

B.TECH. PETROLEUM ENGINEERING AND TECHNOLOGY**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :**

- I. To inculcate in students, a professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to solve problems encountered in petrochemical sector
- II. To make the students conversant with oils and their properties, principles of chemical analysis and preparation of chemicals
- III. To acquaint the students with the standards for the analysis of petroleum products
- IV. To give them an opportunity to gain knowledge on various reaction mechanisms
- V. To help the students understand the theory, instrumentation and applications of analytical equipments used in industries for testing the quality of petroleum, intermediates and products
- VI. To make them learn basic rock and fluid properties relevant to petroleum reservoirs
- VII. To teach the students to solve chemical engineering problems using C and MATLAB and other computational tools
- VIII. To give an introduction to the students on control systems along with instrumentation

PROGRAMME OUTCOMES (POs):

On successful completion of the programme,

- I. Graduates will be able to demonstrate their knowledge professionally and shoulder ethical responsibilities
- II. Graduates will be capable to design experiments, analyze and interpret data
- III. Graduates will be able to meet the world's ever-increasing demand for hydrocarbon fuel, thermal energy, and waste and pollution management
- IV. Graduates will gain a knowledge of the basic principles involved in different chemical synthesis and will be able to apply them in chemical industries
- V. Graduates will have the capacity to choose a proper measuring instrument for a parameter to be measured
- VI. Graduates will have a knowledge of different analytical techniques and shall apply them to analyze chemical and petrochemical products
- VII. Graduates will understand the characteristics of source and reservoir rocks
- VIII. Graduates will become familiar with environmentally sound exploration, evaluation and recovery of oil, gas and other fluids in the earth
- IX. Graduates will have the ability to solve chemical engineering problems.
- X. Understand the pre requisites of control strategies and the mechanism of advance control systems

Programme Educational Objectives	Programme Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
I	✓	✓	✓	✓						
II		✓		✓						
III				✓	✓	✓				
IV		✓		✓						
V					✓	✓				
VI							✓	✓		
VII									✓	
VIII										✓

ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM
I – VIII SEMESTERS CURRICULA
I & II CURRICULA AND SYLLABI
B.TECH. PETROLEUM ENGINEERING AND TECHNOLOGY

I SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	MA7151	Mathematics – I	BS	4	4	0	0	4
3.	PH7151	Engineering Physics	BS	3	3	0	0	3
4.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE7151	Computing Techniques	ES	3	3	0	0	3
PRACTICALS								
6.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
7.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
TOTAL				25	17	0	8	21

II SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7251	Technical English	HS	4	4	0	0	4
2.	MA7251	Mathematics – II	BS	4	4	0	0	4
3.	PH7257	Physics of Materials	BS	3	3	0	0	3
4.	CY7255	Chemistry for Technologists	BS	3	3	0	0	3
5.	GE7152	Engineering Graphics	ES	5	3	2	0	4
6.	CY7256	Organic Chemistry	BS	3	3	0	0	3
PRACTICALS								
7.	CH7261	Chemical Analysis Laboratory	BS	4	0	0	4	2
8.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
TOTAL				30	20	2	8	25

III SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Probability and Statistics	BS	4	4	0	0	4
2.		Petroleum Chemistry	PC	3	3	0	0	3
3.		Fluids and Solid operations	PC	4	4	0	0	4
4.		Engineering Mechanics	ES	4	4	0	0	4
5.		Spectroscopic Techniques for Petroleum Engineers	PC	3	3	0	0	3
6.		Principles of Electrical and Electronics Engineering	ES	3	3	0	0	3
PRACTICALS								
7.		Electrical Engineering Laboratory For Technologists	ES	4	0	0	4	2
8.		Fluid Mechanics & Mechanical Operations Laboratory	ES	4	0	0	4	2
TOTAL				29	21	0	8	25

IV SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Chemical Engineering Thermodynamics	PC	4	4	0	0	4
2.		Reservoir Engineering	PC	3	3	0	0	3
3.		Industrial Stoichiometry	ES	3	3	0	0	3
4.		Basic Mechanical Engineering	ES	3	3	0	0	3
5.		Open Elective I	OE*	3	3	0	0	3
PRACTICALS								
6.		Mechanical Engineering Laboratory	ES	4	0	0	4	2
7.		Organic Chemistry Laboratory	BS	4	0	0	4	2
TOTAL				24	16	0	8	20

