



Revised Syllabus to be implemented from the Academic Year 2010
(for the new batch only)
 First Year First Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
			L	T	P	Total	
1	HU101	ENGLISH LANGUAGE & TECHNICAL COMMUNICATION	2		0	0	2
2	PH101/CH101	Chemistry -1 (Gr-B) / Physics – 1 (Gr-A)	3	1	0	4	4
3	M101	Mathematics-1	3	1	0	4	4
4	ES101	Basic Electrical & Electronic Engineering – 1 (GrA+GrB)	3	1	0	4	4
5	ME101	Engg. Mechanics	3	1	0	4	4
Total of Theory						18	18
B. PRACTICAL							
6	PH191/CH191	Chemistry -1 (Gr-B)/ Physics – 1 (Gr-A)	0	0	3	3	2
7	ES191	Basic Electrical & Electronic Engineering -1	0	0	3	3	2
8	ME191/192	Engg Drawing & Computer Graphics (Gr-B) / Workshop Practice (Gr-A)	1	0	3	4	3
Total of Practical						10	7
C. SESSIONAL							
9	HU181	Language Laboratory	0	0	2	2	1
10	XC181	Extra Curricular Activities(NSS/NCC/NSO etc)	0	0	2	2	1
Total of Sessional						4	2
Total of Semester						32	27

Physics based branches divided in to Gr-A & Gr-B, Gr-A= Phys in sem-I , Gr-B = Phys in sem-II; Chemistry based branches Physics in sem-1.

Group division:

Group-A: Chemistry based subjects: [Bio-Technology, Food Technology, Leather Technology, Textile Technology, Ceramic Technology, Chemical Engineering and any other Engineering that chooses to be Chemistry based] + Physics based subjects: [Mechanical Engineering, Production Engineering, Civil Engineering, Automobile Engineering, Marine Engineering, Apparel Production Engineering, Computer Science & Engineering, Information Technology.]

Group-B: All Physics based subjects which are also Electrical & Electronics based [Electrical Engineering, Electronics & Communication Engineering, Applied Electronics & Instrumentation Engineering, Power Engineering, Electrical & Electronics Engineering, Bio-Medical Engineering, Instrumentation & Control Engineering]



First Year Second Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
			L	T	P	Total	
1	CS201	Basic Computation & Principles of Computer Programming	3	1	0	4	4
2	PH201/CH201	Physics - 1(Gr-B) / Chemistry-1(Gr-A)	3	1	0	4	4
3	M201	Mathematics-2	3	1	0	4	4
4	ES201	Basic Electrical & Electronic Engineering-II	3	1	0	4	4
5	ME201	Engineering Thermodynamics & Fluid Mechanics	3	1	0	4	4
Total of Theory						20	20
B. PRACTICAL							
7	CS291	Basic Computation & Principles of Computer Programming	0	0	3	3	2
8	PH291/CH291	Physics – 1 (Gr-B) /Chemistry-1 (Gr-A)	0	0	3	3	2
9	ES291	Basic Electrical & Electronic Engineering- II	0	0	3	3	2
10	ME291/292	Workshop Practice (Gr-B) / Basic Engg Drawing & Computer Graphics (Gr-A)	1	0	3	4	3
Total of Practical						13	9
Total of Semester						32	29

	Group-A	Group-B
1st Sem	Physics-I; Workshop Practice	Chemistry –1; Engg Drawing & Computer Graphics
2nd Sem	Chemistry –1; Engg Drawing & Computer Graphics	Physics-I; Workshop Practice



Syllabus
First Semester
Theory

HU

English

PAPER CODE: HU 101

CONTACT: 2L

CREDIT: 2

PAPER NAME: ENGLISH LANGUAGE & TECHNICAL COMMUNICATION

Guidelines for Course Execution:

Objectives of the Course: This Course has been designed

1. To impart advanced skills of Technical Communication in English through Language Lab. Practice Sessions to 1st Semester UG students of Engineering & Technology.
2. To enable them to communicate confidently and competently in English Language in all spheres.

Desired Entry Behaviour:

The students must have basic command of English to
Talk about day-to-day events and experiences of life.
Comprehend Lectures delivered in English.
Read and understand relevant materials written in English.
Write grammatically correct English.

Strategies for Course Execution:

1. It is a Course that aims to develop Technical Communication Skills. It is, therefore, *Lab-* based and practical in orientation. Students should be involved in Practice Sessions.
2. The content topics should be conveyed through real-life situations. Lecture classes should be conducted as Lecture cum Tutorial classes.
3. Keeping in view the requirements of students, the teachers may have to prepare some learning aids task materials.
4. Some time should be spent in teaching stress and intonation.
5. In teaching 'Speaking skill,' emphasis should be on *clarity, intelligibility, fluency, (as well as accepted pronunciation)*.
6. Micro Presentation and Group Discussion Sessions should be used for developing Communicative Competence
7. The Language Lab, device should be used for giving audio-visual inputs to elicit students' responses by way of Micro-Presentation, Pair Conversation, Group Talk and Class Discussion.
8. The teacher must function as *a creative monitor in the Language Lab for the following:*
 - A. Developing Listening Comprehension Skill;
 1. Developing Listening Comprehension through Language Lab Device
 2. Developing sub skills of the Listening Skill by Conversational Practice Sessions
 3. Focusing on intelligent and advanced Listening Sessions e.g. Seminars, Paper Presentation, Mock Interviews etc.
 4. Conducting Conversational Practice: Face to Face & Via Media (Telephone, Audio, Video + Clips)
 - B. Developing Speaking Competence:
 - a) Helping students in achieving *clarity and fluency* ; manipulating paralinguistic features of speaking (*voice modulation ,pitch , tone stress , effective pauses*)
Conducting *Task oriented interpersonal ,informal and semiformal Speaking / Classroom Presentation*



- b) *Teaching strategies for Group Discussion*
Teaching Cohesion and Coherence
Teaching effective communication & strategies for handling criticism and adverse remarks
Teaching strategies of Turn-taking, effective intervention, kinesics (use of body language) and courtesies and all components of soft skills.

C. Developing Reading Comprehension Skill:

- a) Developing Reading Skill through Non Technical (Literary) Texts
(See Recommended Book 5)

1. The Thief by Ruskin Bond
2. The Open Window by Saki
3. Marriage is a private Affair by Chinua Achebe
4. The Moon in the Earthen Pot by Gopini Karunakar

- b) Developing Reading Skill through Radio Commentary, Technical Texts and Case Studies (Refer to Recommended Book 1.)

* Freedom by G. B. Shaw (Radio Commentary)

- a) Guiding students for Intensive & Extensive Reading (See Recommended Book 1)

D. Developing Writing Competence:

- a) Teaching all varieties of Technical Report, Business Letters and Job Application (Expressing Ideas within restricted word limit through paragraph division, Listing Reference Materials through Charts, Graphs, Tables and Diagrams);

- b) Teaching correct Punctuation & Spelling, Semantics of Connectives, Modifiers and Modals, variety of sentences and paragraphs

- c) Teaching Organizational Communication: Memo, Notice, Circular, Agenda / Minutes etc.

SYLLABUS -- DETAILED OUTLINES

A. ENGLISH LANGUAGE GRAMMAR:

5L

Correction of Errors in Sentences
Building Vocabulary
Word formation
Single Word for a group of Words
Fill in the blanks using correct Words
Sentence Structures and Transformation
Active & Passive Voice
Direct & Indirect Narration
(MCQ Practice during classes)

B. READING COMPREHENSION:

Strategies for Reading Comprehension 1L
Practicing Technical & Non Technical Texts for Global/Local/Inferential/Referential comprehension; 3L
Précis Writing

C. TECHNICAL COMMUNICATION

The Theory of Communication –Definition & Scope
Barriers of Communication
Different Communication Models
Effective Communication (Verbal / Non verbal)
Presentation / Public Speaking Skills
(MCQ Practice during classes)

5L



D. MASTERING TECHNICAL COMMUNICATION

Technical Report (formal drafting)	3L
Business Letter (formal drafting)	4L
Job Application (formal drafting)	3L
Organizational Communication (see page 3)	3L
Group Discussion –Principle & Practice	3L

Total Lectures 30

MARKS SCHEME (Written Examination) Total Marks 70

1. 10 Multiple Choice Questions(Communication & Eng. Language-Vocabulary & Syntax)
Marks 10
2. Short Questions & Précis writing on unseen passages
Marks 15 (10+5)
3. 3 Essay type Questions on Technical Communication (Technical Report / Business Letter / Job Application / Organizational Communication etc,)
Marks 45-15*3

MARKS SCHEME (Internal Examination) Total Marks 30

1. Attendance
Marks 5
2. Testing Speaking Ability
Marks 5
3. Testing Listening Ability
Marks 5
4. 2 Unit Tests
Marks 15

BOOKS -- RECOMMENDED:

1. Board of Editors: Contemporary Communicative English for Technical Communication
Pearson Longman,2010
2. Dr. D. Sudharani: Manual for English Language Laboratory
Pearson Education (W.B. edition), 2010
3. Technical Communication Principles and Practice by Meenakshi Raman, Sangeeta Sharma(Oxford Higher Education)
4. Effective Technical Communication by Barun K.Mitra(Oxford Higher Education)
5. V. Sashikumar (ed.): Fantasy- A Collection of Short Stories
Orient Black swan (Reprint 2006)

References:

1. D. Thakur: Syntax Bharati Bhawan , 1998
2. Longman Dictionary of Contemporary English (New Edition) for Advanced Learners
3. Internet



Basic Science

Chemistry-1(Gr-A/Gr-B)

Code: CH101

Contacts: 3L + 1T = 4

Credits: 4

Module 1

Chemical Thermodynamics -I

Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: different statements, mathematical form.

Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.

Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. 3L

Heat Capacity: Definition, Classification of Heat Capacity (C_p and C_v): Definition and General expression of $C_p - C_v$. Expression of $C_p - C_v$ for ideal gas.

Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas,

Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process.

Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchoff's law. 3L

2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature.

Evaluation of entropy: characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. 2L

Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation.

Condition of spontaneity and equilibrium reaction. 2L



Module 2

Reaction Dynamics

Reaction laws: rate and order; molecularity; zero, first and second order kinetics. Pseudomolecular reaction, Arrhenius equation.

Mechanism and theories of reaction rates (Transition state theory, Collision theory:).

Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). 3L

Solid state Chemistry

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).

Role of silicon and germanium in the field of semiconductor. 2L

Module 3

Electrochemistry

Conductance

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte).

Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions.

Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs AgNO₃. 2L

Electrochemical cell

Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quinhydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, Discussion, Application)

Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application).

Application of EMF measurement on a) Ascertain the change in thermodynamic function (ΔG , ΔH , ΔS) b) ascertain the equilibrium constant of a reversible chemical reaction c) ascertain the valency of an ion.

3L

Module 4

Structure and reactivity of Organic molecule

Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals.

Brief study of some addition, eliminations and substitution reactions. 3L

Polymerization

Concepts, classifications and industrial applications.



Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly dispersity index (PDI).

Polymerization processes (addition and condensation polymerization), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of T_m) and amorphicity (Concept of T_g) of polymer.

Preparation, structure and use of some common polymers: plastic (**PE**: HDPE, LDPE, LLDPE, UHMWPE)), rubber (natural rubber, SBR), fibre(nylon 6.6). Vulcanization.

Conducting and semi-conducting polymers. 5L

Module 5

Industrial Chemistry

Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Coal analysis: Proximate and ultimate analysis.

Liquid fuel: Petroleum, classification of petroleum, Refining, Petroleum distillation, Thermal cracking, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Bio-diesel.

Gaseous fuels: Natural gas, water gas, Coal gas, bio gas. 5L

Reference Books

1. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
2. S. Glasston, Text Book of Physical Chemistry, Macmillan India Limited.
3. S. Pahari, Physical Chemistry, New Central Book Agency.
4. S. Sarkar, Fuels and Combustion, Taylor & Francis (3rd Edition), 2009
5. P. Ghosh, Polymer Science and Technology of Plastics and Rubbers, Tata McGraw Hill Publishing Company Limited.
6. F.W.Billmeyer : Textbook of Polymer Science is published by Wiley India (is now an Indian Imprint.)
7. Joel R. Fried, Polymer Science and Technology, Pearson Education (2nd Edition).
8. I. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc.
9. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
10. Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers.

Or

Physics-1(Gr-B/Gr-A)

Code: PH-101

Contacts: 3+1

Credit: 4L

Module 1:

Oscillation:

1.1 Simple harmonic motion: Preliminary concepts, Superposition of S. H. Ms in two mutually perpendicular directions: Lissajous figure 2L



- 1.2 Damped vibration: Differential equation and its solution, Logarithmic decrement, Quality factor. 3L
- 1.3 Forced vibration: Differential equation and its solution, Amplitude and Velocity resonance, Sharpness of resonance. Application in L-C-R Circuit 3L

Module 2:

Optics 1:

- 2.1 Interference of electromagnetic waves: Conditions for sustained interference, double slit as an example. Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring 3L
- 2.2 Diffraction of light: Fresnel and Fraunhofer class. Fraunhofer diffraction for single slit and double slits. Intensity distribution of N-slits and plane transmission grating (No deduction of the intensity distributions for N-slits is necessary), Missing orders. Rayleigh criterion, Resolving power of grating and microscope. (Definition and formulae) 5L

Module 3:

Optics 2

- 3.1 Polarization: General concept of Polarization, Plane of vibration and plane of polarization, Qualitative discussion on Plane, Circularly and Elliptically polarized light, Polarization through reflection and Brewster's law, Double refraction (birefringence) -Ordinary and Extra-ordinary rays . Nicol's Prism, Polaroid. [Half wave plate and Quarter wave plate](#) 4L
- 3.2 Laser : Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B coefficient (derivation of the mutual relation), Optical resonator and Condition necessary for active Laser action, Ruby Laser, He-Ne Laser- applications of laser. 4L
- 3.3 [Holography: Theory of holography, viewing the hologram, Applications](#) 3L

Module 4:

Quantum Physics:

- 4.1 Concept of dependence of mass with velocity, mass energy equivalence, energy- momentum relation (no deduction required). Blackbody radiation: Rayleigh Jeans' law ([derivation without the calculation of number of states](#)), Ultraviolet catastrophe, Wien's law, Planck's radiation law (Calculation of the average energy of the oscillator), Derivation of Wien's displacement law and Stephan's law from Planck's radiation law. Rayleigh Jean's law and Wien's law as limiting cases of Planck's law. Compton Effect (calculation of Compton wavelength is required). 5L



4.2 Wave-particle duality and de Broglie's hypothesis, Concept of matter waves, Davisson-Germer experiment, Concept of wave packets and Heisenberg's uncertainty principle.

