a thin transparent plate.

UNIT III:

Diffraction:

Introduction – Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating).

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.





UNIT IV:

Polarization

Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewster’s law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen’s explanation) – Quarter wave plate, Half wave plate – Babinet’s compensator – Optical activity, analysis of light by Laurent’s half shade polarimeter.

NOTE: Problems should be solved at the end of every chapter of all units.

Suggested books

1. **Optics** by Ajoy Ghatak. *The McGraw-Hill companies.*
2. **Optics** by Subramaniyam and Brijlal. *S. Chand & Co.*
3. **Fundamentals of Physics.** Halliday/Resnick/Walker.C. *Wiley India Edition 2007.*
4. **Optics and Spectroscopy.** R. Murugesan and Kiruthiga Siva Prasath. *S. Chand & Co.*
5. **Second Year Physics – Telugu Academy.**
1. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
2. **Feynman’s Lectures on Physics** Vol. 1, 2, 3 & 4. *Narosa Publications.*
3. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
4. K. Ghatak, **Physical Optics**
5. D.P. Khandelwal, **Optical and Atomic Physics** (Himalaya Publishing House, Bombay, 1988)
11. Jenkins and White: **‘Fundamental of Optics’** (McGraw-Hill)
12. Smith and Thomson: **‘Optics’** (John Wiley and sons).



PAPER – IV:: WAVES AND OPTICS
PRACTICALS

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation- polarimeter.
6. Dispersive power of a prism
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.
13. Verification of Laws of a stretched string (Three Laws).
14. Velocity of Transverse wave along a stretched string
15. Determination of frequency of a bar- Melde's experiment

Note: Minimum of eight experiments should be performed Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.





PAPER – V:: (A) MODERN PHYSICS**(DSE-1: ELECTIVE)**

Theory:	4 Hours/Week;	Credits: 4	Marks: 100 (Internal: 20; External: 80)
Practical:	3 Hours/Week	Credits: 1	Marks: 25

UNIT - I**SPECTROSCOPY**

Atomic Spectra: Introduction - Drawbacks of Bohr's atomic model – Sommerfeld's elliptical orbits -relativistic correction (no derivation). Stern & Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules – spectra of alkali atoms, doublet fine structure, Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

Molecular Spectroscopy: Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

UNIT – II**Quantum Mechanics**

Inadequacy of classical Physics: Spectral radiation - Planck's law (only discussion). Photoelectric effect - Einstein's photoelectric equation. Compton's effect - experimental verification.

Matter waves & Uncertainty principle: de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Broglie waves of electron in Bohr orbits. Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle of Bohr.

Schrodinger Wave Equation

Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values.

UNIT - III**Nuclear Physics**

Nuclear Structure: Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p, n-n, and n-p scattering (concepts), nuclear forces. Nuclear models - liquid drop model, shell model.

Alpha and Beta Decays: Range of alpha particles, Geiger – Nuttall law. Gamow's theory of alpha decay. Geiger – Nuttall law from Gamow's theory. Beta spectrum - neutrino hypothesis,

Particle Detectors: GM counter, proportional counter, scintillation counter.

UNIT:IV**Solid State Physics & Crystallography**

Crystal Structure: Crystalline nature of matter, Crystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, FCC, CsCl, NaCl, diamond and ZincBlende)




X-ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

Bonding in Crystals: Types of bonding in crystals - characteristics of crystals with different bondings. Lattice energy of ionic crystals- determination of Madelung constant for NaCl crystal, Calculation of Born Coefficient and repulsive exponent. Born-Haber cycle.

Suggested books:

1. Modern Physics by G. Aruldhas & P.Rajagopal. Eastern Economy Edition.
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
3. Modern Physics by R. Murugesan and Kiruthiga SivaPrasath.S. Chand & Co.
4. Nuclear Physics by D.C. Tayal, Himalaya Publishing House.
5. Molecular Structure and Spectroscopy by G.Aruldhas. Prentice Hall of India, New Delhi.
6. Spectroscopy -Atomic and Molecular by Gurdeep R Chatwal and Shyam Anand -Himalaya Publishing House.
7. Third Year Physics – Telugu Academy.
8. Elements of Solid State Physics by J.P. Srivastava. (for chapter on nanomaterials)-Prentice-hall of India Pvt. Ltd.



KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (Under CBCS 2021 – 2022 onwards)
B.Sc. PHYSICS III Year
SEMESTER – V

PAPER – V:: (A) MODERN PHYSICS PRACTICALS
(DSE-1: ELECTIVE)

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck's constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of e/m for electron by long solenoid method.
13. Photo Cell – Determination of Planck's constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg's constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal

Note: Minimum of eight experiments should be performed.

PAPER – V:: (B) COMPUTATIONAL PHYSICS

(DSE-1: Elective)

Theory:	4 Hours/Week;	Credits: 4	Marks: 100 (Internal: 20; External: 80)
Practical:	3 Hours/Week	Credits: 1	Marks: 25

UNIT I

Programming in C

Flow charts, algorithms, Integer and floating-point arithmetic, precision, variable types, arithmetic statements, input and output statements, control statements, executable and non-executable statements, arrays, Repetitive and logical structures, Subroutines and functions, operation with files, operating systems, Creation of executable programs.

UNIT II

Numerical methods of Analysis

Solution of algebraic and transcendental equation, Newton Raphan method, Solution of simultaneous linear equations. Matrix inversion method, Interpolation, Newton and Lagrange formulas, Numerical differentiation. Numerical integration, Trapezoidal, Simpson and gaussian quadrature methods, Least square curve fitting, Straight line and Polynomial fits.

UNIT III

Numerical solution of ordinary differential equations

Eulars and Runge kutta methods, simulation. Generation of uniformly distributed random integers, statistical tests of randomness. Monte-Carlo evaluation of integrals and error analysis, Non-uniform probability distributions, Importance sampling, Rejection method.

UNIT IV

Computational methods

Metropolis algorithm, Molecular diffusion and Brownian motions, Random walk problems and their Montecarlo simulation. Finite element and Finite difference methods. Boundary value and initial value problems, density functional methods.

Note: Problems should be solved at the end of every chapter of all units

Suggested Books:

- 1. Computational methods in Physics and Engineering: Wong**
- 2. Computer Oriented Numerical methods: Rajaraman**
- 3. Computer Programming in Fortran 77: Rajaraman**
- 4. Applied Numerical Analysis: Gerald**
- 5. A Guide to Manto -Carlo simulationsi Statistical Physics: Land**

PAPER – V:: (B) COMPUTATIONAL PHYSICS PRACTICALS

(DSE-1: Elective)

1. Jacobi Method of Matrix diagonalization
2. Solution of Transcendental or Polynomial equations by the Newton Raphson method
3. Linear curve fitting and calculation of linear correlation coefficients
4. Matrix Simulation: Subtraction and Multiplication.
5. Matrix Inversion and solution of simultaneous equations
6. Lagrange interpolation based on given input data
7. Numerical integration using the Simpsons method.
8. Numerical integration using the Gaussian quadrature method.
9. Solution of first order Differential Equation using Runge-kutta method.
10. Numerical first order differentiation of a given function.
11. Fast Fourier transform
12. Monte Carlo Integration
13. Use of a package for data generation and graph plotting.
14. Test of Randomness for random numbers generators.

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.





PAPER – VI :: (A) ELECTRONICS

(DSE-2: ELECTIVE)

Theory:	4 Hours/Week;	Credits: 4	Marks: 100 (Internal: 20; External: 80)
Practical:	3 Hours/Week	Credits: 1	Marks: 25

Unit - I

Band theory of P-N junction: Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in solids, insulators, semi conductors and pure or intrinsic semiconductors and impure or extrinsic semi-conductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation.

Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

UNIT-II

Bipolar Junction Transistor (BJT) – p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configurations – transistor as an amplifier -RC coupled amplifier – Frequency response (Qualitative analysis).

Feedback concept & Oscillators: Feedback, General theory of feedback–Concepts of oscillators, Barkhausen’s criteria, Phase shift oscillator – Expression for frequency of oscillation.

UNIT-III

Special devices- Construction and Characteristics: Photo diode - Shockley diode -Solar cell, Opto-couplers - Field Effect Transistor (FET) - FET as an Amplifier - Uni Junction Transistor (UJT), UJT as a relaxation oscillator - Silicon controlled rectifier (SCR) - SCR as a switch.

UNIT-IV

Digital Electronics

Binary number system, conversion of binary to decimal and vice-versa.Binary addition and subtraction (1’s and 2’s complement methods).Hexadecimal number system.Conversion from binary to hexadecimal and vice-versa, Decimal to hexadecimal and vice-versa.

Logic gates:

OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate (EX-OR). De Morgan’s Laws – Verification.

