

ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B.E. AUTOMOBILE ENGINEERING
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM

Programme Educational Objectives (PEO)

PEO1: Students will excel in their **professional career** in automobile industry and research with **highest professional** and **ethical standards** to their activities by acquiring knowledge in **basic engineering, mathematics, science and automobile engineering.**

PEO2: Students will exhibit **professionalism, team work** in their chosen profession and adapt to **current trends, technologies** and industrial scenarios by pursuing **lifelong learning**

Programme Outcomes (PO)

- a. Graduate will demonstrate strong basics in mathematics, science and Engineering
- b. Graduate will demonstrate the ability to design and conduct Experiments, as well as to analyze and interpret data.
- c. Graduate will demonstrate the ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and Safety, manufacturability and sustainability.
- d. Graduate will become familiar with modern Engineering tools and analyse the problems within the domains of Automobile Engineering as the members of multidisciplinary teams.
- e. Graduate will acquire the capability to identify, formulate and solve complex engineering problems related to Automobile Engineering
- f. Graduate will demonstrate and understanding of professional and ethical responsibility with reference to their career in the field of Automobile Engineering
- g. Graduate will be able to communicate effectively both in verbal non-verbal forms
- h. Graduate will be trained towards developing the impact of development of Automobile engineering on global, economic environment and societal context
- i. Graduate will be capable of understanding the value for life-long learning

j. Graduate will demonstrate knowledge of contemporary issues focusing on the necessary to develop new material, design, and engineering practice in the field of Automobile Engineering

k. Graduate will demonstrate the ability to use the techniques , skills and Modern engineering tools necessary for engineering practice in the field of Automobile Engineering

l. Graduate will have a firm scientific, technological and communication base that helps them either to find a desire placement or to become an Entrepreneur and explore their knowledge in their field.

m. Graduate will be capable of doing higher studies and research in inter and multi-disciplinary areas.

Mapping PEO with POs:

PEO \ PO	a	b	c	d	e	f	g	h	i	J	K	L	m
1	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
2	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓

ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B.E. AUTOMOBILE ENGINEERING
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM
CURRICULA I - VIII SEMESTERS
AND
SYLLABI I & II SEMESTERS

I SEMESTER

S. No	COURSE CODE	COURSE TITLE	CATEGORY	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.	GE7152	Engineering Graphics	ES	5	3	2	0	4
PRACTICALS								
6.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
7.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
TOTAL				27	17	2	8	22

II SEMESTER

S. No	COURSE CODE	COURSE TITLE	CATEGORY	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.	GE7151	Computing Techniques	ES	3	3	0	0	3
4.	PH7251	Materials Science	BS	3	3	0	0	3
5.	GE7153	Engineering Mechanics	ES	4	4	0	0	4
6.	PR7251	Production Processes	ES	3	3	0	0	3
PRACTICALS								
7.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
8.	PR7261	Production Processes Laboratory	ES	4	0	0	4	2
TOTAL				29	21	0	8	25

III SEMESTER

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Environmental Science and Engineering	HS	3	3	0	0	3
2.		Numerical Methods	BS	4	4	0	0	4
3.		Mechanics of Solid	ES	3	3	0	0	3
4.		Thermodynamics and Thermal Engineering	ES	4	4	0	0	4
5.		Electrical and Electronics Engineering	ES	3	3	0	0	3
6.		Automotive Petrol Engines	PC	3	3	0	0	3
PRACTICALS								
7.		Mechanical Science Laboratory	BS	4	0	0	4	2
8.		Electrical and Electronic Engineering Laboratory	ES	4	0	0	4	2
TOTAL				28	20	0	8	24

IV SEMESTER

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Engineering Fluid Mechanics	ES	3	3	0	0	3
2.		Kinematics & Dynamics of Machines	ES	4	4	0	0	4
3.		Theory of Fuels and Lubricants	PC	3	3	0	0	3
4.		Automotive Diesel Engines	PC	3	3	0	0	3
5.		Automotive Chassis	PC	3	3	0	0	3
6.		Metrology & Measurement System	PC	3	3	0	0	3
PRACTICALS								
7.		Automotive Engine and Chassis Components Laboratory	PC	4	0	0	4	2
8.		Fuels and Lubricants Laboratory	PC	4	0	0	4	2
TOTAL				27	19	0	8	23