4L

Module 5:

Crystallography:

5.1 Elementary ideas of crystal structure : lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, f.c.c. and b.c.c. lattices, (use of models in the class during teaching is desirable) Miller indices and miller planes, Co-ordination number and Atomic packing factor. 4L

5.2 X-rays : Origin of Characteristic and Continuous X-ray, Bragg's law (No derivation), Determination of lattice constant. 2L

Recommended Text Books and Reference Books:

For Both Physics I and II

1. B. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
- 4.. Arthur Baiser (Perspective & Concept of Modern Physics)

Physics I (PH101/201)

Vibration and Waves

- c) Kingsler and Frey
- d) D.P. Roychaudhury
- e) N.K. Bajaj (Waves and Oscillations)
- f) K. Bhattacharya
- g) R.P. Singh (Physics of Oscillations and Waves)
- h) A.B. Gupta (College Physics Vol.II)
- i) Chattopadhyaya and Rakshit (Vibration, Waves and Acoustics)

Optics

- 10 Möler (Physical Optics)
- 11 A.K. Ghatak
- 12 E. Hecht (Optics)
- 13 E. Hecht (Schaum Series)
- 14 F.A. Jenkins and H.E. White
- 15 6. Chita Ranjan Dasgupta (Degree Physics Vol 3)

Quantum Physics

- 2 Eisberg & Resnick is published by Wiley India
- 3 A.K. Ghatak and S. Lokenathan
- 4 S.N. Ghoshal (Introductory Quantum Mechanics)
- 5 E.E. Anderson (Modern Physics)
- 6 Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India
- 7 Binayak Dutta Roy [Elements of Quantum Mechanics]



Crystallography

1. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)
2. A.J. Dekker
3. Ashcroft and Mermin
4. Ali Omar
5. R.L. Singhal
6. Jak Tareen and Trn Kutty (Basic course in Crystallography)

Laser and Holography

- 1 A.K. Ghatak and Thyagarajan (Laser)
- 2 Tarasov (Laser)
- 3 P.K. Chakraborty (Optics)
- 4 B. Ghosh and K.G. Majumder (Optics)
- 5 B.B. Laud (Laser and Non-linear Optics)
- 6 Bhattacharyya [Engineering Physics] Oxford

Mathematics

Code: M101

Contacts: 3L + 1T = 4

Credits: 4

Note 1: The whole syllabus has been divided into five modules.

Note 2: Structure of the question paper

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the three modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have three parts covering not more than two topics (marked in bold italics face). Sufficient questions should to be set covering all modules.

Module I

Matrix: Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoint of a determinant, Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, orthogonal matrix and its properties, Trace of a matrix.

Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Eigen values and eigen vectors of a square matrix (of order 2 or 3), Eigen values of AP^{TP} , kA , AP^{-1P} , Caley-Hamilton theorem and its applications.

9L



Module II

Successive differentiation: Higher order derivatives of a function of single variable, Leibnitz's theorem (statement only and its application, problems of the type of recurrence relations in derivatives of different orders and also to find $(y_n)_0$). **2L**

Mean Value Theorems & Expansion of Functions: Rolle's theorem and its application, Mean Value theorems – Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem, Maclaurin's infinite series expansion of the functions: $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(a+x)^n$, n being an integer or a fraction (assuming that the remainder $R_n \rightarrow 0$ as $n \rightarrow \infty$ in each case). **5L**

Reduction formula: Reduction formulae both for indefinite and definite integrals of types $\int \sin^n x$, $\int \cos^n x$, $\int \sin^m x \cos^n x$, $\int \cos^m x \sin^n x$, $\int \frac{dx}{(x^2 + a^2)^n}$, m, n are positive integers.

2L

Module III

Calculus of Functions of Several Variables: Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives and related problems, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems, Concept of line integrals, Double and triple integrals. **9L**

Module IV

Infinite Series: Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test and Raabe's test (statements and related problems on these tests), Alternating series, Leibnitz's Test (statement, definition) illustrated by simple example, Absolute convergence and Conditional convergence. **5L**

Module-V

Vector Algebra and Vector Calculus: Scalar and vector fields – definition and terminologies, dot and cross products, scalar and vector triple products and related problems, Equation of straight line, plane and sphere, Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions,



Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative. Related problems on these topics. Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications). **8L**

Total 40 Lectures
Suggested Reference Books

1. Advanced Engineering Mathematics 8e by Erwin Kreyszig is published by Wiley India
2. **Engineering Mathematics:** B.S. Grewal (S. Chand & Co.)
3. **Higher Engineering Mathematics:** John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
4. **Mathematics Handbook:** for Science and Engineering, L. Rade and B. Westergren (5Pth edition, 1Pst Indian Edition 2009, Springer)
5. **Calculus:** M. J. Strauss, G. L. Bradley and K. L. Smith (3Prd Edition, 1Pst Indian Edition 2007, Pearson Education)
6. **Engineering Mathematics:** S. S. Sastry (PHI, 4Pth Edition, 2008)
7. **Advanced Engineering Mathematics, 3E:** M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition.

Engineering Science

Basic Electrical and Electronics Engineering-I

Code: ES101

Contacts: 3L + 1T = 4

Credits: 4

Basic Electrical Engineering-I

DC Network Theorem: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, Kirchhoff's law, Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, star-delta conversion. Maximum power transfer theorem with proof. **7L**

Electromagnetism: Biot-savart law, Ampere's circuital law, field calculation using Biot-savart & ampere's circuital law. Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faraday's law, Self and mutual inductance. Energy stored in a magnetic field, B-H curve, Hysteretic and Eddy current losses, Lifting power of Electromagnet. **5L**

AC fundamental: Production of alternating voltage, waveforms, average and RMS values, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behavior of AC series, parallel and series parallel circuits, Power factor, Power in AC circuit, Effect of frequency variation in RLC series and parallel circuits, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit. **9L**

Basic Electronics Engineering-I

Instruction: 1 credit means 1 hour; 1 lecture means a lecture of 1 hour duration.

Basic Electronics Engineering - I: 18L + 2L = 20L

Pre-requisites: Knowledge of Class XII level electronics, Physics & Mathematics.



Recapitulation and Orientation lectures: 2L

Module – 1: Semiconductors: 4L

Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Module – 2: Diodes and Diode Circuits: 3L+3L = 6L

Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode.

Simple diode circuits, load line, linear piecewise model;

Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module – 3: Bipolar Junction Transistors: 6L+2L = 8L

Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes.

Biasing and Bias stability: calculation of stability factor;

Outcome:

Students will be able to identify semiconductor materials, draw band-diagrams, distinguish between intrinsic and extrinsic semiconductors, n- and p- type semiconductors, calculate drift and diffusion current components.

Students must be able to explain the junction properties and the phenomenon of rectification, draw the I-V characteristics and identify operating points; Calculate ripple factors, efficiency of power supplies.

Students will be able to draw and explain the I-V characteristics of BJTs – both input and output; learn to bias transistors, both as amplifiers and switches; identify operating points.

Recommended Books:

Text:

9. Sedra & Smith: Microelectronics Engineering.
10. Millman & Halkias: Integrated Electronics.

References:

- b) Malvino: Electronic Principle.
- c) Schilling & Belove: Electronics Circuits.
- d) Millman & Grabal: Microelectronics.
- e) Salivahanan: Electronics Devices & Circuits.
- f) Boylestad & Nashelsky: Electronic Devices & Circuit Theory



Engineering Mechanics

Code: ME101

Contacts: 3L + 1T = 4

Credits: 4

Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice
Mo d-I	Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector).	2L	Meriam & Kraig: Vol-I Chapt: 1/1, 2/2,1/3
	Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications.	4L+1T	1. Meriam & Kraig: Vol-I Chapt: 1/3, 2/4, 2/7 2. I.H. Shames Chapt: 2.1 to 2.8 Probs: 2.1, 2.2, 2.3,2.6, 2.10, 2.48, 2.52, 2.54, 2.64, 2.68
	Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces.	4L+2T	1. Meriam & Kraig: Vol-I Chapt: 2/3, 2/4, 2/5, 2/6, 2/9 Probs: 2/1 to 2/8; 2/13, 2/16, 2/20; 2/27, 2/31 to 2/33, 2/35, 2/37, 2/39; 2/53, 2/55, 2/57, 2/61, 2/66; 2/75, 2/77, 2/79, 2/78 to 2/82; 2/135 to 2/137, 2/139, 2/141, 2/146, 2/147,2/151, 2/157
Mo d-II	Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium.	3L+1T	Meriam & Kraig: Vol-I Chapt: 3/2, 3/3 Probs: 3/1, 3/3, 3/4 to 3/7, 3/11, 3/13, 3/15, 3/21, 3/25, 3/27, 3/31,3/39
	Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.	3L+1T	Meriam & Kraig: Vol-I Chapt: 6/1, 6/2, 6/3 Probs: 6/1 to 6/6, 6/13, 6/15, 6/17; 2. I.H. Shames; Chapt: 7.1,7.2
Mo d-III	Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadrilateral, composite areas consisting of above figures.	4L+1T	1. Meriam & Kraig: Vol-I Chapt: 5/1, 5/2, 5/3 Sample probs: 5/1 to 5/5 Probs: 5/2, 5/5, 5/7, 5/9, 5/12, 5/20, 5/25, 5/30, 5/43,5/47
	Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone.	3L+1T	1. Meriam & Kraig: Vol-I Chapt: Appendix A/1, A/2 Sample Probs: A/1 to A/5; Probs: A/1, A/5, A/9, A/15, A/20



Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice
	Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.	2L+1T	1.Elements of strength of Materials by Timoshenko & Young Chapt: 1.1,1.2,1.3, 2.2 Prob set 1.2 : Prob: 3,4,5,8,9,10 Prob set 1.3: Prob: 1,3,5,7 2. Nag & Chanda -3 rd Part Chapt: 1.1, 1.2.1 to 1.2.3, 1.2.6, 1.2.7
Mo d- IV	Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs.	3L+1T	Meriam & Kriag: Vol-II Chapt: 1/3, 1/5,1/7, 2/1,2/2 Probs: 1/1 to 1/10; 2/1 to 2/14; 2/15, 2/17, 2/19, 2/25, 2/27;
	Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion).	3L+1T	Meriam & Kraig: Vol-II Chapt: 2/3, 2/4, 2/5, Probs: 2/59 to 2/65, 2/67, 2/71, 2/81, 2/84, 2/89; 2/97, 2/99 to 2/103;
Mo d- V.	Kinetics of particles: Newton's second law; Equation of motion; D'Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency.	5L+2T	Meriam & Kraig: Vol-II Chapt: 3/2, 3/3, 3/4,3/6, 3/7; Probs: 3/1, 3/3, 3/4,3/7, 3/11, 3/12; 3/17, 3/19, 3/23; 3/103 to 3/107, 3/113, 3/115, 3/116; Sample probs: 3/16, 3/17; Probs: 3/143,3/145, 3/158

Books Recommended

1. Engineering Mechanics [Vol-I & II]by Meriam & Kraige, 5th ed. – Wiley India
2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI
3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. – TMH
4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P
5. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani
6. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
7. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson

Sessional

HU

HU 181 (Practical)

LANGUAGE LABORATORY

CONTACTS: 2P

CREDIT: 1

LANGUAGE LABORATORY PRACTICE

- | | |
|---|----|
| a) Honing 'Listening Skill' and its sub skills through Language Lab Audio device; | 3P |
| b) Honing 'Speaking Skill' and its sub skills; | 2P |
| c) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch & Accent) of connected speech; | 2P |



j) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone & Role Play Mode);	2P
k) Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success;	2P
f) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD;	4P
g) Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension;	2P
h) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions	2P
Total Practical Classes	17

Books Recommended:

Dr. D. Sudharani: Manual for English Language Laboratory
Pearson Education (WB edition),2010
Board of Editors: Contemporary Communicative English
for Technical Communication
Pearson Longman, 2010

Wxtra Curricular Activities(NSS/NCC/NSO etc)

Code: XC181

Code Credits: 1

- Creating awareness in social issues
- Participating in mass education programmes
- Proposal for local slum area development
- Waste disposal
- Environmental awareness
- Production Oriented Programmes
- Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

- Women's development – includes health, income-generation, rights awareness.
- Hospital activities – Eg. writing letters for patients, guiding visitors
- Old age home – visiting the aging in-mates, arranging for their entertainment.
- Children's Homes - visiting the young in-mates, arranging for their entertainment
- Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
- Gender issues- Developing an awareness, to link it with Women's Cell of college

Participating in mass education programmes

- Adult education
- Children's education

Proposal for local slum area development

One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness

- Resource conservation – Awareness to be developed on water, energy,soil.
- Preservation of heritage monuments- Marches, poster campaigns



- Alternative energy consciousness amongst younger school-children.
- Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
- Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

5. Working with people and explaining and teaching improved agricultural practices
6. Rodent control and pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;
9. Work for the promotion and strengthening of cooperative societies in villages;
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
11. Popularization of small savings and
12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

- g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
- h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
- i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
- j) Assisting and working with local authorities in relief and rescue operation;
Collection of clothes and other materials, and sending the same to the affected areas;

Practical **Basic Science**

Chemistry-1(Gr-A/Gr-B)

Code: CH191

Contacts:

Credits: 2

1. To Determine the alkalinity in a given water sample.
2. Red-ox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water)
6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
9. Determination of dissolved oxygen present in a given water sample.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)



At least **Six** experiments must perform in a semester out of above **Ten** experiments.