*Course from the curriculum of other UG Programmes

V SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Petroleum Refining I	PC	3	3	0	0	3
2.		Natural Gas Engineering	PC	3	3	0	0	3
3.		Heat and Mass Transfer	PC	4	4	0	0	4
4.		Engineering Ethics	HS	3	3	0	0	3
5.		Professional Elective I	PE	3	3	0	0	3
6.		Open Elective II	OE*	3	3	0	0	3
PRACTICALS								
7.		Heat Transfer Laboratory	PC	4	0	0	4	2
8.		Petroleum Testing Laboratory	PC	4	0	0	4	2
TOTAL				27	19	0	10	23

*Course from the curriculum of other UG Programmes

VI SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Petroleum Refining II	PC	4	4	0	0	4
2.		Petrochemicals	PC	4	4	0	0	4
3.		Chemical Reaction Engineering	PC	4	4	0	0	4
4.		Employability Skills	EEC	3	3	0	0	3
5.		Open Elective III	OE*	3	3	0	0	3
6.		Professional Elective II	PE	3	3	0	0	3
PRACTICALS								
7.		Mass Transfer Laboratory	PC	4	0	0	4	2
8.		Computational Programming in Chemical Engineering Laboratory	PC	4	0	0	4	2
TOTAL				29	21	0	8	25

*Course from the curriculum of other UG Programmes

VII SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Process Instrumentation dynamics and Control	PC	3	3	0	0	3
2.		Petroleum Equipment Design	PC	3	3	0	0	3
3.		Professional Elective III	PE	3	3	0	0	3
4.		Professional Elective IV	PE	3	3	0	0	3
5.		Professional Elective V	PE	3	3	0	0	3
6.		Environmental Science And Engineering	HS	3	3	0	0	3
7.		Process Control Laboratory	PC	4	0	0	4	2
8.		Chemical Reaction Engineering Laboratory	PC	4	0	0	4	2
9.		Seminar I	EEC	3	3	0	0	3
TOTAL				29	21	0	8	25

VIII SEMESTER

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective VI	PE	3	3	0	0	3
PRACTICALS								
1.		Project	EEC	20	0	0	20	10
2.		Seminar II	EEC	3	3	0	0	3
TOTAL				26	6	0	20	16

TOTAL NO. OF CREDITS : 180

HUMANITIES AND SOCIAL SCIENCES (HS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Foundational English	HS	4	4	0	0	4
2.		Technical English	HS	4	4	0	0	4
3.		Engineering Ethics	HS	3	3	0	0	3
4.		Environmental science and engineering	HS	3	3	0	0	3

BASIC SCIENCES (BS)

S.No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.		Mathematics – I	BS	4	4	0	0	4
2.		Engineering Physics	BS	3	3	0	0	3
3.		Engineering Chemistry	BS	3	3	0	0	3
4.		Basic Sciences Laboratory	BS	4	0	0	4	2
5.		Mathematics – II	BS	4	4	0	0	4
6.		Physics of Materials	BS	3	3	0	0	3
7.		Chemistry for Technologists	BS	3	3	0	0	3
8.		Organic Chemistry	BS	3	3	0	0	3
9.		Chemical analysis Laboratory	BS	4	0	0	4	2
10.		Probability and Statistics	BS	4	4	0	0	4
11.		Organic Chemistry Laboratory	BS	4	0	0	4	2

ENGINEERING SCIENCES (ES)

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.		Computing Techniques	ES	3	3	0	0	3
2.		Computer Practices Laboratory	ES	4	0	0	4	2
3.		Engineering Graphics	ES	4	4	0	0	4
4.		Engineering Practices Laboratory	ES	4	0	0	4	2
5.		Engineering Mechanics	ES	4	4	0	0	4
6.		Principles of Electrical and Electronics Engineering	ES	3	3	0	0	3
7.		Electrical Engineering Laboratory For Technologists	ES	4	0	0	4	2
8.		Fluids Mechanics and Mechanical operations Laboratory	ES	4	0	0	4	2

9.		Industrial Stoichiometry	ES	3	3	0	0	3
10.		Basic Mechanical Engineering	ES	3	3	0	0	3
11.		Mechanical Engineering Laboratory	ES	4	0	0	4	2