V SEMESTER

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Automotive Components Design	PC	3	3	0	0	3
2.		Automotive Transmission	PC	3	3	0	0	3
3.		Electronic Engine Management System	PC	3	3	0	0	3
4.		Automotive Electrical and Electronics Systems	PC	3	3	0	0	3
5.		Professional Elective I	PE	3	3	0	0	3
6.		Professional Elective II	PE	3	3	0	0	3
PRACTICALS								
7.		Automotive Electrical and Electronics Laboratory	PC	4	0	0	4	2
8.		Simulation of Engine and Chassis Components Laboratory	PC	4	0	0	4	2
TOTAL				26	18	0	8	22

VI SEMESTER

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Automotive Pollution and Control	PC	3	3	0	0	3
2.		Vehicle Body Engineering	PC	3	3	0	0	3
3.		Vehicle Control System	PC	3	3	0	0	3
4.		Hybrid and Electric Vehicles	PC	3	3	0	0	3
5.		Professional Elective III	PE	3	3	0	0	3
6.		Open Elective- I*	OE	3	3	0	0	3
PRACTICALS								
7.		Creative and Innovative Project	EEC	6	0	0	6	3
8.		Engine Testing and Emission Measurement Laboratory	PC	4	0	0	4	2
TOTAL				28	18	0	10	23

VII SEMESTER

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Hydraulic and Pneumatic Systems	PC	3	3	0	0	3
2.		Vehicle Dynamics	PC	3	3	0	0	3
3.		Engineering Ethics and Human Values	HS	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.		Open Elective- II*	OE	3	3	0	0	3
PRACTICALS								
7.		Industrial Training and Seminar	EEC	4	0	0	4	2
8.		Vehicle Testing Laboratory	PC	4	0	0	4	2
TOTAL				26	18	0	8	22

VIII SEMESTER

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

TOTAL NO. OF CREDITS:177

*Course from the curriculum of other UG Programmes

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.		Environmental Science and Engineering	HS	3	3	0	0	3
4.		Engineering Ethics and Human Values	HS	3	3	0	0	3

BASIC SCIENCES (BS)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	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 Science Lab	BS	4	0	0	4	2
5.		Mathematics - II	BS	4	4	0	0	4
6.		Materials Science	BS	3	3	0	0	3
7.		Numerical Methods	BS	4	4	0	0	4
8.		Mechanical Science Laboratory	BS	4	0	0	4	2

ENGINEERING SCIENCES (ES)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Engineering Graphics	ES	5	3	2	0	4
2.		Engineering Practices Laboratory	ES	4	0	0	4	2
3.		Engineering Mechanics	ES	4	4	0	0	4
4.		Production Processes	ES	3	3	0	0	3
5.		Production Processes Laboratory	ES	4	0	0	4	2
6.		Mechanics of Solid	ES	3	3	0	0	3
7.		Thermodynamics and Thermal Engineering	ES	4	4	0	0	4
8.		Electrical and Electronics Engineering	ES	3	3	0	0	3
9.		Electrical and Electronic Engineering Laboratory	ES	4	0	0	4	2
10.		Engineering Fluid Mechanics	ES	3	3	0	0	3
11.		Kinematics & Dynamics of Machines	ES	4	4	0	0	4
12.		Computer Practice Laboratory	ES	4	0	0	4	2
13.		Computing Techniques	ES	3	3	0	0	3

PROFESSIONAL CORE (PC)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Automotive Petrol Engines	PC	3	3	0	0	3
2.		Theory of Fuels and Lubricants	PC	3	3	0	0	3
3.		Automotive Diesel Engines	PC	3	3	0	0	3
4.		Automotive Chassis	PC	3	3	0	0	3
5.		Metrology & Measurement System	PC	3	3	0	0	3
6.		Automotive Engine and Chassis Components Laboratory	PC	4	0	0	4	2
7.		Fuels and Lubricants Laboratory	PC	4	0	0	4	2
8.		Automotive Components Design	PC	3	3	0	0	3
9.		Automotive Transmission	PC	3	3	0	0	3
10.		Electronic Engine Management System	PC	3	3	0	0	3
11.		Automotive Electrical and Electronics Systems	PC	3	3	0	0	3
12.		Automotive Electrical and Electronics Laboratory	PC	4	0	0	4	2
13.		Simulation of Engine and Chassis Components Laboratory	PC	4	0	0	4	2
14.		Automotive Pollution and Control	PC	3	3	0	0	3
15.		Vehicle Body Engineering	PC	3	3	0	0	3
16.		Vehicle Control System	PC	3	3	0	0	3
17.		Hybrid and Electric Vehicles	PC	3	3	0	0	3
18.		Engine Testing and Emission Measurement Laboratory	PC	4	0	0	4	2
19.		Hydraulic and Pneumatic Systems	PC	3	3	0	0	3
20.		Vehicle Dynamics	PC	3	3	0	0	3
21.		Vehicle Testing Laboratory	PC	4	0	0	4	2