NOTE: Problems should be solved from every chapter of all units.

Suggested Books:

1. Electronic devices and circuits – Millman and Halkias. *Mc.Graw-Hill Education*.
2. Principles of Electronics by V.K. Mehta – *S. Chand & Co.*
3. Basic Electronics (Solid state) – B. L. Theraja , *S. Chand & Co.*
4. A First Course in Electronics- Anwar A. Khan&Kanchan K. Dey, *PHI.*
5. Physics of Semiconductor Devices- *S. M. Sze*
6. Physics of Semiconductors- *Streetman.*
7. Basic Electronics – *Bernod Grob.*
8. Basic Electronics for B.Sc (Physics) III Year, 2019, *Telugu Academy*
9. Digital Principles & Applications – *A.P. Malvino and D.P. Leach*

**PAPER – VI:: (A) ELECTRONICS PRACTICALS
(DSE-2: ELECTIVE)**

1. Construction of logic gates (AND, OR, NOT, gates) with discrete components– Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. Construction of NAND and NOR gates with discrete components and truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan's Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

Note: Minimum of eight experiments should be performed.

Suggested Books:

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, Pragathi Prakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

Paper – VI:: (B) APPLIED OPTICS

(DSE-2: ELECTIVE)

Theory: 4 Hours/Week; **Credits:** 4 **Marks:** 100 (Internal: 20; External: 80)
Practical: 3 Hours/Week **Credits:** 1 **Marks:** 25

UNIT I

Principles of LASER

Emission and absorption of Radiation, -Einstein Relations- Pumping Mechanism- optical feedback- Laser rate equation for two, three and Four level Lasers, pumping threshold condition- Principle of Laser beams. Classification of LASER Systems- Gas, Liquid and Solid Lasers He-Ne and Argon Lasers, their energy level schemes- Ruby Laser and YAG laser, Ga-As Laser and their applications in various fields.

UNIT II

Holography

Basic principle of Holography- Recording of amplitude and phase. The recording medium- reconstruction of original wave front- Image formation by wave front reconstruction- Gabor Hologram- limitations of Gabor Hologram- Fourier Transform Hologram- Volume Hologram- Applications of holograms.

UNIT III

Fourier and Non-Linear Optics: Thin lens as phase transformation-thickness function-various types of lenses- Fourier transforming properties of lenses-Object placed In front of the lens- Object placed behind the lens.

Non-Linear Optics: harmonic generation- second harmonic generation-phase matching condition- Optical mixing- parametric generation of Light- Self focusing of light.

Unit IV: Optical Fibers (14 Hrs)

Fiber types and their structures. Ray optic representation, Acceptance angle and numerical aperture. Step index and graded index fibers. Single mode and multi-mode fibers. Fiber materials for glass fibers and plastic fibers. Signal attenuation in optical fibers. Absorption, Scattering and bending losses in fibers, core and cladding losses. Material dispersion, wave guide dispersion, inter modes distortion and pulse broadening.

Note:-Problems should be solved at the end of every chapter of all units

Suggested Books:

1. Optoelectronics an Introduction-Wilson & JFB Hawkes 2nd edition
2. Introduction to Fourier optics-JW Goodman
3. Lasers and Non linear Optics--BB Laud
4. Optical electronics – Ghatak and Thyagarajan
5. Principles of Lasers- O. Svelto
6. Optical fiber communication -By Geradkeiser
7. Optical fiber communication-by John M Senior(PHI)





**Paper – VI:: (B) APPLIED OPTICS PRACTICALS
(DSE-2: ELECTIVE)**

1. Study of the Profile of a laser beam
2. Determination of the diameter of a thin wire using laser
3. Determination of wavelength of He-Ne laser by transmission grating
4. Construction and recording of a Hologram
5. Study of Fourier transforming properties of lenses
6. Study of second harmonic generation by KDP crystal
7. Measurement of numerical aperture of an optical fiber
8. Measurement of coupling losses in optical fiber
9. Measurement of bending losses in optical fiber
10. Study of audio signal transmission through optical fiber
11. To study the interference of light using optical fiber

Note: Minimum of eight experiments should be performed.

Suggested Books:

1. Introduction to fourier Optics- J Goodman
2. Optical Fiber Communication- john M senior
3. Principles of Lasers-by O.Svelto
4. Modern Optics by Grant Fowles
5. Principles of Optics byBorn & Wolf
6. Fundamentals of Optics by Jekins& White



B.Sc I Yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER I
Paper - I
Chemistry - I

Unit-I (Inorganic Chemistry)

15 h (1 hr/week)

S1-I-1. Chemical Bonding

8 h

Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule, polarity and polarizability of ions. VSPER Theory - Common hybridization- sp , sp^2 , sp^3 , sp^3d , sp^3d^2 and sp^3d^3 , shapes of molecules. Molecular orbital theory: Shapes and sign convention of atomic orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept. π and σ overlapping. Concept of Types of molecular orbitals- bonding, antibonding and non bonding. MOED of homonuclear diatomics - H_2 , N_2 , O_2^- , O_2^{2-} , F_2 (unhybridized diagrams only) and heteronuclear diatomics CO , CN^- , NO , NO^+ and HF . Bond order, stability and magnetic properties.

S1-I-2. p-Block Elements 1

7 h

Group-13: Structure of diborane and higher Boranes (B_4H_{10} and B_5H_9), Boron nitrogen compounds ($B_3N_3H_6$ and BN), Lewis acid nature of BX_3 .
Group - 14: Carbides-Classification - ionic, covalent, interstitial - Structures and reactivity. Industrial applications. Silicones - Classification - straight chain, cyclic and cross-linked.
Group - 15: Nitrides - Classification - ionic, covalent and interstitial. Reactivity - hydrolysis. Reactions of hydrazine, hydroxyl amine, phosphazenes.

Unit - II (Organic Chemistry)

15h(1 hr/week)

S1-O-1: Structural Theory in Organic Chemistry

5 h

Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance - Mesomeric effect, application to (a) acidity of phenol. (b) acidity of carboxylic acids and basicity of anilines. Stability of carbo cations, carbanions and free radicals. Hyper conjugation and its application to stability of carbonium ions, free radicals and alkenes.

S1-O-2: Acyclic Hydrocarbons

6 h

Alkanes- Methods of preparation: From Grignard reagent, Kolbe synthesis. Chemical reactivity - inert nature, free radical substitution, Halogenation example- reactivity, selectivity and orientation.

Alkenes - Preparation of alkenes (with mechanism) (a) by dehydration of alcohols (b) dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides, Zaitsev's rule. Properties: Anti-addition of halogen and its mechanism. Addition of HX , Markonikov's rule, addition of H_2O , HOX , H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition). Oxidation (cis - additions) - hydroxylation by $KMnO_4$, OsO_4 ,

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anti addition- peracids (via epoxidation), hydroboration, ozonolysis – location of double bond. Dienes – Types of dienes, reactions of conjugated dienes – 1,2 and 1,4 addition of HBr to 1,3 – butadiene and Diels – Alder reaction.

Alkynes– Preparation by dehydrohalogenation of vicinal dihalides, dehalogenation of tetrahalides. Physical Properties: Chemical reactivity – electrophilic addition of X_2 , HX, H_2O (tautomerism), Oxidation (formation of enediol, 1,2 diones and carboxylic acids) and reduction (Metal-ammonia reduction, catalytic hydrogenation).

Aromatic Hydrocarbons

4h

Introduction to aromaticity: Huckel's rule – Benzene, Naphthalene and Anthracene. Reactions - General mechanism of electrophilic substitution, mechanism of nitration, sulphonation and halogenation, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para, and meta directing groups. Ring activating and deactivating groups with examples. Orientation – (i) activating groups: Amino, methoxy and alkyl groups. (ii) Deactivating groups - nitro, nitrile, carbonyl, carboxylic acid, sulphonic acid and halo groups.

Unit – III (Physical Chemistry)

15h(1 hr/week)

S1-P-1: Atomic structure and elementary quantum mechanics

3 h

Black body radiation, heat capacities of solids, Rayleigh Jeans law, Planck's radiation law, photoelectric effect, Limitations of classical mechanics, Compton effect, de Broglie's hypothesis. Heisenberg's uncertainty principle.

S1-P-2: Gaseous State

5 h

Deviation of real gases from ideal behavior. van der Waals equation of state. Critical phenomenon. PV isotherms of real gases, continuity of state. Andrew's isotherms of CO_2 . The van der Waal's equation and critical state. Derivation of relationship between critical constants and van der Waal's constants. The law of corresponding states, reduced equation of states. Joule Thomson effect and inversion temperature of a gas. Liquifaction of gases: i) Linde's method based on Joule Thomson effect ii) Claude's method based on adiabatic expansion of a gas.