PROFESSIONAL CORE (PC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Petroleum Chemistry	PC	3	3	0	0	3
2.		Fluids and Solid operations	PC	4	4	0	0	4
3.		Spectroscopic Techniques for Petroleum engineers	PC	3	3	0	0	3
4.		Chemical engineering thermodynamics	PC	4	4	0	0	4
5.		Reservoir Engineering	PC	3	3	0	0	3
6.		Petroleum Refining I	PC	3	3	0	0	3
7.		Natural Gas Engineering	PC	3	3	0	0	3
8.		Heat and Mass Transfer	PC	4	4	0	0	4
9.		Heat Transfer Laboratory	PC	4	0	0	4	2
10.		Petroleum Testing Laboratory	PC	4	0	0	4	2
11.		Petroleum Refining II	PC	4	4	0	0	4
12.		Petrochemicals	PC	4	4	0	0	4
13.		Chemical Reaction engineering	PC	4	4	0	0	4
14.		Mass Transfer Laboratory	PC	4	0	0	4	2
15.		Computational Chemical Engineering Laboratory	PC	4	0	0	4	2
16.		Process Instrumentation, Dynamics and Control	PC	3	3	0	0	3
17.		Petroleum Equipment Design	PC	3	3	0	0	3
18.		Process Control Laboratory	PC	4	0	0	4	2
19.		Chemical Reaction Engineering Laboratory	PC	4	0	0	4	2

PROFESSIONAL ELECTIVES (PE)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Numerical Methods	PE	4	4	0	0	4
2.		Refinery process design	PE	3	3	0	0	3
3.		Engineering Economics	PE	3	3	0	0	3
4.		Statistics and Linear Programming	PE	3	3	0	0	3
5.		Drilling operations	PE	3	3	0	0	3
6.		Well Completion Techniques	PE	3	3	0	0	3
7.		Plant Safety And Risk Analysis	PE	3	3	0	0	3
8.		Enhanced Oil Recovery	PE	3	3	0	0	3
9.		Petroleum Production Engineering	PE	3	3	0	0	3
10.		Science and Health in resonance	PE	3	3	0	0	3
11.		Technical analysis – An Analytical Insight	PE	3	3	0	0	3
12.		Multicomponent Distillation	PE	3	3	0	0	3
13.		Energy Technology	PE	3	3	0	0	3
14.		Advanced Separation Techniques	PE	3	3	0	0	3
15.		Process Optimization	PE	3	3	0	0	3
16.		Chemical Process Modeling and Simulation	PE	3	3	0	0	3
17.		Process Plant Utilities	PE	3	3	0	0	3
18.		Supply Chain Management	PE	3	3	0	0	3
19.		Design of Heat Exchangers	PE	3	3	0	0	3
20.		Product Design and Development	PE	3	3	0	0	3
21.		Computational Fluid Dynamics	PE	3	3	0	0	3
22.		Design of Pressure Vessels and Piping	PE	3	3	0	0	3
23.		Disaster Management	PE	3	3	0	0	3
24.		Human Rights	PE	3	3	0	0	3
25.		Physical Chemistry	PE	3	3	0	0	3
26.		Safety and Environmental Health	PE	3	3	0	0	3
27.		Petroleum Geology	PE	3	3	0	0	3
28.		Process Engineering	PE	3	3	0	0	3
29.		Crude oil transportation	PE	3	3	0	0	3
30.		Equilibrium staged operations	PE	3	3	0	0	3
31.		Transport Phenomena	PE	4	4	0	0	4

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Employability Skills	EEC	3	3	0	0	3
2.		Seminar I	EEC	3	3	0	0	3
3.		Project	EEC	0	0	0	20	10
4.		Seminar II	EEC	3	3	0	0	3

SUMMARY

S.No	Subject Area	Credits per Semester								Credits Total
		I	II	III	IV	V	VI	VII	VIII	
1	HS	4	4	-	-	3	-	3	-	14
2	BS	12	12	4	5	-	-	-	-	33
3	ES	5	6	14	5	-	-	-	-	30
4	PC	-	-	10	7	14	16	10	-	57
5	PE	-	-	-	-	3	3	9	3	18
6	OE	-	-	-	3	3	3	-	-	9
7	EEC	-	-	-	-	-	3	3	13	19
	Total									180
8	Non-Credit/ Mandatory									

COURSE DESCRIPTION:

This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:

- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students' communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS**UNIT I GREETING AND INTRODUCING ONESELF 12**

Listening- Types of listening – Listening to short talks, conversations; **Speaking** – Speaking about one's place, important festivals etc. – Introducing oneself, one's family/ friend;**Reading** – Skimming a passage– Scanning for specific information;**Writing**- Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one's leisure time activities, hometown, etc.); **Grammar** – Tenses (present and present continuous) -Question types - Regular and irregular verbs; **Vocabulary** – Synonyms and Antonyms.