PROFESSIONAL ELECTIVES (PE)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Advance Theory of IC Engines	PE	3	3	0	0	3
2.		Advance Vehicle Technology	PE	3	3	0	0	3
3.		Alternative Fuels and Energy System	PE	3	3	0	0	3
4.		Automotive Aerodynamics	PE	3	3	0	0	3
5.		Automotive Test Instrumentation	PE	3	3	0	0	3
6.		Combustion Thermodynamics and Heat Transfer	PE	3	3	0	0	3
7.		Computational Fluid Mechanics	PE	3	3	0	0	3
8.		Principles of Control System	PE	3	3	0	0	3
9.		Simulation of IC Engines	PE	3	3	0	0	3
10.		Noise, Vibration and Harshness	PE	3	3	0	0	3
11.		Polymer Components in Automotive Applications	PE	3	3	0	0	3
12.		Two and Three Wheeler Technology	PE	3	3	0	0	3
13.		Vehicle Multiplexing	PE	3	3	0	0	3
14.		Special Types of Vehicles	PE	3	3	0	0	3
15.		Vehicle Air-Conditioning	PE	3	3	0	0	3
16.		Virtual Instrumentation in Automobile Engineering	PE	3	3	0	0	3
17.		Finite Element Techniques	PE	3	3	0	0	3
18.		Automotive Materials	PE	3	3	0	0	3
19.		Fundamentals of Nano Science	PE	3	3	0	0	3
20.		Vehicle Maintenance	PE	3	3	0	0	3
21.		Total Quality Management	PE	3	3	0	0	3
22.		Vehicle Modeling	PE	3	3	0	0	3
23.		Quantitative techniques in management	PE	3	3	0	0	3
24.		Quality control and reliability	PE	3	3	0	0	3
25.		Manufacturing of Automotive Components	PE	3	3	0	0	3

26.		Automotive Automation	PE	3	3	0	0	3
27.		Human Rights	PE	3	3	0	0	3
28.		Disaster Management	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Creative and Innovative Project	EEC	6	0	0	6	3
2.		Industrial Training and Seminar	EEC	4	0	0	4	2
3.		Project work	EEC	20	0	0	20	10

SUMMARY

S.NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	HS	04	04	03	00	00	00	00	00	11
2.	BS	12	12	06	00	00	00	00	00	30
3.	ES	06	09	12	07	00	00	00	00	34
4.	PC	00	00	03	16	16	14	11	00	60
5.	PE	00	00	00	00	06	03	06	06	21
6.	OE	00	00	00	00	00	03	03	00	06
7.	EEC	00	00	00	00	00	03	02	10	15
	Total	22	25	24	23	22	23	22	16	177
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

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

L	T	P	C
4	0	0	4

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.

UNIT III INTEGRAL CALCULUS**12**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS**12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS**12**

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS**OUTCOMES:**

- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXTBOOKS:

1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi, 2008.
2. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

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.

OBJECTIVE:

- 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**OUTCOME:**

- 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.

TEXTBOOKS:

- Gaur R.K. and Gupta S.L., "Engineering Physics", Dhanpat Rai Publications (2013)
- Palanisamy P.K., "Engineering Physics", Scitech Publications (P) Ltd. (2006).

2. Arumugam M., "Engineering Physics", Anuradha Publications (2000)

REFERENCES:

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

OBJECTIVE

- 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: Tg, 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-Frendlich 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 NANO CHEMISTRY

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

OUTCOME

- 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.

TEXTBOOKS

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

REFERENCES

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. AshimaSrivastava. 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.

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.

UNIT I PLANE CURVES AND FREE HANDSKETCHING

14

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

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

14

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 15

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.

BS7161**BASIC SCIENCES LABORATORY**
(Common to all branches of B.E. / B.Tech Programmes)**LT 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).

GE7162	ENGINEERING PRACTICES LABORATORY	L	T	P	C
	(Common to all Branches of B.E. / B.Tech. Programmes)	0	0	4	2

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) **15**

3. MECHANICAL ENGINEERING PRACTICES

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:

Centrifugal pump

- a. Mixie
- b. Air Conditioner.
- c. 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

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.

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.

UNIT II VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 12

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z+c$, az , $\frac{1}{z}$, z^2 - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS**OUTCOMES:**

- Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
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.