S1-P-3: Liquid State and Solutions

4h

Liquid State

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Solutions

3h

Liquid - liquid mixtures, ideal liquid mixtures, Raoult's and Henry's laws. Non ideal systems. Azeotropes: HCl- H_2O and $C_2H_5OH - H_2O$ systems. Fractional distillation. Partially miscible liquids: Phenol – Water, Trimethyl amine – Water and Nicotine – Water systems.

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Unit - IV (General Chemistry)

15h(1 hr/week)

S1-G-1. General Principles of Inorganic Qualitative Analysis

6 h

Anion analysis: Theory of sodium carbonate extract, classification and reactions of anions- CO_3^{2-} , Cl^- , Br^- , SO_4^{2-} , PO_4^{3-} , BO_3^{3-} , CH_3COO^- , NO_3^- . Interfering ions. Cation Analysis: Principles involved - Solubility product, common ion effect, general discussion for the separation and identification of group I individual cations (Hg_2^{2+} , Ag^+ , Pb^{2+}) with flow chart and chemical equations. Principle involved in separation of group II & IV cations. General discussion for the separation and identification of group II (Hg^{2+} , Pb^{2+} , Bi^{3+} , Cd^{2+} , Sb^{3+}), III (Al^{3+} , Fe^{3+}), IV (Mn^{2+} , Zn^{2+}) individual cations with flow chart and chemical equations. General discussion for the separation and identification of group V individual cations (Ba^{2+} , Sr^{2+} , Ca^{2+}) with flow chart and chemical equations. Theory of flame test. Identification of Group VI cations (Mg^{2+} , NH_4^+).

S1-G-2. Isomerism

5h

Isomerism: Definition of isomers. Classification of isomers: Constitutional and Stereoisomers - definition and examples. Constitutional isomers: chain, functional and positional isomers. Stereoisomers: enantiomers and diastereomers - definitions and examples. Representation of stereoisomers - Wedge, Fischer projection, Sawhorse, Newmann formulae.

Conformational analysis : Classification of stereoisomers based on energy. Definition and examples Conformational and configurational isomers. Conformational analysis of ethane, n-butane, 1,2-dichloroethane, 2-chloroethanol. Cyclic compounds: Baeyer's strain theory, Conformational analysis of cyclohexane

Cis-trans isomerism: E-Z-Nomenclature

S1-G-3: Solid state Chemistry

4 h

Laws of Crystallography: (i) Law of Constancy of interfacial angles (ii) Law of Symmetry-Symmetry elements in crystals (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais Lattices and Seven Crystal systems (a brief review). X-ray diffraction by crystals; Derivation of Bragg's equation. Determination of structure of NaCl, KCl and CsCl (Bragg's method and Powder method).

References

General reference: B.Sc I Year Chemistry : Semester I, Telugu Academy publication, Hyd
Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001. Chem.

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5. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th edn.
6. Chemistry of the elements by N.N. Greenwood and A. Earnshaw Pergamon Press 1989.
7. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
9. Textbook of Inorganic Chemistry by R Gopalan.

Unit- II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Principles of physical chemistry by Prutton and Marron.
2. Text Book of Physical Chemistry by Soni and Dharmahara..
3. Text Book of Physical Chemistry by Puri and Sharma.
4. Text Book of Physical Chemistry by K. L. Kapoor.
5. Physical Chemistry through problems by S.K. Dogra.
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry by Lewis Glasstone.

Unit IV

1. Qualitative analysis by Welcher and Hahn.
2. Vogel's Qualitative Inorganic Analysis by Svehla.
3. Text Book of Organic Chemistry by Morrison And Boyd.
4. Text Book of Organic Chemistry by Graham Solomons.
5. Text Book of Organic Chemistry by Bruice Yuranis Powla.
6. Text Book of Organic Chemistry by Soni.
7. Text Book of Physical Chemistry by Soni And Dharmahara..
8. Text Book of Physical Chemistry by Puri And Sharma.
9. Text Book of Physical Chemistry by K. L. Kapoor.

Laboratory Course

45h (3 h / week)

Paper I - Qualitative Analysis - Semi micro analysis of mixtures

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: CO_3^{2-} , SO_3^{2-} , S^{2-} , Cl^- , Br^- , I^- , CH_3COO^- , NO_3^- , PO_4^{3-} , BO_3^{3-} , SO_4^{2-} . .

Cations: Hg_2^{2+} , Ag^+ , Pb^{2+}

Hg^{2+} , Pb^{2+} , Bi^{3+} , Cd^{2+} , Cu^{2+} , $As^{3+/5+}$, $Sb^{3+/5+}$, $Sn^{2+/4+}$

Al^{3+} , Cr^{3+} , Fe^{3+}

Zn^{2+} , Ni^{2+} , Co^{2+} , Mn^{2+}

Ba^{2+} , Sr^{2+} , Ca^{2+}

Mg^{2+} , NH_4^+

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B.Sc I Yr CHEMISTRY
SEMESTER WISE SYLLABUS

SEMESTER II

Paper – II

Chemistry – II

Unit-I (Inorganic Chemistry)

15 h (1 hr/week)

S2-I-1 p-block Elements -II

7 h

Oxides: Types of oxides (a) Normal- acidic, basic amphoteric and neutral (b) Mixed (c) sub oxide d) peroxide e) superoxide. Structure of oxides of C, N, P, S and Cl - reactivity, thermal stability, hydrolysis.

Oxy acids: Structure and acidic nature of oxyacids of B, C, N, P, S, Cl and I. Redox properties of oxyacids of Nitrogen: HNO_2 (reaction with FeSO_4 , KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$), HNO_3 (reaction with H_2S , Cu), HNO_4 (reaction with KBr, Aniline), $\text{H}_2\text{N}_2\text{O}_2$ (reaction with KMnO_4). Redox properties of oxyacids of Phosphorus: H_3PO_2 (reaction with HgCl_2), H_3PO_3 (reaction with AgNO_3 , CuSO_4). Redox properties of oxyacids of Sulphur: H_2SO_3 (reaction with KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$), H_2SO_4 (reaction with Zn, Fe, Cu), $\text{H}_2\text{S}_2\text{O}_3$ (reaction with Cu, Au), H_2SO_5 (reaction with KI, FeSO_4), $\text{H}_2\text{S}_2\text{O}_8$ (reaction with FeSO_4 , KI). Redox properties of oxy acids of Chlorine.

Interhalogens- Classification- general preparation- structures of AB , AB_3 , AB_5 and AB_7 type and reactivity.

Poly halides- Definition and structure of ICl_2^- , ICl_4^- and I_3 .

Pseudohalogens: Comparison with halogens.

S2-I-2: Chemistry of Zero group elements

2 h

Isolation of noble gases, Structure, bonding and reactivity of Xenon compounds – Oxides, Halides and Oxy-halides. Clathrate compounds and Anomalous behavior of He (II)

S2-I-3: Chemistry of d-block elements

6 h

Characteristics of d-block elements with special reference to electronic configuration, variable valence, ability to form complexes, magnetic properties & catalytic properties. Stability of various oxidation states and standard reduction potentials. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu triads. Titanium triad – electronic configuration and reactivity of +3 and +4 states – oxides and halides. Chromium triad – reactivity of +3 and +6 states. Copper triad – reactivity of +1, +2 and +3 states.

Unit - II (Organic Chemistry)

15h(1 hr/week)

S2-O-1: Halogen compounds

4 hrs

Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl. Chemical reactivity - reduction, formation of RMgX , Nucleophilic substitution reactions – classification into $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$. Mechanism and energy profile diagrams of $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions. Stereochemistry of $\text{S}_{\text{N}}2$ (Walden Inversion) 2-bromobutane, $\text{S}_{\text{N}}1$ (Racemisation) 1-bromo-1-phenylpropane Structure and reactivity – Ease of hydrolysis - comparison of alkyl, vinyl, allyl, aryl, and benzyl halides.

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S2-O-2: Hydroxy compounds and ethers

6 hrs

Alcohols: Preparation: 1°, 2° and 3° alcohols using Grignard reagent, Reduction of Carbonyl compounds, carboxylic acids and esters. Physical properties: H-bonding, Boiling point and Solubility. Reactions with Sodium, HX/ZnCl₂ (Lucas reagent), esterification, oxidation with PCC, alk. KMnO₄, acidic dichromates, conc. HNO₃ and Oppenauer oxidation (Mechanism).

Phenols: Preparation: (i) from diazonium salts of anilines, (ii) from benzene sulphonic acids and (iii) Cumene hydroperoxide.

Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Reimer Tiemann reaction (Mechanism), Kolbe reaction (Mechanism), Gattermann-Koch reaction, Azo-coupling reaction, Schotten-Boumann reaction, Houben-Hoesch condensation, .

Ethers : Nomenclature, preparation by (a) Williamson's synthesis (b) from alkenes by the action of conc. H₂SO₄. Physical properties – Absence of Hydrogen bonding, insoluble in water, low boiling point. Chemical properties – inert nature, action of conc. H₂SO₄ and HI.

S2-O-3 Carbonyl compounds

5h

Preparation of aldehydes & ketones from acid chloride, 1,3-dithianes, nitriles and from carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by (a) Oxidation of arenes (b) Hydrolysis of benzal halides Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) NaHSO₃ (b) HCN (c) RMgX (d) NH₃ (e) RNH₂ (f) NH₂OH (g) PhNHNH₂ (h) 2,4-DNP (Schiff bases). Addition of H₂O to form hydrate, chloral hydrate (stable), addition of alcohols - hemiacetal and acetal formation. Cannizzaro reaction. Oxidation reactions – KMnO₄ oxidation and auto oxidation, reduction – catalytic hydrogenation, mechanism of Clemmenson's reduction, Wolf-kishner reduction, Meerwein Ponnoff Verly reduction. Reduction with LAH, NaBH₄.

Unit - III (Physical Chemistry)

15h(1 hr/week)

S2-P-1: Electrochemistry

15 h

Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. Migration of ions and Kohlrausch's law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law - its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf's method for attackable electrodes. Applications of conductivity measurements: Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. Electro motive force (EMF) of a cell and its measurement. Computation of EMF. Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble

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salt and redox electrodes. Electrode reactions, Nernst equation, cell EMF and Single electrode potential, Standard Hydrogen electrode – reference electrodes (calomel electrode) – standard electrode potential, sign conventions, electrochemical series and its significance. Applications of EMF measurements. Calculation of thermodynamic quantities of cell reactions (Gibbs free energy G , Helmholtz free energy and Equilibrium constant K). Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode. Solubility product of AgCl. Potentiometric titrations.

Unit – IV (General Chemistry)

15 h (1 hr/week)

S2-G-1: Theory of Quantitative Analysis

6 hours

Volumetric Analysis: Introduction, standard solutions, indicators, end point, titration curves, Types of titrations: i) neutralization titration- principle, theory of acid base indicators, titration curves and selection of indicators- strong acid - strong base, strong acid –weak base, weak acid-strong base and weak acid –weak base. Theory of redox titrations - internal(KMnO_4) and external indicators – use of diphenylamine and ferroin indicators. Theory of complexometric titrations – use of EBT, Murexide and Fast sulphone black indicators. Role of pH in complexometric titrations. Precipitation titrations – theory of adsorption indicators.

Gravimetric analysis- Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate, coprecipitation and post precipitation. Determination of Ni^{2+}

S2-G-2: Stereoisomerism

5h

Optical activity: Definition, wave nature of light, plane polarised light, optical rotation and specific rotation, chiral centers. Chiral molecules: definition and criteria - absence of plane, center and S_n axis of symmetry – asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans-1,2-dichlorocyclopropane). Molecules with constitutionally symmetrical chiral carbons (Tartaric acid) Molecules with constitutionally unsymmetrical chiral carbons (2,3dibromopentane). D, L configuration – examples. R, S – configuration: Cahn-Ingold-Prelog rules, examples for asymmetric and dissymmetric molecules.

S2-G-3: Dilute Solutions & Colligative Properties

4 h

Dilute Solutions, Colligative Properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.

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George
26/06/19

Shreyas
26/6/19

~Dishant
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John
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References

General reference: B.Sc I Year Chemistry : Semester II, Telugu Academy publication, Hyd
Unit I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A. Cotton, G. Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001.
4. Chemistry of the elements by N.N. Greenwood and A. Earnshaw Pergamon Press 1989.
5. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
6. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th Edn.
7. Textbook of inorganic chemistry by R Gopalan.

Unit II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruce Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Physical chemistry by P W Atkins
2. Principles of physical chemistry by Prutton and Marron.
3. Text Book of Physical Chemistry by Soni and Dharmahara.
4. Text Book of Physical Chemistry by Puri and Sharma
5. Text Book of Physical Chemistry by K. L. Kapoor
6. Physical Chemistry through problems by S.K. Dogra.
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Material science by Kakani & Kakani

Unit IV

1. Vogel's Text Book of Quantitative Analysis by G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney 5th edn Addison Wesley Longman Inc. 1999.
2. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn..
3. Nano: The Essentials by T. Pradeep, McGraw-Hill Education.
4. Chemistry of nanomaterials: Synthesis, Properties and applications by CNR Rao et.al.
5. Nanostructured Materials and Nanotechnology, edited by Hari Singh Nalwa, Academic Press
6. Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati.

Laboratory Course

45hrs (3 h / week)

Paper II- Quantitative Analysis

Acid - Base titrations

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.

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R. S.
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M. S.
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J. S.
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KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (Under CBCS 2019–2022)
B.Sc. CHEMISTRY II Year
SEMESTER – III

Paper-III
Chemistry - III

Unit-I (Inorganic Chemistry)

15 h (1 hr/week)

S3-I-1: Chemistry of f-block elements:

5 h

Chemistry of Lanthanides: Position in periodic table, Electronic structure, oxidation state, ionic and atomic radii- lanthanide contraction- cause and consequences, anomalous behavior of post lanthanides-complexation- type of donor ligands preferred. Magnetic properties- paramagnetism. Colour and spectra, f-f transitions –occurrence and separation– ion exchange method, solvent extraction.

Chemistry of actinides- general features – electronic configuration, oxidation state, actinide contraction, colour and complex formation. Comparison with lanthanides.

S3-I-2: Coordination Compounds-I

6 h

Simple inorganic molecules and coordination complexes. Nomenclature – IUPAC rules, 1. Coordination number, coordination geometries of metal ions, types of ligands. 2. Brief review of Werner's theory, Sidgwick's electronic interpretation and EAN rule and their limitations. (Valence bond theory (VBT) – postulates and application to (a) tetrahedral complexes $[\text{Ni}(\text{NH}_3)_4]^{2+}$, $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CO})_4]$ (b) Square planar complexes $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $[\text{PtCl}_4]^{2-}$ (c) Octahedral complexes $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{FeF}_6]^{4-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{CoF}_6]^{3-}$. Limitations of VBT. 3. Isomerism in coordination compounds, stereo isomerism – (a) geometrical isomerism in (i) square planar meta l complexes of the type $[\text{MA}_2\text{B}_2]$, $[\text{MA}_2\text{BC}]$, $[\text{M}(\text{AB})_2]$, $[\text{MABCD}]$. (ii) Octahedral metal complexes of the type $[\text{MA}_4\text{B}_2]$, $[\text{M}(\text{AA})_2\text{B}_2]$, $[\text{MA}_3\text{B}_3]$ using suitable examples, (b) Optical isomerism in (i). tetrahedral complexes $[\text{MABCD}]$, (ii). Octahedral complexes $[\text{M}(\text{AA})_2\text{B}_2]$, $[\text{M}(\text{AA})_3]$ using suitable examples. Structural isomerism: ionization, linkage, coordination ligand isomerism using suitable examples.

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S3-I-3: Metal carbonyls and Organometallic Chemistry**4 h**

Metal carbonyls: Preparation and properties of $\text{Ni}(\text{CO})_4$. Structural features of $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Fe}_3(\text{CO})_{12}$ and $\text{Cr}(\text{CO})_6$ -18 valence electron rule.

Definition, nomenclature and classification of organometallic compounds. Methods of preparation, properties and applications of alkyl and aryl compounds of Li, Mg & Al.

Unit - II (Organic Chemistry)**15h(1 hr/week)****S3-O-1: Carboxylic acids and derivatives****5 h**

Preparation: a) Hydrolysis of Nitriles, amides and esters. b) Carbonation of Grignard reagents. Special methods of preparation of Aromatic Acids - Oxidation of Arenes. Physical properties- hydrogen bonding, dimeric association,. Chemical properties – Reactions involving H, OH and COOH groups -salt formation, anhydride formation, Acid halide formation, Esterification (mechanism) & Amide formation. Reduction of acid to the corresponding primary alcohol - via ester or acid chloride. Degradation of carboxylic acids by Huns Diecker reaction, Schmidt reaction (Decarboxylation). Arndt – Eistert synthesis, Halogenation by Hell – Volhard - Zelensky reaction. Carboxylic acid Derivatives – Hydrolysis and Amonolysis of acid halides, Acid anhydrides and esters (mechanism of ester hydrolysis by base and acid). Hydrolysis and dehydration of amides.