UNIT II GIVING INSTRUCTIONS AND DIRECTIONS 12

Listening – Listening and responding to instructions; **Speaking** – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; **Reading** – Reading and finding key information in a given text - Critical reading - **Writing** –Process description(non-technical)- **Grammar** – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - **Vocabulary** – Compound words – Word formation – Word expansion (root words).

UNIT III READING AND UNDERSTANDING VISUAL MATERIAL 12

Listening- Listening to lectures/ talks and completing a task; **Speaking** –Role play/ Simulation – Group interaction; **Reading** – Reading and interpreting visual material;**Writing**- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative);**Grammar** – Tenses (perfect), Conditional clauses –Modal verbs; **Vocabulary** –Cause and effect words; Phrasal verbs in context.

UNIT IV CRITICAL READING AND WRITING 12

Listening- Watching videos/ documentaries and responding to questions based on them; **Speaking**Informal and formal conversation;**Reading** –Critical reading (prediction & inference);**Writing**–Essay writing (compare & contrast/ analytical) – Interpretation of visual materials;**Grammar** – Tenses (future time reference);**Vocabulary** – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V LETTER WRITING AND SENDING E-MAILS 12

Listening- Listening to programmes/broadcast/ telecast/ podcast;**Speaking** – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation;**Reading** – Extensive reading;**Writing**- Poster making – Letter writing (Formal and E-mail) ;**Grammar** – Direct and Indirect speech – Combining sentences using connectives;**Vocabulary** –Collocation;

TEACHING METHODS:

Interactive sessions for the speaking module.

Use of audio – visual aids for the various listening activities.

Contextual Grammar Teaching.

EVALUATION PATTERN:

Internals – 50%

End Semester – 50%

TOTAL:60 PERIODS**LEARNING OUTCOMES:**

- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

1. Richards, Jack.C with Jonathan Hull and Susan Proctor **New Interchange : English for International Communication. (level2, Student's Book)** Cambridge University Press, New Delhi: 2010.

REFERENCES:

1. Bailey, Stephen. **Academic Writing: A practical guide for students.** New York: Rutledge, 2011.
2. Morgan, David and Nicholas Regan. **Take-Off: Technical English for Engineering.** London: Garnet Publishing Limited, 2008.
3. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skills for Business English.** Cambridge University Press, Cambridge: Reprint 2011.

MA7151**MATHEMATICS – I**

L	T	P	C
4	0	0	4

(Common to all branches of B.E. /B.Tech. Programmes in I Semester)**COURSE OBJECTIVES**

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS**12**

Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES**12**

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

12

12

12

TOTAL : 60 PERIODS

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
4. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi. 2007.

(Common to all branches of B.E. /B.Tech. Programmes)

COURSE OBJECTIVES

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity – Poisson's ratio and relationship between moduli (qualitative) - stress-strain diagram for ductile and brittle materials, uses - factors affecting elastic modulus and tensile strength - bending of beams - cantilever - bending moment - Young's modulus determination - theory and experiment - uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus-moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - calculation of reverberation time for different types of buildings – sound absorbing materials - factors affecting acoustics of buildings : focussing, interference, echo, echelon effect, resonance - noise and their remedies. Ultrasonics: production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating – ultrasonic interferometer - industrial applications – Non-destructive testing - ultrasonic method: scan modes and practice.

UNIT III THERMAL AND MODERN PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity- heat conductions in solids – flow of heat through compound media - Forbe's and Lee's disc method: theory and experiment- Black body radiation – Planck's theory (derivation) – Compton effect – wave model of radiation and matter – Schrödinger's wave equation – time dependent and independent equations – Physical significance of wave function – particle in a one dimensional box.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its applications - Lasers – principle and applications – Einstein's coefficients – CO₂ and Nd:YAG laser - semiconductor lasers: homo junction and hetro junction - construction and working – applications. Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL : 45 PERIODS

COURSE OUTCOMES

- The students will acquire knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS

1. Palanisamy P.K., "Engineering Physics", Scitech Publications (P) Ltd. (2006).
2. Arumugam M., "Engineering Physics", Anuradha Publications (2000)
3. Gaur R.K. and Gupta S.L., "Engineering Physics", Dhanpat Rai Publications (2013)

REFERENCE BOOKS

1. Serway R.A. and Jewett, J.W. "Physics for Scientists and Engineers with Modern Physics". Brooks/cole Publishing Co. (2010).
2. Tipler P.A. and Mosca, G.P., "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, (2007).
3. Markert J.T., Ohanian, H. and Ohanian, M. "Physics for Engineers and Scientists". W.W.Norton & Co. (2007).