Or

Physics-1(Gr-B/Gr-A)

Code: PH191

Contacts: 3P

Credits: 2

Group 1: Experiment from Higher Secondary knowledge of Physics

13. Determination of thermal conductivity of a good conductor by Searle's method.
14. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
15. Determination of dispersive power of the material of given prism.
16. Use of Carry Foster's bridge to determine unknown resistance.

Group 2: Experiments on General Properties of matter

17. Determination of Young's modulus by Flexure method and calculation of bending moment and shear force at a point on the beam.
18. Determination of modulus of rigidity by static/ dynamic method.
19. Determination of co-efficient of viscosity by Poiseuille's capillary flow method.

Group 3: Optics

7. Determination of wavelength of light by Newton's ring method.
8. Determination of wavelength of light by Fresnel's bi-prism method
9. Determination of wavelength of light by Laser diffraction method.
10. Determination of numerical aperture and the energy losses related to optical fibre experiment

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

b) In addition, a student should perform one more experiments where he/she will have to convert the non-electrical signals (viz. Temperature, Intensity of Light, Pressure etc.) present in an Experiment into electrical signals and measure them with the help of Multi-meters/ Oscilloscopes. Student should calibrate the Sensor for Experiment before use.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:

- i. Failure to perform each experiment mentioned in b) and c) should be compensated by *two* experiments from two different groups mentioned in the above list.
- ii. At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b) and c]
- iii. Experiment in b) and c] can be coupled and can be parts of a single experiment.



Engineering Science

Basic Electrical and Electronics Engineering-I

Code: ES191

Contacts:

Credits: 2

Basic Electrical Engineering Laboratory-I

List of Experiments:

Sl. No Name of the Experiments

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
(b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit

Basic Electronics Engineering Laboratory-I

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given. Lectures on measurement techniques and error calculation will also have to be organized.

3 hours per week must be kept, initially for practical lectures, and later for tutorials.

List of Experiments:

Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.

Familiarisation with measuring and testing equipment like CRO, Signal generators etc.

Study of I-V characteristics of Junction diodes.

Study of I-V characteristics of Zener diodes.

Study of Half and Full wave rectifiers with Regulation and Ripple factors.

Study of I-V characteristics of BJTs.

Engineering Drawing & Computer Graphics(Gr-A/GrB)

Code: ME191

Contacts: 1L+3P

Credits: 3

A. THEORETICAL PART

- | | |
|--|------|
| 1. Introduction to Lines, Lettering, Dimensioning, Scales. | - 1L |
| 2. Geometrical Construction and Curves | - 1L |
| 3. Projection of Points, Lines and Surfaces | - 2L |
| 4. Projection of Solids | - 2L |
| 5. Isometric Views | - 1L |
| 6. Sectional Views | - 1L |
| 7. Development of Surfaces | - 1L |
| 8. Introduction to Computer Aided Drafting | - 3L |



B. PRACTICAL PART

1. LINES, LETTERING, DIMENSIONING, SCALES; Plain scale, Diagonal scale. - 6hrs
2. GEOMETRICAL CONSTRUCTION AND CURVES; Construction of polygons, Parabola, Hyperbola, Ellipse. - 6hrs
3. PROJECTION OF POINTS, LINES, SURFACES; Orthographic projection- 1st and 3rd angle projection, Projection of lines and surfaces– Hexagon. - 3hrs
4. PROJECTION OF SOLIDS; Cube, Pyramid, Prism, Cylinder, Cone. - 6hrs
5. DRAWING ISOMETRIC VIEW FROM ORTHOGONAL/ SECTIONAL VIEWS OF SIMPLE SOLID OBJECTS. - 3hrs
6. FULL AND HALF SECTIONAL VIEWS OF SOLIDS. - 3hrs
7. DEVELOPMENT OF SURFACES; Prism, Cylinder, Cone. - 3hrs
8. COMPUTER AIDED DRAFTING (Using AutoCAD and/or similar softwares); Introduction: Cartesian and Polar coordinate system, Absolute and Relative coordinates; Basic editing commands: Line, Point, Trace, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline; Editing methods; Basic object selection methods, Window and crossing window, Erase, Move, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror; Display commands: Zoom, Pan, Redraw, Regenerate; Simple dimensioning and text, Simple exercises. - 6hrs

References / Books:

- Narayana, K.L. and Kannaiah, P. “Engineering Graphics”, Tata McGraw Hill, New Delhi, 1988
- Bhatt, N.D. “Elementary Engineering Drawing”, Charotar Book Stall, Anand, 1998
- Lakshminarayanan, V. and Vaish Wanar, R.S., “Engineering Graphics”, Jain Brothers, New Delhi, 1998
- Chandra, A.M. and Chandra Satish, “Engineering Graphics”, Narosa, 1998
- Jolhe, “Engineering Graphics”, Tata McGraw-Hill- WBUT Series
- Gill, P.S., “A Text Book of Engineering Drawing”, Katson Publishing House (Kataria and Sons)
- Venugopal, K., “Engineering Drawing & Graphics + AutoCAD”, New Age International
- Ventaka Reddy K., “Text Book of Engineering Drawing (2nd Edition)”, BS Publication.

Or

Workshop Practice(Gr-B/GrA)

Code: ME192

Contacts:

Contact Hours Per week: 1L+3P= 4

Credits: 3

A. THEORETICAL PART

1. INTRODUCTION TO MANUFACTURING; Socio-economic role, Definition, Major grouping and Examples. - 1L



2. ENGINEERING MATERIALS; Classification / Major grouping, Physical, Chemical and Mechanical properties, Applications - 1L

3. DIFFERENT CONVENTIONAL MANUFACTURING PROCESSES MAINLY COVERING BASIC PRINCIPLES, DIFFERENT METHODS AND GENERAL APPLICATIONS; Manufacturing by forming /shaping from solid (input) to solid (product); Forging, Rolling, Drawing, Extrusion; Press tool work- Bending, Shearing, Drawing and Coining. - 3L

4. FORMING / SHAPING FROM LIQUID TO SOLID- CASTING; General principles, General classification or Types of casting; Sand mould casting- procedural steps and requirements; Pattern, Mould, Melting, Pouring, Solidification, Extracting and Fettling. Other casting processes (for larger volume and quality); Centrifugal casting, Investment casting, Die casting. -3L

5. JOINING PROCESSES; Welding (Permanent Joining)- General classification and basis; Gas welding, Arc welding, Friction welding and Resistance welding, w.r.t. Principle, Requirements, Relative Advantages and Applications; Brazing and soldering.

- 2L

6. REMOVAL (MACHINING) PROCESS; Principle and purpose of machining, Machining requirements, Machine tools- Definition, General classification w.r.t, functional principles and applications; Major machining parameters (and responses)- Speed, Feed and Depth of cut; Tool geometry (Rake, Clearance and Cutting angles), Cutting fluid application; Elementary machining operations- Facing, Centering, Turning, Threading, Drilling, Boring, Shaping and Milling.

-2L



B. SCHEDULE OF PRACTICAL CLASSES

Suggested apportionment / weigtage:

- Machining (and fitting)- 50% (6 days) 18 hrs
- Casting (including pattern making molding and preparation) - 25% (3 days 9hrs)
- Welding (gas, arc and resistance) (2 days 6hrs) and Sheet Metal Working (1 day 3hr)- 25% (3 days 9hrs)

FEASIBLE TYPES / MODELS OF ASSIGNMENTS

i) FITTING (in 2 days or 6 hours); Making a gauge from MS plate as shown in Fig.1.

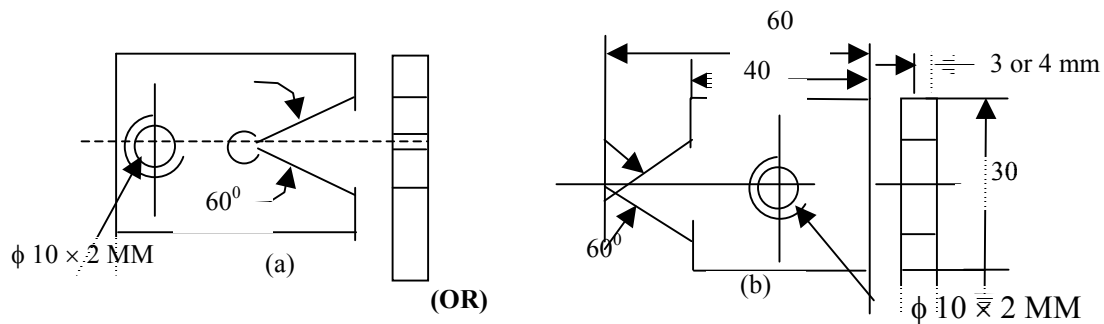


Fig.1: Job for fitting practice

Operations required:

11. Squaring and finishing of the blank by filing
12. Making the Vee-portion by sawing and filing
13. Drilling (in machine) and tapping (hand)

ii) MACHINING (in 3 days or 9 hours); To make a pin as shown in Fig.2 from a $\square 20$ mm mild steel rod in a lathe.

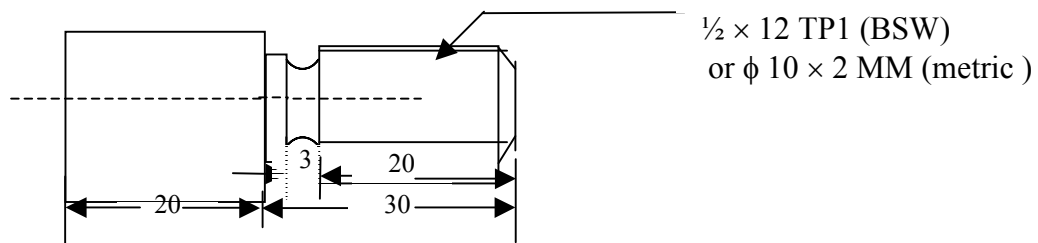


Fig.2: Job for practice on a lathe



iii) MACHINING (in 1 day or 3 hours); To make a MS prism as shown in Fig.3 from a ϕ 20mm mild steel rod in a shaping and / or milling machine.

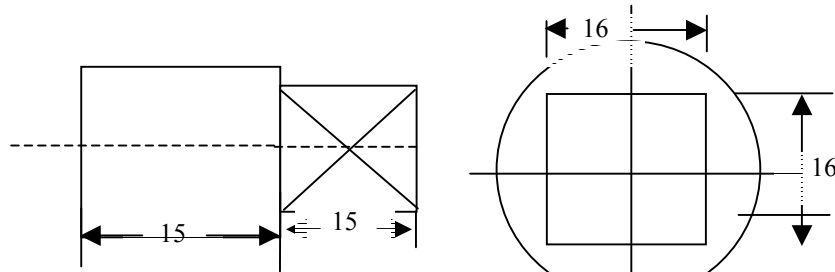


Fig.3: Job for practice on a shaping and/or milling machine

iv) PATTERN MAKING, SAND MOULDING AND CASTING (in 3 classes or 9 hours); To make a wooden pattern and a sand mould with that pattern for casting a cast iron block as shown in Fig.4.

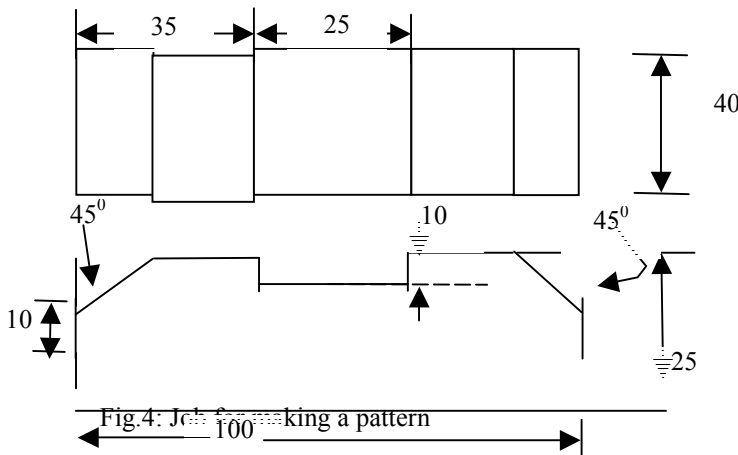


Fig.4: Job for making a pattern

v) WELDING (GAS WELDING) (in 1 class or 3 hours); To join two thin mild steel plates or sheets (1 to 3 mm thick) as shown in Fig. 5 by gas welding.