S3-O-2: Nitrohydrocarbons**3 h**

Preparation of Nitroalkanes. Reactivity - halogenation, reaction with HNO_2 (Nitrous acid), Nef reaction, reduction. Aromatic Nitrohydrocarbons: Preparation of Nitrobenzene by Nitration. Physical properties, chemical reactivity –Reduction of Nitrobenzenes in different media.

S3-O-3: Amines, Cyanides and Isocyanides**7 h**

Amines: classification into 1° , 2° , 3° Amines and Quarternary ammonium compounds. Preparative methods – Ammonolysis of alkyl halides, Gabriel synthesis, Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties. Use of amine salts as phase transfer catalysts. Chemical Properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation. Reaction with Nitrous acid of 1° , 2° , 3° (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines – Bromination and Nitration, oxidation of aryl and 3° Amines, diazotisation. Diazonium salts: Preparation with mechanism. Synthetic importance – a) Replacement of diazonium group by – OH, X (Cl)- Sandmeyer and Gatterman reaction, by fluorine (Schiemann's reaction), by iodine, CN, NO_2 , H and aryl groups. Coupling Reaction of diazonium salts. i) with phenols ii) with anilines. Reduction to phenyl hydrazines.

Cyanides and isocyanides: Structure. Preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iii)

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reduction iv) oxidation.

Unit III (Physical Chemistry)

15 h (1 hr/week)

S3-P-1: Thermodynamics -I

10 h

A brief review of - Energy, work and heat units, mechanical equivalent of heat, definition of system, surroundings. First law of thermodynamics statement- various forms mathematical expression. Thermodynamic quantities- extensive properties and intensive properties, state function and path functions. Energy as a state function and exact differential. Work of expansion and heat absorbed as path function.

Expression for work of expansion, sign convention problems on first law. Heat changes at constant pressure and heat changes at constant volume. Enthalpy. Heat capacities at constant pressure and constant volume. Derivation of $C_p - C_v = R$. Isothermal adiabatic processes. Reversible and irreversible processes. Reversible change and maximum work. Derivation of expression for maximum work for isothermal reversible process. Problems. Internal energy of an ideal gas. Joules experiment. Joule-Thompson coefficient. Adiabatic changes in ideal gas, derivation of equation, $PV^\gamma = \text{constant}$. P-V curves for isothermal and adiabatic processes. Heat of a reaction at constant volume and at constant pressure, relation between ΔH and ΔV . Variation of heat of reaction with temperature. Kirchhoff's equation and problems. Limitations of first law and need for second law. Statement of second law of thermodynamics. Cyclic process. Heat engine, Carnot's theorem, Carnot's cycle. Derivation of efficiency of heat engine. Problems. Thermodynamic scale of temperature.

S3-P-2: Thermodynamics-II

5 h

Entropy: Definition from Carnot's cycle. Entropy as a state function. Entropy as a measure of disorder. Sign of entropy change for spontaneous and non-spontaneous processes & equilibrium processes. Entropy changes in i). Reversible isothermal process, ii). Reversible adiabatic process, iii). Phase change, iv). Reversible change of state of an ideal gas. Problems. Entropy of mixing of ideal gases. Free energy Gibbs's function (G) and Helmholtz's function (A) as thermodynamic quantities. Concept of maximum work and network ΔG as Criteria for spontaneity. Derivation of equation $\Delta G = \Delta H - T\Delta S$. Significance of the equation. Gibbs equations and Maxwell relations. Variation of G with P, V and T.

Unit - IV (General Chemistry)

15 h (1 hr/week)

S3-G-1 Evaluation of analytical data

4 h

Significant figures, accuracy and precision. Errors-classification of errors- determinate and indeterminate errors, absolute and relative errors. Problems based on mean, median, range, standard deviation

S3-G-2: Carbanions-I

5 h

Introduction, acidic nature of α -hydrogens and tautomerism in carbonyl compounds, nitro hydrocarbons, ethyl acetoacetate, diethyl malonate. Terminal alkynes. Stability of carbanions Reactions : Aldol reaction, Perkin reaction, Benzoin condensation, haloform reaction, conversion of smaller alkynes to higher alkynes.

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S3-G-3: Phase Rule

6 h

Statement and meaning of the terms – Phase, Component and Degrees of freedom, Gibb's Phase rule, phase equilibria of one component system – water system. Phase equilibria of two-component system – Solid-Liquid equilibria, simple eutectic –Pb-Ag system, desilverisation of lead. Solid solutions – compound with congruent melting point – Mg-Zn system and incongruent melting point – NaCl-H₂O system.

References

General reference: B.Sc II Year Chemistry : Semester III, Telugu Academy publication, Hyd Unit- I

1. Analytical chemistry by G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasada Rao, K.L.N. Reddy and C. Sudhakar
2. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications(1996).
3. Concise Inorganic Chemistry by J.D. Lee 3rd edn Van Nostrand Reinhold Company(1977)
4. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
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8. Textbook of Inorganic Chemistry by R Gopalan(Universities Press(2012)
9. College Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati Universities Press (India) Limited(2012)

Unit- II

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2. General Organic chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008).
3. Text book of organic chemistry by Morrison and Boyd. Person(2009)
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5. Text book of organic chemistry by Bruice Yuranis Powla. (2012)
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Unit III

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2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand and Sons.(2011)
3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chand and Co.(2017)
4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Colloidal and surface chemistry , M. Satake, Y. Hayashi, Y.Mido, S.A.Iqbal and
6. M.S.sethi, Discovery Publishing Pvt.Ltd (2014)
7. Material science by Kakani & Kakani, New Age International(2016)
8. Physical Chemistry by Ira Levine (Author) McGraw-Hill Education; 6 edition (May 9, 2008)

Unit IV

1. Text book of organic chemistry by Morrison and Boyd, Person(2009)

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2. Text book of organic chemistry by Graham solomons, Wiley(2015)
3. Text book of organic chemistry by Sony, Sultan Chand & Sons; 29th edition (2012)
4. Text book of organic chemistry by Bruice yuranis Powla, (2012)
5. General Organic chemistry by Sachin kumar Ghosh, New Age Publishers Pvt Ltd (2008)

Laboratory Course

Paper III (Organic Synthesis)

45 h (3h/week)

1. Synthesis of Organic compounds:

Acetylation: Acetylation of salicylic acid, Benzoylation of Aniline.

Aromatic electrophilic substitution: Nitration: Preparation of nitro benzene and m-dinitro benzene.

Halogenation: Preparation of p-bromo acetanilide, Preparation of 2,4,6-tribromo phenol

Oxidation: Preparation of benzoic acid from benzyl chloride.

Esterification: Preparation of n-butyl acetate from acetic acid.

Methylation: Preparation of - naphthyl methyl ether.

Condensation: Preparation of benzilidene aniline and Benzaldehyde and aniline.

Diazotisation: Azocoupling of β -Naphthol.

2. Microwave assisted synthesis of Asprin – DEMO (demonstration only)

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B.Sc. II yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER IV
Paper-IV
Chemistry - IV

Unit-I (Inorganic Chemistry) 15h (1 h/week)

S4-I-1: Coordination Compounds –II 11 h

Crystal field theory (CFT)- Postulates of CFT, splitting patterns of d-orbitals in octahedral, tetrahedral, square planar with suitable examples. Crystalfield stabilization energies and its calculations for various dn configurations in octahedral complexes. High Spin Low Spin complexes. Colour and Magnetic properties of transition metal complexes. Calculations of magnetic moments spin only formula. Detection of complex formation - basic principles of various methods- change in chemical properties, solubility, colour, pH, conductivity, magnetic susceptibility.

Hard and soft acids bases (HSAB) - Classification, Pearson's concept of hardness and softness, application of HSAB principles - Stability of compounds / complexes, predicting the feasibility of reaction. Thermodynamic and kinetic stability of transition of metal complexes. Stability of metal complexes -stepwise and overall stability constant and their relationship and chelate effect determination of composition of complex by Job's method and mole ratio method.

Applications of coordination compounds: Applications of coordination compounds a) in quantitative and qualitative analysis with suitable examples b) in medicine for removal of toxic metal ions and cancer therapy c) in industry as catalysts polymerization - Ziegler Natta catalyst d) water softening.

S4-I-2: Bioinorganic Chemistry 4 h

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl⁻). Toxic metal ions As, Hg & Pb Oxygen transport and storage - structure of hemoglobin, binding and transport of oxygen. Fixation of CO₂ in photosynthesis- overview of light and dark reactions in photosynthesis. Structure of chlorophyll and coordination of magnesium. Electron transport in light reactions from water to NADP⁺ (Z - scheme).