CY7151

ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY

9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: T_g, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS

9

Adsorption-Types of adsorption-adsorption of gases on solids- adsorption from solutions-Types of isotherms-Freundlich adsorption isotherm, Langmuir adsorption isotherm. Industrial applications of adsorption. Catalysis: Characteristics and types of catalysts-homogeneous and heterogeneous, auto catalysis. Enzyme catalysis -factors affecting enzyme catalysis, Michaelis-Menton equation. Industrial applications of catalysts.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

9

Photochemistry: Laws of photochemistry-Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo processes-internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo-sensitization. Spectroscopy: Electromagnetic spectrum-absorption of radiation-electronic, vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

UNIT IV CHEMICAL THERMODYNAMICS

9

Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCHEMISTRY**9**

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Preparation of nanoparticles – sol-gel and solvothermal. Preparation of carbon nanotube by chemical vapour deposition and laser ablation. Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning. Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

TOTAL : 45 PERIODS**COURSE OUTCOMES**

- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXT BOOKS

1. Jain P. C. & Monica Jain., "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2014.
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2014

REFERENCE BOOKS

1. Pahari A., Chauhan B., "Engineering Chemistry", Firewall Media, New Delhi, 2012.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. Ashima Srivastava. Janhavi N N, Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi., 2010.
4. Vairam S., Kalyani P., Suba Ramesh., "Engineering Chemistry", Wiley India Pvt Ltd., New Delhi., 2011.

GE7151**COMPUTING TECHNIQUES****L T P C****(Common to all branches of Engineering and Technology) 3 0 0 3****OBJECTIVES:**

- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION**9**

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS**9**

Introduction to C programming – Fundamentals – Structure of a C program – Compilation and linking processes - Constants, Variables – Data Types – Expressions - Operators – Decision Making and Branching – Looping statements – Solving Simple Scientific and Statistical Problems.

UNIT III ARRAYS AND STRINGS**9**

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - Strings- String operations – String Arrays - simple programs- sorting- searching – matrix operations.

UNIT IV POINTERS**9**

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems
- Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES**9**

Function – definition of function – Declaration of function – Pass by value – Pass by reference –
Recursion –Enumerators – Structures - Unions

TOTAL : 45 PERIODS**OUTCOMES**

At the end of the course, the student should be able to:

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, "Programming with C", Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

BS7161**BASIC SCIENCES LABORATORY**

(Common to all branches of B.E. / B.Tech Programmes)

L T P C**0 0 4 2****PHYSICS LABORATORY: (Any Seven Experiments)****OBJECTIVE:**

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.

10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

OUTCOME:

The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

CHEMISTRY LABORATORY:

(Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXTBOOKS

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)
2. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).

GE7161

COMPUTER PRACTICES LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts

4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES

At the end of the course, the student should be able to:

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

30 Systems with C compiler

HS7251

TECHNICAL ENGLISH

L T P C
4 0 0 4

OBJECTIVES

- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I ANALYTICAL READING 12

Listening- Listening to informal and formal conversations; **Speaking** – Conversation Skills(opening, turn taking, closing)-explaining how something works-describing technical functions and applications;**Reading** –Analytical reading, Deductive and inductive reasoning; **Writing-** vision statement–structuring paragraphs.

UNIT II SUMMARISING 12

Listening- Listening to lectures/ talks on Science & Technology;**Speaking** –Summarizing/ Oral Reporting, **Reading** – Reading Scientific and Technical articles; **Writing-** Extended definition – Lab Reports – Summary writing.

UNIT III DESCRIBING VISUAL MATERIAL 12

Listening- Listening to a panel discussion; **Speaking** – Speaking at formal situations; **Reading** –Reading journal articles - Speed reading;**Writing**-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV WRITING/ E-MAILING THE JOB APPLICATION 12

Listening- Listening to/ Viewing model interviews; **Speaking** –Speaking at different types of interviews – Role play practice (mock interview); **Reading** – Reading job advertisements and profile of the company concerned;**Writing-** job application – cover letter –Résumé preparation.