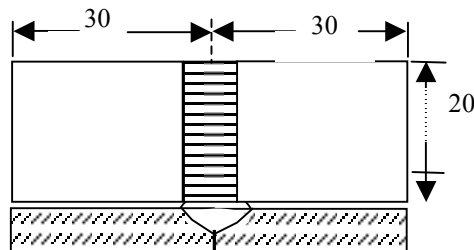


Fig.5: Welding specimen for practice

- vi) WELDING (ARC WELDING) (in 1 day or 3 hours); To join two thick (6mm) MS plate as shown in Fig. 5 by arc welding.
- vii) SHEET METAL WORK (in 1 day or 3 hours); Forming a cone, for example.



Second Semester

Theory

Basic Science

Basic Computation & Principles of Computer Programming

Code: CS 201

Contacts: 3L + 1T = 4

Credits: 4

Fundamentals of Computer:

History of Computer, Generation of Computer, Classification of Computers 2L

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices 3L

Binary & Allied number systems representation of signed and unsigned numbers. BCD, ASII. Binary Arithmetic & logic gates 6L

Assembly language, high level language, compiler and assembler (basic concepts) 2L

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Algorithm & flow chart 2L

C Fundamentals:

The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements 3L

Operators & Expressions:

Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Input and Output: Standard input and output, formatted output -- printf, formatted input scanf. 5L

Flow of Control:

Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels 2L

Fundamentals and Program Structures:

Basic of functions, function types, functions returning values, functions not returning values, auto, external, static and register variables, scope rules, recursion, function prototypes, C preprocessor, command line arguments. 6L

Arrays and Pointers:

One dimensional arrays, pointers and functions, multidimensional arrays. 6L

Structures Union and Files:

Basic of structures, structures and functions, arrays of structures, bit fields, formatted and unformatted files. 5L

Recommended reference Books:

Introduction To Computing (TMH WBUT Series), E. Balagurusamy, TMH

Kerninghan, B.W.

The Elements of Programming Style

Yourdon, E.

Techniques of Program Structures and Design

Schied F.S.

Theory and Problems of Computers and Programming

Gottfried

Programming with C Schaum

Kerninghan B.W. & Ritchie D.M.

The C Programming Language

Rajaraman V.

Fundamental of Computers

Balaguruswamy

Programming in C

Kanetkar Y.

Let us C

M.M.Oka

Computer Fundamentals, EPH



Leon	Introduction to Computers, Vikas
Leon-Ram B.	Fundamental of Information Technology, Vikas
Ravichandran D.	Computer Fundamentals, New Age International
Xavier C.	Programming in C, New Age International
Xavier C.	C Language & Numerical Methods, New Age Inter.
Rao S.B.	Introduction to Computers, New Age International
	Numerical Methods with Programs in Basic Fortran Pascal & C++, Universities Press
Dutta N.	Computer Programming & Numerical Analysis, Universities Press
Bhanu Pratap	Computer Fundamentals
Rajaram	Computer Concepts & C Program, Scitech

Chemistry-1(Gr-B/Gr-A)
Code: CH201
Contacts: 3L + 1T = 4
Credits: 4

Or

Physics-1(Gr-A/Gr-B)
Code: PH201
Contacts: 3L + 1T = 4
Credits: 4

Mathematics
Code: M201
Contacts: 3L + 1T = 4
Credits: 4

Note 1: The whole syllabus has been divided into five modules.

Note 2: Structure of the question paper

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the three modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have three parts covering not more than two topics (marked in bold italics faces). Sufficient questions should to be set covering all modules.

Module I

Ordinary differential equations (ODE)- First order and first degree: Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation). **5L**

Module II

ODE- Higher order and first degree: General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations, Solution of simultaneous linear differential equations. **6L**



Module III

Basics of Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph,; Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph. **10L**

Module IV

Tree: Definition and properties, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using DFS, BFS, Kruskal's and Prim's algorithms. **6L**

Module V

Improper Integral: Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. **3L**

Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of $\frac{f(t)}{t}$, LT of $t^n f(t)$, LT of derivatives of $f(t)$, L.T. of $\int f(u)du$. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT. **10L**

Total 40 Lectures

Suggested Reference Books:

1. **Advanced Engineering Mathematics**, Erwin Kreyszig, (Wiley Eastern)
2. **Graph Theory:** V. K. Balakrishnan, (Schaum's Outline, TMH)
3. **A first course at Graph Theory:** J. Clark and D. A. Holton (Allied Publishers LTD)
4. **Introduction to Graph Theory:** D. B. West (Prentice-Hall of India)
5. **Graph Theory:** N. Deo (Prentice-Hall of India)
6. **Engineering Mathematics:** B.S. Grewal (S. Chand & Co.)
7. **Higher Engineering Mathematics:** John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
8. **Calculus:** Strauss, Bradley and Smith (3rd edition, Pearson Education)
9. **Engineering Mathematics (Volume 2):** S. S. Sastry (Prentice-Hall of India)
10. **Advanced Engineering Mathematics, 3E:** M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition
11. **An Introduction to Differential Equations**, R.K. Ghosh and K.C. Maity (New Central Book Agency)



Engineering Science

Basic Electrical and Electronics Engineering-II

Code: ES201

Contacts: 3L + 1T = 4

Credits: 4

Basic Electrical Engineering-II

Electrostatics: Coulomb's law, Electric Field Intensity, Electric field due to a group of charges, continuous charge distribution, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, proof of Gauss's law, its applications to electric field and potential calculation, Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors. Energy stored in a capacitor. 5L

DC Machines: Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control) 6L

Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation. 4L

3 phase induction motor: Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control, resistance control) 5L

Three phase system: Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method. 3L

General structure of electrical power system: Power generation to distribution through overhead lines and under ground cables with single line diagram. 1L

Text books:

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
3. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

Reference books:

1. Basic Electrical Engineering(TMh WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.



Basic Electronics Engineering-II

Basic Electronics Engineering - II: 20L

Pre-requisites: Knowledge of Basic Electronics Engineering – I.

Module – 1: Field Effect Transistors: 5L
Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

Module – 2: Feed Back Amplifier, Oscillators and Operational Amplifiers: 5L+5L = 10L
Concept (Block diagram), properties, positive and negative feed back, loop gain, open loop gain, feed back factors; topologies of feed back amplifier; effect of feed back on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feed back: instability and oscillation, condition of oscillation, Barkhausen criteria.
Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

Module – 3: Digital Electronics: 5L
Introduction to binary number; Basic Boolean algebra; Logic gates and function realization with OPAMPs.

Outcomes:

Students will be able to distinguish the different Gate isolation techniques; draw and explain the I-V characteristics of FETs; Appreciate the utility of CMOS.

Student will analyse the different OPAMP circuits and apply the knowledge of network theory to OPAMP circuits.

Student must acquire the proficiency to express binary numbers, convert binary to decimal and vice versa, draw truth tables for different logic operations, design Gates and simple digital circuits using the Gates.

Recommended Books:

Text:

- Sedra & Smith: Microelectronics Engineering.
- Millman & Halkias: Integrated Electronics.

References:

- Malvino: Electronic Principle.
- Schilling & Belove: Electronics Circuits.
- Millman & Grabal: Microelectronics.
- Salivahanan: Electronics Devices & Circuits.
- Boyelstad & Nashelsky: Electronic Devices & Circuit Theory.

Engineering Thermodynamics & Fluid Mechanics

Code: ME201

Contacts: 3L + 1T = 4

Credits: 4

Module 1 :

Basic Concepts of Thermodynamics

Introduction: Microscopic and Macroscopic viewpoints

Definition of Thermodynamic systems: closed, open and isolated systems

Concept of Thermodynamics state; state postulate.

8L+3T



Definition of properties: intensive, extensive & specific properties.
Thermodynamic equilibrium
Thermodynamic processes; quasi-static, reversible & irreversible processes; Thermodynamic cycles.
Zeroth law of thermodynamics. Concept of empirical temperature.

Heat and Work

Definition & units of thermodynamic work.
Examples of different forms of thermodynamic works; example of electricity flow as work.
Work done during expansion of a compressible simple system
Definition of Heat; unit of Heat
Similarities & Dissimilarities between Heat & Work

Ideal Equation of State, processes; Real Gas

Definition of Ideal Gas; Ideal Gas Equations of State.
Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes.
Equations of State of Real Gases: Van der Waal's equation; Virial equation of state.

Properties of Pure Substances

p-v & P-T diagrams of pure substance like H₂O
Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status.
Definition of dryness fraction of steam, degree of superheat of steam.

Module 2 :

4L+3T

1st Law of Thermodynamics

Definition of Stored Energy & Internal Energy
1st Law of Thermodynamics for cyclic processes
Non Flow Energy Equation
Flow Energy & Definition of Enthalpy
Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation

Module 3 :

6L+3T

2nd Law of Thermodynamics

Definition of Sink, Source Reservoir of Heat.
Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators
Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics
Absolute or Thermodynamic scale of temperature
Clausius Integral
Entropy
Entropy change calculation for ideal gas processes.
Carnot Cycle & Carnot efficiency
PMM-2; definition & its impossibility

Module 4:

6L+3T

Air standard Cycles for IC engines

Otto cycle; plot on P-V, T-S planes; Thermal efficiency
Diesel cycle; plot on P-V, T-S planes; Thermal efficiency

Rankine cycle of steam

h-s chart of steam (Mollier's Chart)
Simple Rankine cycle plot on P-V, T-S, h-s planes
Rankine cycle efficiency with & without pump work
(Problems are to solved for each module)

Module 5:

9L+3T

Properties & Classification of Fluids

Ideal & Real fluids
Newton's law of viscosity; Newtonian and Non-Newtonian fluids



Compressible and Incompressible fluids

Fluid Statics

Pressure at a point

Measurement of Fluid Pressure

Manometers : simple & differential

U-tube

Inclined tube

Fluid Kinematics

Stream line

laminar & turbulent flow

external & internal flow

Continuity equation

Dynamics of ideal fluids

Bernoulli's equation

Total head; Velocity head; Pressure head

Application of Bernoulli's equation

Measurement of Flow rate : Basic principles

Venturimeter

Pilot tube

Orifice meter

33L+15T
=48P

(Problems are to be solved for each module)

Engineering Thermodynamics

Text :

1 Engineering Thermodynamics - P K Nag, 4th edn, TMH.

References :

- 1 "Fundamentals of Thermodynamics" 6e by Sonntag & Van Wylin published by Wiley India.
- 2 Engineering Thermodynamics – Russel & Adeliyi (Indian edition), OUP
- 3 Engineering Thermodynamics – Onkar Singhh, New Age International Publishers Ltd.
- 4 Basic Engineering Thermodynamics – R Joel, 5th Ed., Pearson

Fluid Mechanics

Text :

- 1 Fluid Mechanics and Hydraulic Machines - R K Bansal

References :

- 1 Introduction to Fluid Mechanics and Fluid Machines - S.K.Som and G.Biswas. 2nd edn, TMH
- 2 Fluid Mechanics by A.K.Jain.



Practical

Basic Science

Basic Computation & Principles of Computer Programming Lab

Code: CS 291

Contacts: Credits: 2

Exercises should include but not limited to:

1. DOS System commands and Editors (Preliminaries)
2. UNIX system commands and vi (Preliminaries)
3. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number , generate Pascal's triangle, find roots of a quadratic equation
4. Programs to demonstrate control structure : text processing, use of break and continue, etc.
5. Programs involving functions and recursion
6. Programs involving the use of arrays with subscripts and pointers
7. Programs using structures and files.

Chemistry-1(Gr-B/Gr-A)

Code: CH291

Contacts:

Credits: 2

Or

Physics-1(Gr-A/Gr-B)

Code: PH291

Contacts:

Credits: 2

Engineering Science

Basic Electrical and Electronics Engineering-II

Code: ES291

Contacts:

Credits: 2

Basic Electrical Engineering Laboratory-II

List of Experiments:

Sl. No Name of the Experiments

1. Calibration of ammeter and voltmeter.
2. Open circuit and Short circuit test of a single phase Transformer.
3. No load characteristics of D.C shunt Generators
4. Starting and reversing of speed of a D.C. shunt
5. Speed control of DC shunt motor.
6. Measurement of power in a three phase circuit by two wattmeter method.

Basic Electronics Engineering Laboratory-II

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled will be given.

3 hours per week must be kept, initially for practical lectures, and later for tutorials.



List of Experiments:

1. Study of I-V characteristics of Field Effect Transistors.
2. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
3. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
4. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
5. Study of Logic Gates and realization of Boolean functions using Logic Gates.
6. Study of Characteristic curves for CB, CE and CC mode transistors.