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

OBJECTIVE

- 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

OUTCOME

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

OBJECTIVE:

- To introduce the essential principles of materials science for mechanical and related Engineering applications.

UNIT I PHASE DIAGRAMS**9**

Solid solutions - Hume Rothery's rules - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II FERROUS ALLOYS AND HEAT TREATMENT**9**

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructure of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick's law - phase transformations - T-T-T-diagram for eutectoid steel – pearlitic, bainitic and martensitic transformations - tempering of martensite - heat treatment of steels - annealing - normalizing - quenching and tempering - case hardening - induction, flame and laser hardening - carburizing, cyaniding, carbonitriding and nitriding.

UNIT III MECHANICAL PROPERTIES**9**

Tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep curves - mechanisms of creep - creep-resistant materials - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS**9**

Ferromagnetism – Domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites - dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization - dielectric breakdown – insulating materials – Ferroelectric materials - superconducting materials, properties, types and applications.

UNIT V NEW MATERIALS**9**

Ceramics – types and applications – Composites: classification, role of matrix and reinforcement – processing of fiber reinforced plastics – Metallic glasses – types, glass forming ability of alloys – Inoue criteria – melt spinning process – applications - Shape memory alloys – phases, shape memory effect, pseudoelastic effect – NiTi alloy – applications- Nanomaterials – preparation: ball milling and chemical vapour deposition - properties and applications – carbon nanotubes - Biomaterials

TOTAL: 45 PERIODS**OUTCOME:**

- Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.

TEXTBOOKS:

- Raghavan, V. "Physical Metallurgy: Principles and Practice", Phi Learning (2009).
- Balasubramaniam, R. "Callister's Materials Science and Engineering", Wiley India Pvt. Ltd. (2014).
- Palanisamy P.K., "Materials Science", Scitech (2013).

REFERENCES:

- Raghavan, V. "Materials Science and Engineering", Printice Hall of India (2007).
- Shackelford, J.F. "Introduction to Materials Science for Engineers". Pearson India (2006).

UNIT V UNCONVENTIONAL MACHINING PROCESSES**9**

Need for unconventional – Construction, working principle merits, demerits and applications with block diagram only for AJM, AWJM, USM, CHM, ECM, EDM, EBM, LBM, PAM and IBM.

TOTAL: 45 PERIODS**OUTCOMES:**

- Has enough knowledge on the various process available to make a part.
- Confident to select the process to based on cost of time and quantities.
- Can determine processes for new materials.

TEXT BOOKS

1. Serope Kalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology - Anna University, 4/e, Pearson Education, 2014
2. P.C. Sharma, "A Text Book of Production Technology", S.Chand and Co. Ltd., New Delhi, 2010.

REFERENCE BOOKS:

1. B.H.Amstead, "Manufacturing Processes", Phillip F.Ostwald, L.Begemon, John Wiley and Sons, 8th Edition, 1998.
2. De Garmo, "Materials and Processes in Manufacturing", Prentice Hall of India, 8th Edition, 2008.
3. P.N.Rao, "Manufacturing Technology – I and II", Tata McGraw Hill Publishing Co., New Delhi – 2013.
4. Amitabha Ghosh, Asok Kumar Mallik, Manufacturing Science, EWP Pvt. Ltd, 2007

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

PR7261	PRODUCTION PROCESSES LABORATORY	L	T	P	C
	(Common to Aero/Auto/Rubber and Plastics)	0	0	4	2

OBJECTIVE:

- To get hands on experience in the machines for production
- To prepare the process planning sheets for all the operations and then follow the sequence during the machining processes.

LIST OF EXPERIMENTS:

1. Study of all the machining tools- identification of parts/mechanisms and position of tool and work piece.
2. Facing, plain turning/step turning operations in Lathe.
3. Taper Turning/Threading and knurling operations in Lathe.
4. Multi-start Threading/Burnishing operations in Lathe.
5. Machining to make a cube using shaper
6. Machining to make a V-block using shaper.
7. Counter sinking, counter Boring and Tapping operations in a drilling machine.
8. Surfacing/pocket milling in a vertical milling machine.
9. Polygonal shape milling in a horizontal milling machine
10. Flat surface grinding and cylindrical grinding operations
11. Machining an internal spline in slotting machine.
12. To machine the given part drawing using Lathe and milling machines.

TOTAL: 60PERIODS

OUTCOME:

- Enough experience to operate machines and processes commonly used in production of components.
- Enable interpretation of process plan sheets to be followed for the machining of products.