UNIT V REPORT WRITING 12

Listening- Viewing a model group discussion;**Speaking** –Participating in a discussion - Presentation;**Reading** – Case study - analyse -evaluate – arrive at a solution;**Writing-**

Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:

Practice writing

Conduct model and mock interview and group discussion.

Use of audio – visual aids to facilitate understanding of various forms of technical communication.

Interactive sessions.

EVALUATION PATTERN:

Internals – 50%

End Semester – 50%

TOTAL:60 PERIODS

LEARNING OUTCOMES

- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

1. Craig,Thaine. **Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012

REFERENCES:

1. Laws, Anne. **Presentations**. Hyderabad: Orient Blackswan, 2011.
2. Ibbotson, Mark. **Cambridge English for Engineering**. Cambridge University Press, Cambridge,New Delhi: 2008
3. Naterop, Jean B. and Rod Revell. **Telephoning in English**. Cambridge: Cambridge University Press, 2004.
4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Bailey, Stephen. **Academic Writing A practical Guide for Students**. Routledge, London: 2004.
6. Hewings, Martin. **Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012.

MA7251

MATHEMATICS – II

L	T	P	C
4	0	0	4

(Common to all branches of B.E. /B.Tech. Programmes in II Semester)

COURSE OBJECTIVES

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

12

12

12

12

12

TOTAL : 60 PERIODS

Upon successful completion of the course, students should be able to:

- 20

3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
5. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7257

PHYSICS OF MATERIALS

L T P C
3 0 0 3

OBJECTIVE:

- To introduce the physics of various materials relevant to different branches of technology

UNIT I PREPARATION OF MATERIALS 9

Phases - phase rule – binary systems – tie line rule – lever rule – phase diagram – invariant reactions - nucleation – homogeneous and heterogeneous nucleation – free energy of formation of a critical nucleus – Thin films – preparation: PVD, CVD method – Nanomaterials Preparation: wet chemical, solvothermal, sol-gel method.

UNIT II ELECTRICAL AND SUPERCONDUCTING MATERIALS 9

Classical free electron theory - expression for electrical conductivity – thermal conductivity, - Wiedemann-Franz law - Quantum free electron theory – applications of Schrodinger wave equation: particle in a finite potential well – particle in a three-dimensional box- degenerate states – Fermi-Dirac statistics – density of energy states – electron in periodic potential – electron effective mass – concept of hole. Superconducting phenomena, properties of superconductors – Meissner effect and isotope effect. Type I and Type II superconductors, High T_c superconductors – Magnetic levitation and SQUIDS.

UNIT III SEMICONDUCTING MATERIALS 9

Elemental Semiconductors - Compound semiconductors - Origin of band gap in solids (qualitative) - carrier concentration in metals - carrier concentration in an intrinsic semiconductor (derivation) – Fermi level – variation of Fermi level with temperature – electrical conductivity – band gap determination – carrier concentration in n-type and p-type semiconductors (derivation) – variation of Fermi level with temperature and impurity concentration – Hall effect – determination of Hall coefficient – LED - Solar cells.

UNIT IV DIELECTRIC AND MAGNETIC MATERIALS 9

Dielectric, Paraelectric and ferroelectric materials - Electronic, Ionic, Orientational and space charge polarization – Internal field and deduction of Clausius Mosotti equation – dielectric loss – different types of dielectric breakdown – classification of insulating materials and their applications - Ferroelectric materials - Introduction to magnetic materials - Domain theory of ferromagnetism, Hysteresis, Soft and Hard magnetic materials – Anti-ferromagnetic materials – Ferrites, Giant Magneto Resistance materials.

UNIT V NEW MATERIALS AND APPLICATIONS 9

Ceramics – types and applications – Composites: classification, role of matrix and reinforcement – processing of fibre reinforced plastics and fibre reinforced metals – Metallic glasses – Shape memory alloys – Copper, Nickel and Titanium based alloys – graphene and its properties – Relaxor ferroelectrics - Bio materials – hydroxyapatite – PMMA – Silicone - Sensors: Chemical Sensors - Bio-sensors – Polymer semiconductors – Photoconducting polymers.

TOTAL: 45 PERIODS

OUTCOME:

- On completion of the course the students are expected to have a through knowledge on the various materials and their physical properties.