Engineering Drawing & Computer Graphics(Gr-B/Gr-A)

Code: ME291

Contacts:

Credits: 3

Or

Workshop Practice(Gr-A/Gr-B)

Code: ME292

Contacts:

Credits: 3

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Second Year – Third Semester

A. THEORY							
Sl.No.	Paper Code	Subjects	Contact Hours / Week				Cr.Points
			L	T	P	Total	
1.	HU-301	Values & Ethics in Profession	3	0	0	3	3
2.	PH-301	Physics-2	3	1	0	4	4
3.	CH301	Basic Environmental Engineering & Elementary Biology	3	0	0	3	3
4.	ME 301	Applied Thermodynamics	4	0	0	4	4
5.	ME 302	Strength of Materials	3	0	0	3	3
6.	ME 303	Engineering Materials	3	0	0	3	3
Total Theory			19	1	0	20	20
B. PRACTICAL							
Sl.No.	Field	Subjects	Contact Hours / Week				Cr.Points
			L	T	P	Total	
7.	HU-381	Technical Report Writing & Language Lab Practice	0	0	3	3	2
	PH391	Physics Lab-2	0	0	3	3	2
8.	ME 391	Machine Drawing –I	0	0	3	3	2
9.	ME 392	Workshop Practice-II	0	0	3	3	2
10.	ME 393	Applied Mechanics Lab	0	0	3	3	2
Total Practical			0	0	15	15	10
Total Semester			19	1	15	35	30

Second Year – Fourth Semester

A. THEORY							
Sl.No.	Field	Subjects	Contact Hours / Week				Cr.Points
			L	T	P	Total	
1.	M(CS)401	Numerical Methods	2	1	0	3	2
2.	M-402	Mathematics-3	3	1	0	4	4
3.	ME 401	Fluid Mechanics & Hydraulic Machines	4	0	0	4	4
4.	ME 402	Mechanisms	3	0	0	3	3
5.	ME 403	Primary Manufacturing Processes	4	0	0	4	4
Total Theory			16	2	0	18	17
B. PRACTICAL							
Sl.No.	Field	Subjects	Contact Hours / Week				Cr.Points
			L	T	P	Total	
6.	M(CS)491	Numerical Methods Lab	0	0	2	2	1
7.	ME491	Fluid Mechanics & Hydraulics Lab	0	0	3	3	2
8.	ME 492	Manufacturing Technology Lab	0	0	3	3	2
9.	ME493	Material Testing Lab	0	0	3	3	2
10.	ME 494	Machine Drawing-II	0	0	3	3	2
Total Practical			0	0	14	14	9
Total Semester			16	2	12	32	26

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AUE 803 (C) Finite Element Methods (To be taken from ME605B)

SEMESTER - III

Theory

VALUES & ETHICS IN PROFESSION

HU-301

Contracts:3L

Credits- 3

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development

Energy Crisis: Renewable Energy Resources

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics

Appropriate Technology Movement of Schumacher; later developments

Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.

Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life

Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity

Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

Ph 301 : :Physics2

Contacts : 3L + 1T

Credits : 4

Module 1:

Vector Calculus:

1.1 Physical significances of grad, div, curl. Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism and statements of Stokes theorem and Gauss theorem [No Proof]. Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates. 2L

Module 2 :

Electricity

2.1 Coulombs law in vector form. Electrostatic field and its curl. Gauss's law in integral form and conversion to differential form . Electrostatic potential and field, Poisson's Eqn. Laplace's eqn (Application to Cartesian, Spherically and Cylindrically

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symmetric systems – effective 1D problems) Electric current, drift velocity, current density, continuity equation, steady current. 5L

2.2 Dielectrics-concept of polarization, the relation $D=\epsilon_0E+P$, Polarizability. Electronic polarization and polarization in monoatomic and polyatomic gases. 3L

Module 3:

Magnetostatics & Time Varying Field:

3. Lorentz force, force on a small current element placed in a magnetic field. Biot-Savart law and its applications, divergence of magnetic field, vector potential, Ampere's law in integral form and conversion to differential form. Faraday's law of electro-magnetic induction in integral form and conversion to differential form. 3L

Module 4:

Electromagnetic Theory:

4.1 Concept of displacement current Maxwell's field equations, Maxwell's wave equation and its solution for free space. E.M. wave in a charge free conducting media, Skin depth, physical significance of Skin Depth, E.M. energy flow, & Poynting Vector.

6L

Module 5:

Quantum Mechanics:

5.1 Generalised coordinates, Lagrange's Equation of motion and Lagrangian, generalised force potential, momenta and energy. Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion.

4L

Course should be discussed along with physical problems of 1-D motion

5.2 Concept of probability and probability density, operators, commutator. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function ψ (normalization and probability interpretation), Expectation values, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels. 9L

Module 6:

Statistical Mechanics:

3.1 Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Calculation of Fermi level in metals, also total energy at absolute zero of temperature and total number of particles, Bose-Einstein statistics – Planck's law of blackbody radiation..

7L

Basic Environmental Engineering and Elementary Biology

CH-301

L-T-P = 3-0-0

At least 30 Hrs/Sem

General

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.

1L

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Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. 2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. 1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. 2L

Ecology

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. 1L

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web. 2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 2L

Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. 1L

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems. 1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget. 1L

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). 2L

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. 2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant.

Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. 2L

Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. 1L

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). 1L

Water Pollution and Control

Hydrosphere, Hydrological cycle and Natural water.

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Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. 2L

River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH.
2L

Lake: Eutrophication [Definition, source and effect]. 1L

Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) 1L

Standard and control: Waste water standard [BOD, COD, Oil, Grease],

Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.

2L

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

1L

Land Pollution

Lithosphere; Internal structure of earth, rock and soil 1L

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling.

Solid waste management and control (hazardous and biomedical waste). 2L

Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]
1L

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18 hr Index), Ld_n .

Noise pollution control. 1L

Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. 2L

References/Books

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.

De, A. K., "Environmental Chemistry", New Age International.

ME301 : Applied Thermodynamics

Contacts : 4L

Credits : 3

Module No.	Syllabus	Contact Hrs
1	<ol style="list-style-type: none"> 1. Review of fundamentals; Heat and work, First law for unsteady flow system. 2. Pure Substance, Properties of pure substance; Phases of pure substances- Phase rule; Phase Change Processes of Pure Substances – triple pt., critical pt.; Property diagrams of Phase change Processes; P-V-T surface for phase change; Property tables of real substances - compressed liquid, saturated, wet & superheated vapour. 	03
		04

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2	<p>3. The 2nd Law of Thermodynamics; the corollaries & their proofs; the property of entropy; entropy change of a pure substance; Tds equations and calculation of entropy change; concept and uses of entropy; the entropy generation principle. The second law of thermodynamics for an open system.</p> <p>4. Exergy analysis, Reversible work and irreversibility, Exergy change of a system, 2nd Law efficiency.</p>	07 04
3	5. Maxwell relations; Clapeyron Equation, Joule Thompson co-efficient	04
4	<p>6. I.C.Engine, Air Standard cycles; Otto, Diesel, Dual Combustion.</p> <p>7. Reciprocating air compressors; the compressor cycle with and without clearance, efficiencies; volumetric efficiency & its effect on performance; multistaging.</p>	03 03
5	8. Vapour power cycles & its modifications, Reheat & Regenerative cycle for steam, Binary cycle and cogeneration.	04
6	<p>9. Refrigeration cycles, reversed carnot cycle; components and analysis of simple vapour compression Refrigeration cycle, Actual Refrigeration cycles, Vapour Absorption Refrigeration cycle.</p> <p>10. Use of psychometric charts & processes for air conditioning</p>	05 03

Total=40L

Books recommended:

1. Engineering Thermodynamics - P.K Chattopadhyay, OUP
2. Fundamentals of Thermodynamics - 6e by Sonntag, Borgnakke & Van Wylen, John Wiley.
3. Engineering Thermodynamics-4e by P.K .Nag, TMH
4. Thermodynamics- an Engineering approach - 6e, Cengel & Boles, TMH
5. Engineering Thermodynamics- M. Achyuthan, PHI
6. Basic Engineering Thermodynamics- R. Joel, 5th ed, Pearson
7. Engineering Thermodynamics (Indian edition) – Russel & Adeliyi, OUP
8. Thermodynamics (Schaum's) – 2nd ed, Potter & Somerton, TMH

ME : Strength of Materials

Contact Week / Semester= 12 minimum

Contact per week: 3L

Credit: 3

Module	Syllabus	Contact Hrs.
1A.	Concept of mechanics of deformable solids; concept of stress developed against external force/pressure; brief review of normal and shearing stress and strain;	1L
B.	Deformation of axially loaded members, statically determinate and indeterminate problems.	4L
C.	Strain energy in tension and compression	1L
2.	Analysis of Biaxial stresses-Mohr's circle for biaxial stress; concept of normal stress, principal stress and pure shear. Shear strain and shear strain energy. Stresses in thin walled pressure vessels- tangential and Hoop stress. Relation between shear modulus and Young's modulus.	6L
3.	Stresses in beams; shear force (SF), axial force and bending moment (BM); differential relations for BM, SF and load; SF and BM diagrams; bending stresses in straight beams – symmetric loading; stresses in beams of various cross sections; stresses in built-up beams and beams of different materials.	7L
4.	Torsion of a circular shaft, shear energy in torsion. Concept of closed and open coiled helical springs, Stresses and deflection of helical springs under axial pull.	4L
5.	Deflection of statically determinate and indeterminate beams due to bending moment, differential equation of elastic line, Area-moment method, Strain energy method- Castigliano's theorem, superposition method.	7L
6.	Theory of columns; eccentric loading of short strut; column buckling: Euler load for columns with pinned ends and other end restraints; Euler's curve; empirical column formulae – (i) straight line, (ii) parabolic and (iii) Rankine Gordon.	6L

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Note for Teachers:

1. Stress should be given to clarify different concepts of the subject.
2. Deduction of all relevant equations should be worked out and explained.
3. Sufficient number of problems from each topic should be worked out during class and as home assignment.

Books Recommended

1. *Elements of Strength of Materials* by Timoshenko & Young, 5th Ed.- East west press.
2. *Introduction to Solid Mechanics* by Shames & Pitarresi, 3rd Ed., Prentice Hall India.
3. *Mechanics of Materials* by Beer & Johnston, TMH
4. *Engineering Mechanics of Solids* by E.P. Popov; 2nd Ed., Prentice Hall India
5. *Fundamentals of Strength of Materials* by Nag & Chanda, Wiley India
6. *Strength of Materials* by R.Subramanian, 2nd Ed., Oxford Univ. Press
7. *Strength of Materials* by Ryder, Mcmillan press

ME303 : Engineering materials

Contacts : 3L

Contact week/ semester = 12 minimum

Credits : 3

Sl.No.	Syllabus	Contact Hrs.
1.	Introduction: Material Science—its importance in engineering; Classification of Materials—metals, polymers, ceramics, composites; Advanced materials—semiconductors, smart materials, nano-materials; Review atomic structure, Atomic bonding in solids—bonding forces and energies; ionic/covalent/metallic bonding.	2
2.	Crystal Structure: Fundamental concepts; Unit cells; seven crystal systems; single crystal, polycrystalline and non-crystalline materials; Metallic crystal structures—FCC, atomic packing factor, BCC & HCP structures.	2
3.	Imperfections in Metals: Point defects due to vacancy & impurities, alloys, solid solutions; Dislocations—linear defects, interfacial defects, grain boundaries.	2
4.	Phase Diagrams: Definition and basic concepts; solubility limit; Phase equilibria, one-component phase diagram, binary phase diagram, interpretation of phase diagrams.	3
5.	Iron-carbon System: allotropy of iron, iron-iron carbide phase diagram, properties and uses of plain carbon steel	2
6.	Classification of Metals and Alloys- compositions, general properties and uses: 6.1 Ferrous alloys: Classification –low carbon steels, medium carbon steels, high carbon steels, stainless steels, alloy steels, tool and die steel, cast irons. 6.2 Non-ferrous alloys: Copper & Copper alloys; Aluminum alloys; Zinc alloys; Nickel alloys; Lead & Tin alloys;	6
7.	Mechanical Properties of Materials: Elastic properties of materials—tensile and compressive stress and strain, stress-strain behaviour, modulus of elasticity (Young's modulus), yield strength, tensile strength, plastic deformation, true stress and strain; Ductility; Resilience; Toughness, impact tests; Hardness- Brinell, Rockwell and Vickers hardness and their testing procedures, correlation between hardness and tensile strength; Fatigue strength; Effect of temperature on tensile strength & impact properties, creep failure.	6
8.	Heat Treatment: Definition and purposes; Heat treatment processes for steels—Hardening, structural change during heating and cooling, factors affecting hardening; Tempering; Austempering; Normalizing; Annealing—full annealing, spheroidising annealing, stress-relieving, recrystallisation annealing; Precipitation or Age Hardening of non-ferrous alloys.	4
9.	Polymers & Elastomers: Definition; How polymers are made- polymerization; Polymer molecular structures; Thermoplastics & Thermosets; Special characteristics like low sp. gravity, optical, electrical & thermal property, decorative color, easy formability, low corrosion etc; Uses of polymers and elastomers.	2
10.	Ceramic Materials: What is ceramics; common ceramic materials and their characteristics; How ceramics are made—sintering and vitrification process; Ceramic structures; Properties and applications.	2

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Sl.N o.	Syllabus	Contact Hrs.
11.	Composite materials: What is composites; Polymers matrix and their applications; Metal matrix and ceramic matrix composites and their applications; How composites are made.	2
12.	Corrosion and Degradation of Engineering Materials: Definition; Types of corrosion—uniform, pitting, crevice, galvanic, stress corrosion cracking and erosion; Corrosion control — material selection, environment control, proper design.	2
13.	Materials Selection Methodology: Selection of material based on required properties, availability and cost of material, environmental issues.	1

Note for Teachers:

1. Stress should be given to clarify different concepts.
2. Industrial examples must be cited regarding use of various materials and the specific properties involved for selection of these materials.

Books Recommended

1. Materials Science and Engineering by W.D. Callister and adapted by R. Balasubramaniam, Willey India, 2010 Ed.
2. Engineering Materials: properties and selection by Budinski & Budinski, 9th Ed., Prentice Hall India
3. Engineering Materials and Metallurgy by R.Srinivasan, 2nd Ed., Tata McGraw Hill.
4. Materials & Processes in Manufacturing by E.P.Degarmo and adapted by Black & Koshner, 10th Ed., Wiley India.
5. Materials Science and Engineering by V.Raghavan, 5th Ed., Prentice Hall India.