Semester-IV

Unit - II (Organic Chemistry) 15h(1 hr/week)

S4-O-1: Carbohydrates 6 h

Introduction: Classification and nomenclature. Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure. Number of optically active, isomers possible for the structure, configuration

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of glucose based on D-glyceraldehyde as primary standard (No proof for configuration is required). Evidence for cyclic structure of glucose (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). (Haworth formula and chair conformational formula). Structure of fructose; Evidence of 2 - ketohexose structure. Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure, Haworth formula).

Inter Conversion of Monosaccharides: : Arabinose to D-glucose, D- mannose (kiliani - Fischer method). Epimers, Epimerisation- Lobry de bruyn van Ekenstein rearrangement. D-glucose to D-arabinose by Ruff's degradation. Aldohexose(+) (glucose) to ketohexose (-) (fructose) and Ketohexose(Fructose) to aldohexose (Glucose).

S4-O-2: Amino acids and proteins

5 h

Classification. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, Valine and Leucine) by following methods: a) From halogenated Carboxylic acid b) Malonic ester synthesis c) strecker's synthesis. Physical properties: Optical activity of naturally occurring amino acids. Zwitter ion structure - salt like character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups - Lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides. Primary structure of proteins, di peptide synthesis

S4-O-3: Heterocyclic Compounds

4 h

Introduction and definition: 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring systems -Numbering. Aromatic character

Resonance structures: Explanation of feebly acidic character of pyrrole, electrophilic substitution, Halogenation, Nitration and Sulphonation. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene Paul-Knorr synthesis. Structure of pyridine, Basicity - Aromaticity - Comparison with pyrrole - preparation by Hantsch method and properties - Reactivity towards Nucleophilic substitution reaction - chichibabin reaction.

Unit III (Physical Chemistry)

15h (1 hr/week)

S4-P-1: Chemical Kinetics

11 h

Introduction to chemical kinetics, rate of reaction, variation of concentration with time, rate laws and rate constant. Specific reaction rate. Factors influencing reaction rates: effect of concentration of reactants, effect of temperature, effect of pressure, effect of reaction medium, effect of radiation, effect of catalyst with simple examples. Order of a reaction.

First order reaction, derivation of equation for rate constant. Characteristics of first order reaction. Units for rate constant. Half- life period, graph of first order reaction, Examples- Decomposition of H_2O_2 and decomposition of oxalic acid, Problems.

Pseudo first order reaction, Hydrolysis of methyl acetate, inversion of cane sugar, problems. Second order reaction, derivation of expression for second order rate constant, examples-

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Saponification of ester, $2O_3 \rightarrow 3O_2$, $C_2H_4 + H_2 \rightarrow C_2H_6$. Characteristics of second order reaction, units for rate constants, half-life period and second order plots. Problems **4 h**

S4-P-2: Photochemistry

Introduction to photochemical reactions, Difference between thermal and photochemical reactions, Laws of photo chemistry- Grotthus Draper law, Stark-Einstein's Law of photochemical equivalence. Quantum yield. Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of H_2-Cl_2 and H_2-Br_2 reactions, reasons for the high and low quantum yield. Problems based on quantum efficiency. Consequences of light absorption. Singlet and triplet states. Jablonski diagram. Explanation of internal conversion, inter-system crossing, phosphorescence, fluorescence.

Unit III (General Chemistry)

15h (1 hr/week)

S4-G-1: Theories of bonding in metals

4 h

Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors n-type and p-type, extrinsic & intrinsic semiconductors, and insulators.

S4-G-2: Carbanions-II

5 h

Mannich reaction, Michael addition and Knoevenagel condensation Synthetic applications of Aceto acetic ester. Acid hydrolysis and ketonic hydrolysis: Preparation of ketones, monocarboxylic acids and dicarboxylic acids Malonic ester- synthetic applications. Preparation of (i) substituted mono carboxylic acids and (ii) substituted dicarboxylic acids.

S4-G-3: Colloids & Surface Chemistry

6 h

Definition of colloids. Classification of colloids. Solids in liquids (sols): preparations and properties - Kinetic, Optical and Electrical stability of colloids. Protective action. Hardy-Schultz law, Gold number. Liquids in liquids (emulsions): Types of emulsions, preparation and emulsifier. Liquids in solids(gels): Classification, preparations and properties, General applications of colloids.

Adsorption: Types of adsorption. Factors influencing adsorption. Freundlich adsorption isotherm. Langmuir theory of unilayer adsorption isotherm. Applications.

References

General reference: B.Sc II Year Chemistry : Semester IV, Telugu Academy publication, Hyd Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand Reinhold Company (1977)
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4. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
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7. Textbook of Inorganic Chemistry by R Gopalan, Universities Press, (2012)

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Unit- II

1. Text book of organic chemistry by Soni. Sultan Chand & Sons; Twenty Ninth edition (2012)
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4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Physical Chemistry through problems by S.K. Dogra. (2015)
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry by Lewis Glasstone. Macmillan (1966)
8. Industrial Electrochemistry, D. Pletcher, Chapman & Hall, London, 1990

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5. Text book of organic chemistry by Morrison and Boyd, Person (2009)
6. Text book of organic chemistry by Graham solomons, Wiley (2015)
7. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar Kar, CBA,(2014)
8. Organic synthesis by Dr. Jagadamba Singh and Dr. L.D.S. Yadav, Pragati Prakashan, 2010
7. Stereochemistry of organic compounds by D. Nasipuri, New Academic Science Limited, 2012
8. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001
9. Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Universities, Press 2014

Laboratory Course

Paper IV-

Qualitative Analysis of Organic Compounds:

45hrs (3 h/week)

Qualitative analysis: Identification of organic compounds through the functional group analysis - ignition test, determination of melting points/boiling points, solubility test, functional group tests and preparation of suitable derivatives of the following: Carboxylic acids, phenols, amines, urea, thiourea, carbohydrates, aldehydes, ketones, amides, nitro hydrocarbons, ester and naphthalene.

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B.Sc., III YEAR CHEMISTRY

SEMESTER-V

DSE-A: Chemistry Paper-V

(Spectroscopy & Chromatography)

(04 credits)

60 Hrs (04 Hrs/week)

UNIT-I: Molecular Spectroscopy (15 Hrs)

S5-A-E-I: Introduction to electromagnetic radiation, interaction of electromagnetic radiations with molecules, various types of molecular spectra.

Rotational spectroscopy (Microwave spectroscopy)

Rotational axis, moment of inertia, classification of molecules (based on moment of inertia), rotational energies, selection rules, determination of bond length of rigid diatomic molecules eg. HCl.

Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant (Problems). Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules and energy levels. Modes of vibrations in polyatomic molecules. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum

Electronic spectroscopy

Bonding and anti-bonding molecular orbitals, electronic energy levels of molecules (σ , π , n), types of electronic transitions: σ - σ^* , n - σ^* , n - π^* , π - π^* with suitable examples. Selection rules, Terminology of chromophore, auxochrome, bathochromic and hypsochromic shifts. Absorption of characteristics of chromophones: diene, enone and aromatic chromophores. Representation of UV-Visible spectra. General features of absorption-spectroscopy transmittance, absorbance, and molar absorptivity. Beer-Lambert's law and its limitations.

UNIT-II: NMR & Mass Spectroscopy (15 Hrs)

S5-A-E-II: Proton Magnetic Resonance Spectroscopy

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, factors affecting chemical shifts, NMR splitting of signals – spin-spin coupling, representation of proton NMR spectrum – Integrations. ^1H NMR spectrum of – ethyl bromide, acetaldehyde, 1, 1, 2- tribromo ethane, ethyl acetate and acetophenone.

Mass Spectrometry

Electron Impact Mass: Basic principles, Nitrogen rule, types of ions: Molecular ion, fragment ion and isotopic ions, representation of mass spectrum, types of peaks (molecular ion, fragment and isotopic ion peaks). Determination of molecular formula. Mass spectrum of ethyl chloride, ethyl bromide and acetophenone.

UNIT-III: Separation techniques-I (15 Hrs)

S5-A-E-III: Solvent Extraction- Principle, Methods of extraction: Batch extraction, continuous extraction and counter current extraction. Application– Determination of Iron (III).

Chromatography: Classification of chromatographic methods, principles of differential migration, adsorption phenomenon, nature of adsorbents, solvent systems.

Thin layer Chromatography (TLC): Advantages, preparation of plates, solid phase and mobile phase used in TLC, eluotropic series, development of the chromatogram, Detection of the spots, factors effecting R_f values and applications of TLC.

Paper Chromatography: Principle, choice of paper and solvent systems, development of chromatogram – ascending, descending, radial and two dimensional chromatography, detection of spots, and applications of paper chromatography.