REFERENCES:

- Callister W. D. and Rethwisch, D. G., "Materials Science and Engineering", 9th Edition, Wiley (2014).
- Raghavan V., "Materials Science and Engineering", Prentice Hall of India (2004).
- Askeland D.R. and Wright, W.J., "Essentials of Materials Science and Engineering", 3rd Edition, Cengage Learning (2014).
- Pillai, S.O., "Solid State Physics", New Age International, 7th Edition (2015).
- Viswanathan, B., "Nanomaterials", Narosa Book Distributors Pvt Ltd. (2011).

CY7255**CHEMISTRY FOR TECHNOLOGISTS**

L	T	P	C
3	0	0	3

OBJECTIVE

- The students should be conversant with
- boiler feed water requirements, water treatment techniques,
- Applications of oil and its properties, principles of different chemical analysis.
- Different kinds of preparations of important chemicals.

OUTCOME

- Will be familiar with boiler feed water requirements, water treatment techniques.
- Will know the oil and its properties, principles of different chemical analysis.
- Will know the preparations of important chemicals.

UNIT I WATER TECHNOLOGY**9**

Water quality parameters- hardness -definition - units of hardness - determination of hardness (EDTA method).Alkalinity - definition - determination of alkalinity.TDS, BOD, COD and iron and their significance. Softening – zeolite and demineralization processes. Boiler troubles (scale, sludge, boiler corrosion, caustic embrittlement and carry over) and remedies – removal of oils and silica, internal conditioning.Desalination by electro-dialysis and reverse osmosis.

UNIT II OILS, FATS, SOAPS & LUBRICANTS**9**

Chemical constitution, chemical analysis of oils and fats – free acid, saponification and iodine values, definitions, determinations and significance.Soaps and detergents - cleaning action of soap. Lubricants - definition, characteristics, types and properties – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Solid lubricants – graphite and molybdenum disulphide.

UNIT III CHEMICAL ANALYSIS – AN ANALYTICAL INSIGHT**9**

Gravimetric analysis – principles – method – applications.redox titrations – principle – method – applications. Thin layer chromatography – principles – techniques – applications. Principles underlying the estimations of nitrogen in nitrogenous fertilizers, phenol and aniline.

UNIT IV DYE CHEMISTRY**9**

Witt's theory and modern theory of colors – synthesis of methyl red, methyl orange, congo red, malachite green, p-rosaniline, phenolphthalein, fluorescence, eosin dyes.

UNIT V CHEMICALS AND AUXILIARIES**9**

Preparations of bleaching powder, sodium hypochlorite, hydrogen peroxide, chlorine dioxide – estimation of available chlorine in hypochlorite – determination of strength of hydrogen peroxide.

TEXT BOOKS

1. Jain & Jain, "Engineering Chemistry", 16th Edition, 2014, Dhanpat Rai Publishing Company, New Delhi.
2. Sharma B.K, "Industrial Chemistry", 16th Edition, 2014, GOEL Publishing House, Meerut.

REFERENCE BOOKS

1. Dara SS, Umare SS, "A Textbook of Engineering Chemistry", S. Chand & Company Ltd., New Delhi, 2010.
2. Puri BR, Sharma LR, Pathania S, "Principles of Physical Chemistry", 42nd Edition, 2008, Vishal Publishing Co., Jalandhar.
3. Morrison RT, Boyd RN, Bhattacharjee SK, "Organic Chemistry", 7th Edition, Pearson India, 2011.

GE7152**ENGINEERING GRAPHICS**

L	T	P	C
3	2	0	4

OBJECTIVES

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

14**UNIT I PLANE CURVES AND FREE HAND SKETCHING**

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

14**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes-Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS**14**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**14**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems.

Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)**3**

Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS**OUTCOMES:**

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, Planes and Solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.

REFERENCES:

1. K.R.Gopalakrishna., "Engineering Drawing" (Vol I&II combined) SubhasStores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M., "Fundamentals of Engineering Drawingwith an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P)Limited ,2008.
5. K. V.Natarajan, "A text book of Engineering Graphics", 28th Edition, Dhanalakshmi Publishers, Chennai, 2015.
6. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. N.S Parthasarathy and Vela Murali, " Engineering Drawing", Oxford University Press, 2015

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

AIM

To study the type of components in which organic reactions take place and also to know the preparation of the essential organic compounds.