Practical

Technical Report Writing & Language Lab Practice

Code: HU-381

Cr-2

Guidelines for Course Execution:

Objectives of this Course: This course has been designed:

1. To inculcate a sense of confidence in the students.
2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.

Detailed Course Outlines:

A. **Technical Report Writing** : 2L+6P

1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)

B. **Language Laboratory Practice**

1. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory

Practice Sessions 2L

2. Conversation Practice Sessions: (To be done as real life interactions)

2L+4P

a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed

b) Introducing Role Play & honing over all Communicative Competence

3. Group Discussion Sessions: 2L+6P

a) Teaching Strategies of Group Discussion

b) Introducing Different Models & Topics of Group Discussion

c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure
Interview Sessions; 2L+6P

a) Training students to face Job Interviews confidently and successfully

b) Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication

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4. **Presentation:** 2L+6P
- Teaching Presentation as a skill
 - Strategies and Standard Practices of Individual /Group Presentation
 - Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids
5. **Competitive Examination:** 2L+2P
- Making the students aware of Provincial /National/International Competitive Examinations
 - Strategies/Tactics for success in Competitive Examinations
 - SWOT Analysis and its Application in fixing Target

Books – Recommended:

Nira Konar: *English Language Laboratory: A Comprehensive Manual*

PHI Learning, 2011

D. Sudharani: *Advanced Manual for Communication Laboratories & Technical Report Writing*
Pearson Education (W.B. edition), 2011

References:

- Adrian Duff et. al. (ed.): *Cambridge Skills for Fluency*
- Speaking (Levels 1-4 Audio Cassettes/Handbooks)
 - Listening (Levels 1-4 Audio Cassettes/Handbooks)
- Cambridge University Press 1998
- Mark Hancock: *English Pronunciation in Use*
4 Audio Cassettes/CD'S OUP 2004

Physics Lab-2

Code: PH-391

Contacts: (3P)

Credit: (2)

Group 1: Experiments on Electricity and Magnetism

- Determination of dielectric constant of a given dielectric material.
- Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
- Determination of the thermo-electric power at a certain temperature of the given thermocouple.
- Determination of specific charge (e/m) of electron by J.J. Thomson's method.

Group 2: Quantum Physics

- Determination of Planck's constant using photocell.
- Determination of Lande's g factor using Electron spin resonance spectrometer.
- Determination of Stefan's radiation constant
- Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
- Determination of Rydberg constant by studying Hydrogen/ Helium spectrum

Group 3: Modern Physics

- Determination of Hall co-efficient of semiconductors.
- Determination of band gap of semiconductors.
- To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

- A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.
- In addition a student should perform one more experiments where he/she will have to transduce the output of any of the above experiments or the experiment mentioned in c) into electrical voltage and collect the data in a computer using phoenix or similar interface.

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c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:

- i. Failure to perform each experiment mentioned in b) and c) should be compensated by *two* experiments mentioned in the above list.
- ii. At the end of the semester report should be sent to the board of studies regarding experiments, actually performed by the college, mentioned in b) and c)
- iii. Experiment in b) and c) can be coupled and parts of a single experiment.

Recommended Text Books and Reference Books:

For Both Physics I and II

1. B. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
4. Arthur Baiser (Perspective & Concept of Modern Physics)

Physics I (PH101/201)

Vibration and Waves

1. Kingsler and Frey
2. D.P. Roychaudhuri
3. N.K. Bajaj (Waves and Oscillations)
4. K. Bhattacharya
5. R.P. Singh (Physics of Oscillations and Waves)
6. A.B. Gupta (College Physics Vol.II)
7. Chattopadhyaya and Rakshit (Vibration, Waves and Acoustics)

Optics

1. Möler (Physical Optics)
2. A.K. Ghatak
3. E. Hecht (Optics)
4. E. Hecht (Schaum Series)
5. F.A. Jenkins and H.E. White
6. Chita Ranjan Dasgupta (Degree Physics Vol 3)

Quantum Physics

1. Eisberg and Resnick
2. A.K. Ghatak and S. Lokenathan
3. S.N. Ghoshal (Introductory Quantum Mechanics)
4. E.E. Anderson (Modern Physics)
5. Haliday, Resnick and Crane (Physics vol.III)
6. Binayak Dutta Roy [Elements of Quantum Mechanics]

Crystallography

1. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)
2. A.J. Dekker
3. Ashcroft and Mermin
4. Ali Omar
5. R.L. Singhal
6. Jak Tareen and Trn Kutty (Basic course in Crystallography)

Laser and Holography

1. A.K. Ghatak and Thyagarajan (Laser)
2. Tarasov (Laser)
3. P.K. Chakraborty (Optics)
4. B. Ghosh and K.G. Majumder (Optics)
5. B.B. Laud (Laser and Non-linear Optics)
6. Bhattacharyya [Engineering Physics] Oxford

Physics II(PH 301)

Classical Mechanics (For Module 5.1 in PH 301)

H. Goldstein

A.K. Roychaudhuri

R.G. Takwal and P.S. Puranik

Rana and Joag

M. Spiegel (Schaum Series)

J.C. Upadhyaya (Mechanics)

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Electricity and Magnetism

1. Reitz, Milford and Christy
2. David J. Griffith
3. D. Chattopadhyay and P.C. Rakshit
4. Shadowitz (The Electromagnetic Field)

Quantum Mechanics

7. Eisberg and Resnick
8. A.K. Ghatak and S. Lokenathan
9. S.N. Ghoshal (Introductory Quantum Mechanics)
10. E.E. Anderson (Modern Physics)
11. Haliday, Resnick and Crane (Physics vol.III)
12. Binayak Dutta Roy [Elements of Quantum Mechanics]

Statistical Mechanics

1. Sears and Sallinger (Kinetic Theory, Thermodynamics and Statistical Thermodynamics)
2. Mondal (Statistical Physics)
3. S.N. Ghoshal (Atomic and Nuclear Physics)
4. Singh and Singh
5. B.B. Laud (Statistical Mechanics)
6. F. Reif (Statistical Mechanics)

Dielectrics

7. Bhattacharyya [Engineering Physics] Oxford

ME 391 : Machine Drawing-I

Credit : 2

Schematic product symbols for standard components in mechanical, electrical and electronic systems, welding symbols and pipe joints;

Orthographic projections of machine elements, different sectional views- full, auxiliary sections;

Isometric projection of components;

Assembly and detailed drawings of a mechanical assembly, such as a plumber block, tool head of a shaping machine, tailstock of a lathe, welded pipe joints indicating work parts before welding, etc.

(At least six sheets must be drawn)

Books:

1. Text Book on Engineering Drawing, Narayana/ Kannaia H, Scitech
2. Mechanical Engineering Drawing and Design, S. Pal and M. Bhattacharyya
3. Machine Drawing by N.D. Bhatt
4. Machine Drawing by P.S. Gill

Workshop Practice-II

Code: ME-392

Cr-2

Pattern Making; pattern material, pattern allowances and types of patterns; (5P)

Mould making Practice: Uses of moulding tools: green sand moulding, gating system, risering system, core making; (6P)

Making a typical product using sheet metal; (3P)

Basic Forging processes like upsetting, drawing down and forge welding; (5P)

Practicing Resistance Spot Welding, Shielded Metal Arc Welding and Gas Welding; (7P)

Machining of typical products involving lathe, milling/shaping operations and finishing process(es); Machining of gears. (10P)

Applied Mechanics Lab

Code: ME-393

Cr-2

N.B: Minimum six(6) experiments from the list to be conducted by the students.

Verification of Varignon's theorem;

Determining spring stiffness under tension and compressive loads; Strain gauge based strain/ deflection/ force measurement of a cantilever beam;

Tension Test and Compression Test of ductile and brittle materials: stress-strain diagram, determination of yield strength, ultimate strength, modulus of elasticity, percentage elongation and percentage reduction in areas, observation of fractured surfaces;

Bend and rebend test of flat test pieces, determination of bending stresses;

Torsion Test;

Hardness Tests: Brinell/ Vickers and Rockwell tests, Shore hardness test;

Experiments on friction: determination of coefficient of friction;

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Experiments to observe speed ratios obtained using belt pulley and gears, and to evaluate torque and energy required.

SEMESTER - IV

Theory

NUMERICAL METHODS

Code : M(CS) 401

Contacts : 2L+1T

Credits :2

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. (4)

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. (5)

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. (3)

Numerical solution of a system of linear equations:

Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method. (6)

Numerical solution of Algebraic equation:

Bisection method, Regula-Falsi method, Newton-Raphson method. (4)

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. (6)

Text Books:

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar, & Jain: Numerical Methods (Problems and Solution).

References:

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.

MATHEMATICS

Code: M 402

Contacts: 3L +1T = 4

Credits: 4

Note 1: The entire syllabus has been divided into four modules.

Note 2: Structure of Question Paper

There will be two groups in the paper:

Group A: Ten questions, each of 2 marks, are to be answered out of a total of 15 questions, covering the entire syllabus.

Group B: Five questions, each carrying 10 marks, are to be answered out of (at least) 8 questions.

Students should answer at least one question from each module.

[At least 2 questions should be set from each of Modules II & IV.

At least 1 question should be set from each of Modules I & III. Sufficient questions should be set covering the whole syllabus for alternatives.]

Module I: Fourier Series & Fourier Transform [8L]

Topic: Fourier Series:

Sub-Topics: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave.

(1)

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Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π , Fourier Series for functions of period $2l$, Dirichlet's conditions, Sum of Fourier series. Examples. (1)

Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only). Examples. (2)

Topic: Fourier Transform:

Sub-Topics: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. (1)

Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Examples. Fourier Transform of Derivatives. Examples. (1)

Convolution Theorem (statement only), Inverse of Fourier Transform, Examples. (2)

Module II : Calculus of Complex Variable [13L]

Topic: Introduction to Functions of a Complex Variable.

Sub-Topics: Complex functions, Concept of Limit, Continuity and Differentiability. (1)

Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. (1)

Construction of Analytic functions: Milne Thomson method, related problems. (1)

Topic: Complex Integration.

Sub-Topics: Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples. (2)

Cauchy's theorem (statement only). Cauchy-Goursat theorem (statement only). Examples. (1)

Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function. Examples. (2)

Taylor's series, Laurent's series. Examples (1)

Topic: Zeros and Singularities of an Analytic Function & Residue Theorem.

Sub-Topics: Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m. Examples on determination of singularities and their nature. (1)

Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, evaluation of definite integrals: $\int_0^\infty \frac{\sin x}{x} dx$, $\int_0^{2\pi} \frac{d\theta}{a + b \cos \theta + c \sin \theta}$, $\oint_C \frac{P(z)}{Q(z)} dz$ (elementary cases, P(z) & Q(z) are polynomials of 2nd order or less). (2)

Topic: Introduction to Conformal Mapping.

Sub-Topics: Concept of transformation from z-plane to w-plane. Concept of Conformal Mapping. Idea of some standard transformations. Bilinear Transformation and determination of its fixed point. (1)

Module III: Probability [8L]

Topic: Basic Probability Theory

Sub-Topics: Classical definition and its limitations. Axiomatic definition.

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Some elementary deduction: i) $P(O)=0$, ii) $0 \leq P(A) \leq 1$, iii) $P(A')=1-P(A)$ etc. where the symbols have their usual meanings. Frequency interpretation of probability. (1)

Addition rule for 2 events (proof) & its extension to more than 2 events (statement only). Related problems. Conditional probability & Independent events. Extension to more than 2 events (pairwise & mutual independence). Multiplication Rule. Examples. Baye's theorem (statement only) and related problems. (3)

Topic: Random Variable & Probability Distributions. Expectation.

Sub-Topics: Definition of random variable. Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof). Examples. Definitions of Expectation & Variance, properties & examples. (2)

Some important discrete distributions: Binomial & Poisson distributions and related problems.

Some important continuous distributions: Uniform, Exponential, Normal distributions and related problems. Determination of Mean & Variance for Binomial, Poisson & Uniform distributions only. (2)

Module IV: Partial Differential Equation (PDE) and Series solution of Ordinary Differential Equation (ODE) [13L]

Topic: Basic concepts of PDE.

Sub-Topics: Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transform methods. (1)

Topic: Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace & Fourier transform methods.

Sub-Topics:

- PDE I: One dimensional Wave equation. (2)
- PDE II: One dimensional Heat equation. (2)
- PDE III: Two dimensional Laplace equation. (2)

Topic: Introduction to series solution of ODE.

Sub-Topics: Validity of the series solution of an ordinary differential equation. General method to solve $P_0 y'' + P_1 y' + P_2 y = 0$ and related problems. (2)

Topic: Bessel's equation.

Sub-Topics: Series solution, Bessel function, recurrence relations of Bessel's Function of first kind. (2)

Topic: Legendre's equation.

Sub-Topics: Series solution, Legendre function, recurrence relations and orthogonality relation. (2)

TOTAL LECTURES : 42

Text Books:

2. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
3. Das N.G.: Statistical Methods, TMH.
4. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.
5. James G.: Advanced Modern Engineering Mathematics, Pearson Education.
6. Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.

References:

1. Bhamra K. S.: Partial Differential Equations: An introductory treatment with applications, PHI
2. Dutta Debashis: Textbook of Engineering Mathematics, New Age International Publishers.
3. Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
4. Potter M.C, Goldberg J.L and Aboufadel E.F.: Advanced Engineering Mathematics, OUP.
5. Ramana B.V.: Higher Engineering Mathematics, TMH.
6. Spiegel M.R., Lipschutz S., John J.S., and Spellman D., : Complex Variables, TMH.