UNIT-IV: Separation techniques-II (15 Hrs)

S5-A-E-IV: Column Chromatography- Principle, Types of stationary phases, Column packing – Wet packing technique, Dry packing technique. Selection criteria of mobile phase solvents for eluting polar, non-polar compounds and its applications.

Ion exchange chromatography: Principle, cation and anion exchange resins, its application in separation of ions, de-ionized water.

Gas Chromatography: Principle, theory and instrumentation (Block Diagram), Types of stationary phases and carrier gases (mobile phase), application of GC.

High performance liquid chromatography: Principle, theory and instrumentation, stationary phases and mobile phases. Applications of HPLC, analysis of Paracetamol.

Recommended Text Books and Reference Books:

1. Fundamentals of Molecular Spectroscopy, C.N. Ban well & Mc Cash.
2. Organic spectroscopy, William Kemp, Palgrave Macmillan; 2nd Revised edition.
3. Spectroscopy, B K Sharma Krishna Prakashan Media, 1981.
4. Elements of Organic spectroscopy, YR Sharma.
5. Applications of Absorption spectroscopy of Organic compounds (English paper back, Dyer R.John)
6. Organic chemistry, Morrison and Boyd, Pearson Publications.
7. Introduction to Spectroscopy by Donald Pavia, Gary Lampman and George Kriz. Saunders College Division, 2001.
8. Chemistry text book for B.Sc., published by Telugu academy, Govt. of Telangana.
9. Analytical Chemistry by David Krupadanam, Universities Press (India) Limited.
10. Principles of Instrumental Analysis, D.A.Skoog, F.J.Holler & T.A. Nieman, Cengage Learning India Ed.
11. Fundamentals of Analytical Chemistry 6th Edn, D.A.Skoog, D.M. West, F.J.Holler, Saunders College Publishing, Fort worth (1992).
12. Instrumental Methods of Analysis, 7th Ed. Willard, H.H., Merritt, L.L., Dean, J. & Settle, F.A. Wordsworth Publishing Co.Ltd., Belmont, California, USA, 1988.
13. A Text Book of Quantitative Inorganic Analysis 7th Ed., Vogel, A.I. Prentice Hall.
14. Analytical Chemistry 7 th Edition by Gary D.Christian (2004)
15. Separation Methods, M.N Sastry, Himalaya Publication (2004)

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N. Sreelakshmi Page 3 of 6

B.Sc., III YEAR CHEMISTRY

SEMESTER-V

DSE-B: Chemistry Paper-V

(Metallurgy, Dyes and Catalysis)

(04 credits)

60 Hrs (04 Hrs/week)

Unit I: General Principles of Metallurgy and Production of Non Ferrous Metals (15 Hrs)

S5-E-B-I: Pyrometallurgy: Drying and calcination, roasting, smelting, products of smelting,

Hydrometallurgy: Leaching methods, leaching agents, leaching of metals, oxides and sulphides.

Separation of liquid and solid phases and processing of aqueous solutions

Electrometallurgy: Electrolysis, Refining electrolysis, electrolysis from aqueous solutions, fused-salt electrolysis

Refining processes: Chemical and physical refining processes

Production of selected non-ferrous metals (Copper, Nickel, Zinc): Properties, raw materials, production (flow charts presentations and chemical reactions involved) and uses.

Unit II: Natural and Synthetic Dyes (15 Hrs)

S5-E-B-II: Definition and Classification of dyes - Natural dyes, Synthetic dyes: based on chemical constitution of dyes; Chemical nature of dyes; Application of dyes.

Structures of Natural dyes: Indigo, Tyrian purple, Alizarine, Indigotin.

Structures of Synthetic dyes: Nitro dyes, Nitroso dyes, Azo dyes (Mono azo dye, Bis azo dyes) Diaryl methane dyes, Triaryl methane dyes, Xanthenes dyes, Phenolphthalein, Fluoroseine, Acridine dyes.

Synthesis of dyes: Mono azo dye, Bis azo dyes (Congo red), Auromine O, Malachite Green, Crystal Violet, Rhodamine B, Acridine Yellow, Indigotin. Binding of dyes to fabric. Applications of dyes.

Unit III: Catalysis-I (15 Hrs)

S5-E-B-III: Homogeneous and heterogeneous catalysis - Definition of a catalyst and catalysis. Comparison of homogeneous and heterogeneous catalysis with specific examples. General characteristics of catalytic reactions.

Acid-base catalysis- Examples of acid and base catalysed reactions, hydrolysis of esters. Kinetics of acid catalysed reactions. Specific acid and general acid catalysis, Kinetics of base catalysed reactions. Specific base and general base catalysis. Examples- Aldol condensation and decomposition of nitramide, base catalysed conversion of acetone to di acetone alcohol, Mutarotation of Glucose. Effect of pH on reaction rate of acid and base catalysed reactions.

Phase transfer catalysis: Principle of phase transfer catalysis, classification of phase transfer catalysts. Factors influencing the rate of PTC reactions.

Unit IV: Catalysis-II (15 Hrs)

S5-E-B-IV: Enzyme catalysis- Characteristics of enzyme catalysis, Examples: (i) Invertase in inversion of cane sugar (ii) Maltase in conversion of maltose to glucose (iii) Urease in decomposition of urea (iv) Zymase in conversion of glucose to ethanol (v) working of carbonic anhydrase and (vi) Mechanism of oxidation ethanol by alcohol dehydrogenase. Factors affecting enzyme catalysis. Effect of temperature, pH, concentration and effect of inhibitor on enzyme catalysed reactions, Catalytic efficiency.

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Kinetics of enzyme catalysed reactions: Michaelis-Menton Equation. Mechanism of enzyme catalysed reactions. Significance of Michaelis constant (K_m) and maximum velocity (V_{max}), Lineweaver-Burk plot. Types of enzyme inhibitors.

Recommended Text Books and Reference Books:

1. Industrial Chemistry B.K.Sharma
2. Engineering Chemistry, Jain and Jain
3. Industrial Chemistry, E. Stocchi, Vol-I, Ellis Horwood Ltd. UK.
4. Handbook of Industrial Chemistry, J. A. Kent: Riegel's, CBS Publishers, New Delhi.
5. Theory of production of non-ferrous metals and alloys Study. Kateřina Skotnicová, Monika Losertová, Miroslav Kursa.
6. The Chemistry of Synthetic Dyes, Volume 4, K.Venkataraman, Elsevier.
7. Organic Chemistry Vol-I by I.L. Finar.
8. Organic Chemistry by Jennice, Gorzinski Smith.
9. Natural Dyes: Sources, Chemistry, Application and Sustainability Issues by Sujata Saxena and A. S. M. Raja.
10. Physical Chemistry by Atkins and De Paula, 8 th Edn.
11. Physical Chemistry by Puri, Sharma and Pattania, 2017.
12. Kinetics and mechanism of chemical transformations by Rajarajm and Kuriacose, Published by Macmillan India Ltd.
13. Text book of Physical Chemistry by K.L. Kapoor Macmillan, 1999.
14. Catalysis by J.C. Kuriacose, Macmillan Publishers India Limited, 1980.
15. Phase Transfer Catalysis, Fundamentals, Applications and Industrial perspectives, C.M.Stark, C.Liotta & M.Halpern, Academic Press.
16. Phase Transfer Catalysis, E.V.Dehmow & S.S. Dehmow, Verlag Chemie, Weinheim.

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B.Sc., III YEAR CHEMISTRY

SEMESTER-V

LABORATORY COURSE

Paper -V: Experiments in Physical Chemistry-I

(01 Credit)

45 Hrs (03 Hrs/week)

1. **Distribution law**
 - a) Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.
 - b) Determination of distribution coefficient of acetic acid between n-butanol and water.
2. **Electrochemistry**
 - a) Determination of cell constant of conductivity cell.
 - b) Verification of Ostwald's dilution law- Determination of dissociation constant (K_a) of acetic acid by conductivity measurements.
3. **Colorimetry**
 - a) Verification of Beer's - Lamberts law for $KMnO_4$
 - b) Determination of the concentration of the given $KMnO_4$ solution.
4. **Adsorption**
 - a) Adsorption of acetic acid on animal charcoal- Verification of Freundlich adsorption isotherm.
5. **Physical constants**
 - a) Surface tension and b) Viscosity of liquids. (Demonstration Experiment)

Reference books:

1. Senior Practical Physical Chemistry, B. D Khosla, V. C. Garg , Adarsh Gulati Published by R. Chand & Co.
2. Practical Physical Chemistry, B. Vishwanathan and P.S. Raghavan. Viva Books.
3. Practicals in Physical Chemistry by P.S. Sindhu ISBN-10: 1-4039-2916-5/1403929165
ISBN-13: 978-1-4039-2916-7/9781403929167.