OBJECTIVES

At the end of the course students will be in a position to have knowledge on various reaction mechanism, preparation of organic compounds and their properties. This will be a precursor for the study on Chemical Reaction Engineering.

UNIT I CARBOHYDRATES 9

Introduction – various definitions and classifications of carbohydrates – Preparation, Physical & Chemical properties, Structure and Uses of Monosaccharides (Glucose & Fructose) Interconversions – Aldo pentose to aldo hexose–Aldo hexose to aldo pentose- aldose to isomeric Ketose – Ketose to isomeric Aldose – Aldose to epimer

UNIT II HETEROCYCLIC COMPOUNDS 9

Preparation, Physical & Chemical properties and Uses of Pyrrole, Furan, Furfural, Tetrahydro Furan, Thiophene, Indole, Pyridine, Quinoline and Isoquinoline.

UNIT III PREPARATION OF SYNTHETIC INTERMEDIATES 9

Preparations of Benzil from benzyl aldehydes - Furfyl from furfural, Vanillin from catechol, Gramine from indole, N-acetyl-5- bromo indoline from indole, Salol from phenol, Alanine from propionic acid, Heteroauxin from indole - Uses, Preparation of Chloramphenicol - Uses

UNIT IV SYNTHETIC ORGANIC CHEMISTRY 9

Preparation and Synthetic utilities of Grignard reagent, Ethyl aceto acetate and Malonic ester.

UNIT V PHARMACEUTICAL CHEMISTRY 9

Synthesis of Malonyl urea, Phenacetin, Isoniazid, Para amino benzoic acid (PABA), Tryptophan Isopentaquine, chloroquine, Sulphanilamide and Sulphapyridine.

TOTAL : 45 PERIODS

TEXT BOOKS

1. R.T. Morrison and R.N. Boyd "Organic Chemistry" VI Edition Prentice Hall Inc (1996) USA.
2. K.S. Tiwari, N.K. Vishnoi and S.N. Malhotra "A text book of Organic Chemistry" Second Edition, Vikas Publishing House Pvt. Ltd. (1998) New Delhi.

REFERENCE BOOKS

1. Chemistry in Engineering and Technology, Vol.2, TMH Publishing Co Ltd., New Delhi, 1994.
2. I L Finar "Organic Chemistry" ELBS (1994).

(Minimum of 8 experiments to be conducted)

OBJECTIVE

- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of nitrite in water, cement, oil, coal and Phenol.

LIST OF EXPERIMENTS

- Determination of Redwood / Saybolt numbers, kinematic viscosity and viscosity index of Lubricating oils
- Determination of flash point, fire point, cloud and pour point of oils
- Determination of acid value and iodine value of oils
- Determination of COD of water samples
- Cement Analysis
 - Estimation of silica content
 - Estimation of mixed oxide content
 - Estimation of calcium oxide content
 - Estimation of calcium oxide by rapid method
- Coal Analysis
 - Estimation of sulphur present in coal
 - Ultimate analysis of coal
 - Proximate analysis of coal
- Soap Analysis
 - Estimation of total fatty acid
 - Estimation of percentage alkali content
- Flue gas analysis by Orsat's apparatus
- Estimation of phenol.
- Determination of calorific value using bomb calorimeter
- Determination of nitrite in water.

TOTAL: 60 PERIODS

OUTCOME

- Familiarization with equipment like viscometers, flash and fire point apparatus etc
- Familiarization of methods for determining COD
- Familiarization of a few simple synthetic techniques for soap

REFERENCE BOOKS

- Environmental pollution analysis, S.M.Khopkar, New age international. 2011
- Manual of environmental analysis, N.C Aery, Ane books. 2010
- Text book of quantitative chemical analysis, J.Mendham, Pearson education 2008

COURSE OBJECTIVES

- To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)**1. CIVIL ENGINEERING PRACTICES**

15

PLUMBING

- Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

- Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY

- Study of joints in door panels and wooden furniture
- Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES

15

- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS)**3. MECHANICAL ENGINEERING PRACTICES**

15

WELDING

- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations..
- Study and assembling of the following:
 - a. Centrifugal pump
 - b. Mixie
 - c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.**4. ELECTRONIC ENGINEERING PRACTICES**

15

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and Testing.
- Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL : 60 PERIODS**COURSE OUTCOMES**

- Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to do wiring for electrical connections and to fabricate electronics circuits.