ME-401: Fluid mechanics & Hydraulic Machines

Contacts: 4L

Credit: 4

Fluid mechanics

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Module No.	Syllabus	Contact Hrs
1	1. Review of fluid properties and fluid statics. Hydraulic forces on submerged surfaces; forces on vertical, horizontal, inclined and curved surfaces.	02
	2. Kinematics of fluid flow: fluid flow and classifications. Continuity equation in 1D & 3D. Potential flow & Stream function; types of flow lines.	03
2	3. Dynamics of fluid: equations of motion; Euler's equation; Bernoulli's equation; Applications of Bernoulli's equation.	04
	4. Momentum Analysis of flow systems; the linear momentum equation for steady flow, differential approach.	03
3	5. Flow through pipes; Darcy – Weisbach equation of friction loss; hydraulic grade line and total energy line.	03
4	6. Basic principle for flow through orifices, V-notches (rectangular v), weirs (rectangular). Flow through open channels; use of Chezy's formula.	04
5	7. Dimensional Analysis & Model investigation applied to flow systems – Buckingham Pi theorem. Dimensionless numbers in fluid flow.	02
	8. Flow of fluid around submerged bodies; basic concepts of drag and lift.	02
	9. Boundary layer – definition; Boundary layer separation – basic concept.	02

Hydraulic Machines

Module No.	Syllabus	Contact Hrs
6	Hydraulic Turbines; Principles and Classifications; Design & working principle of a Pelton Wheel, efficiency and performance curves. Francis Turbine, Kaplan Turbine. Function of Draft Tube. Cavitation in Turbines.	05
7	Reciprocating Pumps: Components & Principles, Classification, discharge, work done, power requirement.	05
8	Centrifugal pumps: Components, working principle, head & efficiency. Multistage Centrifugal pumps. Pump characteristics, NPSH & Cavitation.	05

Total=40

Books Recommended

1. Fluid Mechanics & Turbo Machines – M.M.Das, PHI, 2010.
2. Fluid Mechanics & Machinery – R.K.Bansal, Luxmi Publications.
3. Fluid Mechanics & Machinery – C.Ratnam, A.V.Kothapalli, I.K. International Publishing House Ltd, 2010.
4. Introduction to Fluid Mechanics & Fluid Machines – Som & Biswas, TMH.
5. Fluid Mechanics & Machinery – C.S.P Ojha, R.Berndtsson, P.N. Chandramouli, OUP.
6. Introduction to Fluid Mechanics – Fox & Macdonald, Wiley.
7. Fluid Mechanics – Fundamentals & Applications – Cengel & Cimbala, TMH.
8. Ojha, C S P, Berndtsson. R, Chandramouli. P. N.

ME-402 Mechanisms

Contact Week / Semester= 12 minimum

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Contact per week: 3L

Credit: 3

Module	Syllabus	Contact Hrs.
1.A	Introduction to mechanisms, Difference between Machine and Mechanism; Classification of Pairs of Elements, Kinematic chain, types of joints in a chain; Four-bar linkage: motions of links, Grashof's criterion of movability.	2L
B	Degrees of freedom for plane Mechanisms, Gruebler's criterion for plane mechanism, Kinematic inversions – four Inversions of a Slider-Crank Chain.	3L
2.	Velocity analysis in Mechanisms: Relative velocity method – slider crank mechanism, four bar mechanism, Crank and slotted lever mechanism; Instantaneous centre method – Kennedy's theorem; Acceleration analysis: Acceleration Images, Klein's construction, analytical expression of velocity & acceleration.	7L
3.	Belt-drive – introduction; Law of belting, Length of flat belt for open and cross belt connections; Stepped pulley for open flat belt; Tension in flat belt and V-belts; Power transmitted in belt drive	4L
4.	Gear terminology, Laws of gearing, types of gears – Spur, Bevel, Helical, Worm; tooth profile, interference; Gear trains – simple, compound, epicyclic gear train; Speed-torque analysis of gear trains.	6L
5.	Classification of Cams and followers; Radial Cam, Analysis of knife-edge, roller and flat face follower motion – constant velocity, simple harmonic, constant acceleration & deceleration; Offset follower.	6L
6. A	Kinematic Synthesis: Introduction to problems of function generation, path generation and rigid body guidance; Type, Number and Dimensional Synthesis; Two and three position synthesis of four bar mechanism and slider –crank mechanism : Graphical – pole, Relative pole and Inversion method; Analytical solution - Freudenstein's Method.	5L
B	Study of lower pair Mechanisms- Pantograph, Parallel linkage mechanisms, Straight line mechanism, Automobile steering mechanism, Hooks joint.	3L

Note to the Teachers :

1. Stress should be given on the concept of different topics.
2. All relevant deductions should be worked out and explained.
3. Sufficient number of problems from each topic should be worked out during the class and should also be assigned as home assignment.

Books Recommended :

1. Elements of Mechanism – Daughy and James, McGraw Hill
2. Theory of Machines – S S Rattan, Tata McGraw Hill
3. Theory of Mechanisms & Machines – A.Ghosh & A.K.Mallik, AEWP
4. Design of Machinery – R.L.Norton, Tata McGraw Hill
5. Mechanism & Machine Theory – Rao, R.V. Dukupati, Wiley
6. Theory of Machines, V.P.Singh, Dhanpat Rai & Co

ME403 : Primary Manufacturing Processes

Contacts : 4L

Credits : 4

S/L	Module/Sub module	Contact Hours	
		Sub module	Module
1.	Introduction		
	□ Manufacturing; Definitions and broad grouping	1	1
2.	Casting		
	□ Introduction History Definition Major Classification Casting Materials	1	15

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	<ul style="list-style-type: none"> ❑ Sand mould casting Moulding sands: composition, properties & testing Design of gating system: sprue, runner, ingate & riser Estimation of powering time Foundry equipments, Furnaces Melting, pouring and solidification Type of patterning, use of a core Different type of sand mould casting Floor mould casting Centrifugal casting Shell mould & CO2 casting Investment casting 	12	
	<ul style="list-style-type: none"> ❑ Permanent mould casting Die casting, types, methods, advantages & applications Slush casting, principle & use 	1	
	<ul style="list-style-type: none"> ❑ Casting defects, types, causes & remedy 	1	
3.	Welding		
	<ul style="list-style-type: none"> ❑ Introduction to metallic parts Major grouping of joining processes, welding, brazing and soldering Broad classification of welding processes, types and principles 	1	12
	<ul style="list-style-type: none"> ❑ Fusion welding, types, principles, equipments, characteristics & applications Sources of heat-chemical action, Gas welding & thermit welding Sources of heat-electrical energy, Arc welding Submerged arc welding TIG & MIG; Plasma arc welding 	6	
	Resistance welding; Spot & butt welding		
	<ul style="list-style-type: none"> ❑ Solid state welding Principles, advantages & applications of: Hot forge welding, Friction welding Pressure & percussion welding 	2	
	<ul style="list-style-type: none"> ❑ Precision welding processes: Ultrasonic welding Laser beam welding Electron beam welding 	2	
	<ul style="list-style-type: none"> ❑ Welding defects, types, causes & remedy 	1	
4.	Forming Processes		
	<ul style="list-style-type: none"> ❑ Forging Introduction, definition, classification, hot forging & cold forging, characteristics & applications Forging material operations, equipments & tools: Smith forging Drop forging Pressing or press forging Forging dies, materials & design 	3	12
	<ul style="list-style-type: none"> ❑ Rolling Introduction, basic principles, hot rolling & cold rolling, characteristics & applications Rolling processes & applications, operations, equipments & roll stands 	3	
	<ul style="list-style-type: none"> ❑ Wire drawing & extensions Basic principles & requirements Classification, methods & applications 	2	

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	<ul style="list-style-type: none"> □ Press tool works Basic principles, systems, operations & applications Shearing, parting, blanking, piercing & notching Cupping(drawing), Spinning & deep drawing Blanks & forces needed for shearing & drawing operations Coining & embossing 	4	
Total Contact Hrs=40			

Text Books:

1. Manufacturing technology, Foundry, Forming & Welding-P.N Rao.
2. Manufacturing Science-A Ghosh & A Mullick.
3. Manufacturing Engineering & Technology-S Kalpakjian; Pub:Addison Wesley.
4. Principles of manufacturing materials & processes-James & Campbell.

Reference Books:

1. Manufacturing engineering & technology-K Jain.
2. Materials & processes in manufacturing-E.P Degarmo, Black & Kohser, Pub: Wiley(10th ed.)
3. Processes & materials of manufacturing-R.A Lindberg.
4. Introduction to manufacturing technology-PP Date, Pub: Jaico.
5. Manufacturing processes-S.K Sharma & S Sharma, Pub: I.K International.

Practical

NUMERICAL METHODS

Code : M(CS) 491

Credits :1

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runge-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

ME 491: Fluid mechanics & Hydraulic Machines Lab

Contacts: 3L

Credit: 2

Fluid flow measurements: Determining coefficient of discharge for venturimeter, orificemeter, weirs;

Experiment to verify Bernouli's theorem;

Flow through pipes: Reynold's experiments; Pipe friction in laminar and turbulent flow regimes; Pitot tube experiments on viscous flow and boundary layer theory;

Determination of metacentric height of a floating vessel;

Experiments on Fluid Machinery : Pumps, jet pumps, Blowers, Compressors;

Experiments on Hydro-Turbines: Francis and Pelton turbines.

(At least six experiments must be conducted)

ME 492: Manufacturing Technology Lab

Contacts: 3L

Credit: 2

Sand preparation and testing: specimen preparation for testing permeability, clay content, grain fineness number, moisture content, green compression strength, green shear strength, splitting strength, hardness, etc.;

Casting of metals after preparation of suitable moulds; Experiments on properties of post casting, fettling, cleaning, deburring, and polishing operations;

Practicing smithy or forging of carbon steels and testing for its property changes;

Laboratory experiments in Fabrication processes to observe effects of varying process parameters in GMAW and SMAW and Testing for Joint defects.

(At least six experiments must be conducted)

ME 493: Material Testing Lab

Contacts: 3L

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Credit: 2

Impact tests: Charpy and Izod tests;

Test for drawability of sheet metals through cupping test;

Fatigue test of a typical sample.

Sample preparation and etching of ferrous and non-ferrous metals and alloys for metallographic observation;

Experiments on heat treatment of carbon steels under different rates of cooling including quenching, and testing for the change in hardness and observing its microstructural changes through metallographic studies.

Observation of presence of surface/ sub-surface cracks using different non-destructive techniques, such as dye penetration (DP) test, magnaflux test, ultrasonic or eddy current test.

(At least six experiments must be conducted)

ME 494: Machine Drawing-II

Contacts: 3L

Credit: 2

Assembly and detailed drawings of a mechanical assembly, such as a simple gear box, flange coupling, welded bracket joined by stud bolt on to a structure, etc.

Practicing AutoCAD or similar graphics softwares and making orthographic and isometric projections of different components.

(At least six assignments must be conducted)

References:

1. Text Book on Engineering Drawing, Narayana and Kannaia H, Scitech.
2. Mechanical Engineering Drawing and Design, S. Pal and M. Bhattacharyya.
3. Machine Drawing by N.D. Bhatt.
4. Machine Drawing by P.S. Gill.
5. Engineering Drawing and Graphics + AutoCAD by K. Venugopal, New Age International Pub.
6. Engineering Drawing with an Introduction to AutoCAD by D.A. Jolhe, Tata-McGraw-Hill Co.

V Semester

AUE 501 : Dynamics of Machines

Contacts : 3L

Credit : 3

Dynamics of reciprocating machines: Static force analysis, Inertia forces in reciprocating parts: analytical method: velocity and acceleration of reciprocating parts, crankshaft torque considering and neglecting the weight of connecting rod; turning moment on crank-shaft, dynamically equivalent system, correction couple.

Graphical method: Klein's construction.

8L

Turning moment diagrams: Coefficient of fluctuation of speed and energy, Flywheels, application as punching press
3L

Governors: Centrifugal governors: Watt, Porter, Proell, Hartnell; stability criterion, controlling force, governor effort and power, friction and insensitiveness. 5L

Brakes and Dynamometers: Brakes: Block or shoe brake, Band brake, Band and Block brake, Internal Expanding Shoe brake, Braking of a vehicle; Dynamometer: Prony brake dynamometer, Rope brake dynamometer, Belt transmission dynamometer. 4L

Balancing: Rotating mass: single rotating mass, balancing of several masses rotating in same plane and in different plane

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Fifth Semester

A. Theory							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr.Points
			L	T	P	Total	
1	AUE501	Dynamics of Machine.	3	0	0	3	3
2	AUE502	Heat Transfer.	3	0	0	3	4
3	AUE503	Design of Machine Element.	4	0	0	4	4
4	AUE504	Professional Elective I	3	0	0	3	3
5	AUE505	M/c Tools & Machining Technology.	3	0	0	3	3
Total Theory			16	0	0	16	17
B. Practical							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr.Points
			L	T	P	Total	
6	AUE 591	Seminar I (Trg.)	0	0	3	3	2
7	AUE592	Engine Component Lab.	0	0	3	3	2
8	AUE 593	Design Practice	0	0	3	3	2
9	AUE 594	Professional Elective Lab I	0	0	3	3	2
Total Theory			0	0	12	12	8
Total Semester			16	0	12	28	25

List of Professional Elective I

AUE504 (A) Automotive Chassis.