B.Sc., III YEAR CHEMISTRY

SEMESTER-VI

DSE-A: Chemistry Paper-VI

(Medicinal Chemistry)

(04 credits)

60 Hrs (04 Hrs/week)

Unit- I: Introduction and Terminology (15 Hrs)

S6-E-A-I: Diseases: Common diseases, infective diseases—insect borne, air-borne, water-borne and hereditary diseases.

Terminology in Medicinal Chemistry: Drug, Active Pharmaceutical Ingredient (ADI), Pharmaceuticals, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, metabolites, anti metabolites and therapeutic index.

Drugs: Nomenclature: Chemical name, Generic name and Trade names with examples; Classification: Classification based on structures and therapeutic activity with examples.

ADMET: a) Absorption: Definition, absorption of drugs across the membrane – active and passive absorption, routes of administration of drugs. b) Distribution: definition and effect of plasma protein binding. c) Metabolism: definition, phase I and phase II reactions. d) Elimination: definition and renal elimination. Toxicity.

Unit-II: Enzymes and Receptors (15 Hrs)

S6-E-A-II: Enzymes: Introduction, Mechanism and factors affecting enzyme action, Specificity of enzyme action (including stereo specificity), Enzyme inhibitors and their importance. Types of inhibition - reversible, irreversible and their subtypes with examples.

Receptors: Introduction, Drug action-receptor theory, Mechanism of drug action, concept of agonists and antagonists with examples. Drug receptor interactions involved in drug receptor complex. Binding role of -OH group, -NH₂ group, quaternary ammonium salts and double bond. Structure – activity relationships of drug molecules, explanation with sulfonamides.

Unit- III: Synthesis and Therapeutic Activity of Drugs (15 Hrs)

S6-E-A-III: Introduction, synthesis and therapeutic activity of:

Chemotherapeutics: Sulphanilamide, dapsone, Penicillin-G (semi synthesis), Chloroquin, Isoniazid, Cisplatin and AZT.

Drugs to treat metabolic disorders: Anti diabetic - Tolbutamide; Anti-inflammatory – Ibuprofen; Cardiovascular- Glyceryl trinitrate; Antipyretic (paracetamol, aspirin) and Antacid- Omeprazole.

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Drugs acting on nervous system: Anesthetics-definition, Classification-local and general. Volatile-Nitrous oxide, chloroform uses and disadvantages. Local anesthetics – benzocaine.

Unit- IV: Molecular Messengers and Vitamins and Micronutrients (15 Hrs)

S6-E-A-IV: Molecular Messengers: Introduction to hormones and neurotransmitters, Thyroid hormones, Antithyroid drug-Carbimazol. Adrenaline: Adrenergic drugs- salbutamol, atenelol. Serotonin: SSRIs- fluoxetine. Dopamine: Antiparkinson drug- Levodopa .

Vitamins and Micronutrients: Introduction, Vitamin sources, Deficiency disorders and remedy of Vitamins A,B, C, D, E, K and micronutrients – Na, K, Ca, Cu, Zn and I .

Recommended Text Books and Reference Books:

1. Introduction to Medicinal Chemistry, G.L. Patrick, Oxford University Press, New York. 2013.
2. Medicinal Chemistry, Thomas Nogrady, Oxford Univ. Press, New York.2005.
3. Foye's Principles of Medicinal Chemistry, David William and Thomas Lemke, Lippincott Williams & Wilkins, 2008.
4. Medicinal Chemistry, Ashutosh Kar, New Age International, 2005.
5. Synthetic Drugs, O.D.Tyagi & M.Yadav, Anmol Publications,1998.
6. Medicinal Chemistry, Alka L. Gupta, Pragati Prakashan.
7. Drugs, G. L. David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Universities Press (India) Ltd. 2012.

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B.Sc., III YEAR CHEMISTRY

SEMESTER-VI

DSE-B: Chemistry Paper-VI

(Agricultural & Fuel Chemistry)

(04 credits)

60 Hrs (04 Hrs/week)

Unit I: Pesticides (15 Hrs)

S6-E-B-I: Introduction, Definition, classification of pesticides based on use (target). Toxicity and chemical structure with examples. Adverse effects of pesticides and its impact on environmental pollution.

Synthesis, manufacture and uses of representative pesticides: Organochlorines (Cypermethrin); Organophosphates (Parathion); Carbamates (carbaryl); Quinones (Chloranil), Anilides (Alachlor).

Pesticide formulations: Dusts, Granules, Wettable powders, Emulsions and Aerosols.

Biopesticides : Introduction: Potential pesticidal plants of India, Role of Neem in plant protection-constituents, Azadirachtin and its role in pest control, Structure and mode of action of Pyrethrins (pyrethrin-1) and Pyrethroids (permethrin) and nicotinoids (Imidacloprid).

Unit II: Fertilizers (15Hrs)

S6-E-B-II: Introduction: (need of fertilizers), functions of essential plant nutrients (N, P, K), Classification formula and uses of fertilizers:

Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Calcium Ammonium Nitrate, Sodium Nitrate, Ammonium Chloride and their uses.

Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate and their uses.

Potassium fertilizers: Potassium chloride, potassium nitrate, potassium sulphate and uses.

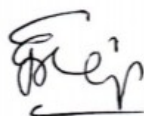
Complex fertilizers: Diaammonium Phosphate and mixed fertilizers their uses. Manufacture of urea and Super phosphate of lime and their reactions in the soil.

Biofertilizers: Introduction, definition, classification, Rhizobium, Azatobactor, Azospirillum, Azolla, Blue Green Algae, Vermicomposting and uses.

Organic farming: The principal methods, crop rotation, green manures and compost, biological pest control, and mechanical cultivation and uses.

Unit III: Energy Sources and Coal (15Hrs)

S6-E-B-III: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.



Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar based chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Unit IV: Petroleum and its products, Petrochemicals and non petroleum fuels (15Hrs)

S6-E-B-IV: Petroleum and its products

Petroleum: Origin, Composition of crude petroleum and classification. Properties-flash point and its determination, Knocking and anti-knocking compounds; Octane number and Cetane number. Distillation of crude petroleum, Fractional Distillation - Principle and process, refining, fractions and uses. Cracking -Thermal and catalytic cracking, Reforming.

Petroleum products – Petrol, Diesel, LPG, Kerosene, Tar and their applications.

Petrochemicals-Vinyl acetate, Propylene oxide, Isoprene and their uses.

Lubricants: Classification of lubricants- Solid, semi solid and liquids; Properties (viscosity, flash point, fire point, cloud point, pour point) and their determination. Functions of Lubricants, Mechanism of lubrication.

Non-Petroleum fuels: Natural Gas- CNG, LNG, clean Fuels- H₂ gas, ethanol, Fuel from waste- bio gas, Fuel from bio mass-Bio ethanol, biodiesel, and Synthetic fuels- syngas based.

Recommended Text Books and Reference Books:

1. Chemistry of pesticides, N. N. Melnikov, Springer-Verlag- Technology & Engineering (2012).
2. Pesticide Synthesis, Thomas A. Unger, Elsevier, (2000).
3. Pesticides, R. Cremllyn, John Wiley, 1980.
4. Manures and Fertilisers, K. Kolay, Published by Atlantic (2007).
5. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
6. A Text Book of Engineering Chemistry Paperback-2017 by Shashi Chawla.
7. Industrial Chemistry, Vol-I, Stocchi.E, Ellis Horwood Ltd. UK (1990).
8. Jain, P.C. & Jain, M. Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
9. Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Sons, Delhi.

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B.Sc., III YEAR CHEMISTRY

SEMESTER-VI

LABORATORY COURSE

Paper –V: Experiments in Physical Chemistry-II

(01 Credit)

45 Hrs (03 Hrs/week)

1. Kinetics

- a) Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
- b) Determination rate of decomposition of hydrogen peroxide catalyzed by FeCl_3 .

2. Electrochemistry

A. Potentiometry:

- a) Determination of redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ by potentiometric titration of ferrous ammonium sulphate vs potassium dichromate.
- b) Precipitation titration of KCl vs AgNO_3 –Determination of given concentration of silver nitrate.

B. pH metry:

- a) pH metric titration of strong acid (HCl) vs strong base- Determination of the concentration of given acid.
- b) pH metric titration of strong acid (acetic acid) with strong base (NaOH)- Determination of acid dissociation constant (K_a) of weak acid.

3. Conductometry:

- a) Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurement

Reference books:

1. Senior practical physical chemistry, B.D.Khosla, V.C.Garg, Adarsh Guati.
2. Advanced Practical Physical chemistry, J.B.Yadav.
3. Practical Physical chemistry, B.Vishvanathan and P.S.Raghavan.
4. Practical Physical chemistry, P.S. Sindhu.

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