AUE504 (B) Fluid Power Control.(To be taken from ME604C)

Sixth Semester

A. Theory							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr. Points
			L	T	P	Total	
1	AUE601	Automotive Petrol & Diesel Engine	3	0	0	3	3
2	AUE602	Power Unit & Transmission	3	0	0	3	3
3	AUE603	Metrology & Measurement.	3	0	0	3	3
4	AUE604	Professional Elective II	3	0	0	3	3
5.	AUE 605	Professional Elective III	3	0	0	3	3
6	AUE 606(HU)	Production Management & Operation Research	3	1	0	4	4
Total Theory			18	1	0	19	19
B. Practical							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr. Points
			L	T	P	Total	
7	AUE 691	Metrology & Measurement Lab.	0	0	3	3	2
8	AUE692	Applied Thermodynamics & Heat Transfer Lab.	0	0	3	3	2
9	AUE 693	CAD Applications in Automotive Engineering	0	0	3	3	2
10	AUE 695	Professional Elective II Lab	0	0	3	3	2
Total Theory			0	0	12	12	8
Total Semester			18	1	12	31	27

List of Professional Elective II

AUE 604 (A) Vehicle Body Engineering.

AUE 604 (B) Mechatronics.(To be taken from ME604B)

List of Professional Elective III

AUE 605 (A) Design of Automotive Systems.

AUE 605 (B) Material Handling(To be taken from ME605A)

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Credit: 2

Impact tests: Charpy and Izod tests;

Test for drawability of sheet metals through cupping test;

Fatigue test of a typical sample.

Sample preparation and etching of ferrous and non-ferrous metals and alloys for metallographic observation;

Experiments on heat treatment of carbon steels under different rates of cooling including quenching, and testing for the change in hardness and observing its microstructural changes through metallographic studies.

Observation of presence of surface/ sub-surface cracks using different non-destructive techniques, such as dye penetration (DP) test, magnaflux test, ultrasonic or eddy current test.

(At least six experiments must be conducted)

ME 494: Machine Drawing-II

Contacts: 3L

Credit: 2

Assembly and detailed drawings of a mechanical assembly, such as a simple gear box, flange coupling, welded bracket joined by stud bolt on to a structure, etc.

Practicing AutoCAD or similar graphics softwares and making orthographic and isometric projections of different components.

(At least six assignments must be conducted)

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1. Text Book on Engineering Drawing, Narayana and Kannaia H, Scitech.
2. Mechanical Engineering Drawing and Design, S. Pal and M. Bhattacharyya.
3. Machine Drawing by N.D. Bhatt.
4. Machine Drawing by P.S. Gill.
5. Engineering Drawing and Graphics + AutoCAD by K. Venugopal, New Age International Pub.
6. Engineering Drawing with an Introduction to AutoCAD by D.A. Jolhe, Tata-McGraw-Hill Co.

V Semester

AUE 501 : Dynamics of Machines

Contacts : 3L

Credit : 3

Dynamics of reciprocating machines: Static force analysis, Inertia forces in reciprocating parts: analytical method: velocity and acceleration of reciprocating parts, crankshaft torque considering and neglecting the weight of connecting rod; turning moment on crank-shaft, dynamically equivalent system, correction couple.

Graphical method: Klein's construction.

8L

Turning moment diagrams: Coefficient of fluctuation of speed and energy, Flywheels, application as punching press
3L

Governors: Centrifugal governors: Watt, Porter, Proell, Hartnell; stability criterion, controlling force, governor effort and power, friction and insensitiveness. 5L

Brakes and Dynamometers: Brakes: Block or shoe brake, Band brake, Band and Block brake, Internal Expanding Shoe brake, Braking of a vehicle; Dynamometer: Prony brake dynamometer, Rope brake dynamometer, Belt transmission dynamometer. 4L

Balancing: Rotating mass: single rotating mass, balancing of several masses rotating in same plane and in different plane

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Reciprocating mass: Partial balancing of primary force, Partial balancing of locomotives: Variation of tractive force (or effort), swaying couple, hammer blow, coupled locomotives, Primary and secondary balancing of Multi-cylinder Inline Engines. 6L

Vibrations: Introduction: Fundamentals of vibration, Free vibrations: longitudinal vibrations; energy method, Rayleigh method; Transverse vibrations; natural frequency of a shaft or beam, whirling speed.

Damped vibrations: over damped, under damped, critically damped vibrations, logarithmic decrement, forced damped vibration, magnification factor, vibration isolation and transmissibility.

Torsional vibration: free torsional vibration single rotor 10L

References:

- 1) Theory of Machines and Mechanisms by J.J.Shigley and J.J.Uicker, McGrawhill.
- 2) Theory of Machines by S.S.Rattan, TMH.
- 3) Design of machinery by R.L.Norton, , McGrawhill
- 4) Theory of Machines by R.K.Bansal , laxmi Publications
- 5) Mechanism and Machine Theory by J.S.Rao and R.V.Dukkipati, New Age International

AUE 502 : Heat Transfer

Contacts: 3L :

Credit : 3

Introduction: Modes of heat transfer. 1L

Conduction: Fourier law of heat conduction for isotropic material. Thermal conductivity. Derivation of the energy equation in three dimensions including transient effect. Non dimensional - thermal diffusivity and Fourier number. One dimensional solution with and without heat generation in slab, cylinder and sphere. Analogy with electrical circuits. Critical thickness of insulation. 10L

Fins: Rectangular and pin fins. Fin effectiveness and efficiency. 4L

Conduction-Unsteady state: Lumped parameter approach and physical significance of time constant, Biot number, Validity of lumped parameter approach. Introduction to Heissler Chart.3L

Radiation : Physical mechanism of thermal radiation, laws of radiation, definition of black body, emissive power, intensity of radiation, emissivity, reflectivity, transmittivity, irradiation, radiosity. Radiation exchange between black bodies, concept of Gray-Diffuse Isotropic (GDI) surface. Radiation exchange between GDI surfaces by radiation network and radiosity matrix method. Radiation shielding. 7L

Convection: Introduction, Newton's law of cooling and significance of the heat transfer coefficient. Momentum and energy equations in two dimensions, nondimensionalisation, importance of non-dimensional quantities and their physical significance. Order of magnitude analysis for flow over a flat plate. Velocity and thermal boundary layer thickness by integral method. Analogies between momentum, heat and mass transfer. 7L

Heat exchangers: Types of heat exchangers, parallel and counter flow types, Introduction to LMTD. Correction factors, fouling factor.-Effectiveness of heat exchanger .NTU method for heat exchangers. 4L

References :

1. Heat Transfer - A Basic Approach by M.N.Ozisik, McGrawhill.
2. Heat Transfer by J.P.Holman, 8th ed., McGrawhill.
3. Heat and Mass Transfer by R. K. Rajput. (S. Chand ,2010)
4. Fundamental of Engineering Heat and Mass Transfer by R.C. Sachdeba (New Age Science,2010)

AUE 503 : Design of Machine Elements

Contacts : 4L

Credit : 4

Introduction: Definition, General procedures and considerations in Machine Design, design stresses, factor of safety, engineering material and application. 2L

Limits, Fits and Tolerances: Indian Standard System for Limits and Fits, Preferred Numbers, Fundamental Deviation for Holes and Shafts. 3L

joints- Types of cotter joint, Knuckle joint, Riveted joints, Design of Riveted joints,

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Welding processes, Types of Weld joints, Strength of different Fillet weld joints and butt joints, Stresses for different Welded joints. 12L

Design of Variable Loads: Endurance limit of materials, Notch sensitivity, Goodman and Soderberg Criteria, Design of Shaft. 6L

Shafts, Keys and Couplings: Design of shafts on the basis of Strength, Design of shafts on the basis of Rigidity, Types of keys, Design of Sunk keys, Effect of keyways, Types of Shaft Couplings, Design of Muff, Split muff and Flange Coupling. 12L

Design of springs: Helical compression, Tension springs under static and variable loads, Laminated Springs. 5L

Design of Belt and Chain Drives: Selection of Belt Drives, Types of Belt Drives, Materials of Belts, Belt joints, Types of Flat Belt Drives, Design of Flat Belt and V belt Drives. Design of chain Drives. 8L

References:

1. Mechanical Engineering Design by J.F.Shigley, McGrawhill.2003
2. Design of Machine Elements by M.F.Spotts, Prentice Hall.1998
3. Mechanical Analysis and Design by A.H.Burr and J.B.Cheathak, 2nd ed., Prentice Hall.1995
4. Fundamentals of Machine Elements - Hawrock, Jacobson - McGraw Hill 1993.
5. Design of machine elements by V. B. Bhandari, Tata McGraw Hill Pub.1994
6. A Text Book of Machine Design by R.S.Khurmi and J.K.Gupta, S.Chand Pub.2005

AUE 504(A) : Automotive Chassis

Contacts : 3L

Credit : 3

INTRODUCTION

Types of chassis layout with reference to power plant locations and drive, Vehicle frames. various types of frames. Constructional details, Materials. Testing of vehicle frames. Unitised frame body construction: Loads acting on vehicle frame, chassis lubrication, and calculation of stresses on sections. 3L

FRONT AXLE AND STEERING SYSTEM

Types of front axles. Construction details. Materials. Front wheel geometry viz. Castor, Camber, King pin inclination, Toe-in Conditions for true rolling motion of wheels during steering. Steering geometry. Ackerman and Davis steering system. Constructional details of steering linkages. Different types of steering gear boxes. Steering linkages and layouts. Power and power assisted steering. 5L

DRIVE LINE

Effect of driving thrust and torque reactions. Hotch kiss drive, torque tube drive and radius rods. Propeller shaft. Universal joints. Constant velocity universal joints. Front wheel drive.3L

FINAL DRIVE AND DIFFERENTIAL

Different types of final drive. Worm and worm wheel, straight bevel gear, Spiral bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential principles. Construction details of differential unit. Non-slip differential. Differential locks - Differential housings. 5L

REAR AXLES

Construction of rear axles. Types of loads acting on rear axles. Full floating. Three quarter floating and semifloating rear axles. Rear axle housing. Construction of different types of axle housings. Multi axled vehicles. Construction details of multi drive axle vehicles. 5L

SUSPENSION SYSTEM

Need of suspension system - Types of front and rear suspension system - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension - Pneumatic suspension - constructional details of telescopic shock absorbers. Types, vibrations and riding comfort, role axis of spring suspension. Two & 4. wheel independent suspension 5L

WHEEL & TYRES

Types of wheels, construction, wired wheels, tyres, construction, types, radial, bias & belted bias, comparison, slip angle, under and over steering, tread patterns, tyre re-treading cold and hot, tyre specification tubeless tyre. 3L

BRAKING SYSTEM

Necessity of brake, stopping distance and time. Brake efficiency, weight transfer, brake shoe theory, determination of braking torque, braking systems -mechanical, hydraulic, disc, drum, parking and emergency brakes, power, servo and

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electrical brakes, details of hydraulic system, mechanical system and components. types of master cylinders, factors influencing operation of brakes such as operating temperature, lining, brake clearance, pedal pressure, linkages etc, Different types of retarders like eddy current and hydraulic retarder. Anti lock braking systems.

5L

References:

1. Jack E Rjavee Automotive Technology- A system approach, Thomson Asia Pte Ltd. Singapore, 3rd edition 2004
2. De A Automobile Engineering, Galgotia Publishers Pvt Ltd , 2004
3. Ramalingam K K Scitech Publication (India) Pvt. Ltd. 2nd edition 2004
4. Joseph Heitner, Automotive Mechanics Principle and Practice East west press, 2nd edition 1999

AUE- 504(B) Fluid Power Control

Contact ; 3L

Credit: 3

Introduction : Fluid power & its Application, Hydraulic symbols. 3L

Pumps: Gear, Vane, Piston & their types of pumps. 8L

Control Valve: Relief valve, Un loader valve, Pressure reducing valve, Different types of flow control valve, Direction control valve. 10L

Air filter, Lubrication & Regulators, Pneumatic control elements, Air cylinders. 3L

Hydraulic Actuators : Linear and rotary, Hydraulic actuator and their circuit. 5L

Pneumatic: Pneumatic safety circuits, Pneumatic logistic control. 5L

References

1. HE Merritt - Hydraulic Control System; Wiley New York
2. Esposito – Fluid Power; Pearson Education
3. Andrew Parr – Hydraulics and Pneumatic; Jaico Publishers

AUE 505: Machine Tools and Machining Technology

Contacts: 3L

Credit : 3

Metal cutting:

Tool geometry and single point cutting tools, orthogonal and oblique cutting, rake, cutting tool signature; Chip shape and chip formation, chip tool interface, chip flow, built up edge, machined surface. 4L

Force systems during turning, Merchant's circle diagram for cutting forces, force systems at chip tool interface and shear plane, velocity relationships, derivations of expressions and problems.

Energy of cutting process, derivation of expression; Principle of heat generations in metal cutting;

Machining economics- machining cost, optimum production rate, derivation of expressions.

Cutting tool materials, cutting fluids, tool life 10L

Conventional Machining: Constructional Details and Working of Lathe, Drilling machine, Milling machine, Shaper and Planer; Tooling, Attachments and Operations Performed, Process Geometry, Cutting Conditions, Calculation of Time of Machining (T_m) and Material Removal Rate (MRR), problems. 12L

Non traditional machining: basic concepts and application of EDM, ECM, USM, PAM, EBM, AJM, WJM, LBM and Explosive forming. 10L

References:

1. Production Technology by R.K.Jain and S.C.Gupta, Khanna Publishers.
2. Manufacturing Science by A. Ghosh and A. Mullick, East West Publishers.
3. A text book of Production Engineering by P.C.Sharma , S.Chand.2002
4. Manufacturing Technology – Metal Cutting and Machine Tools by Rao P.N, Tata McGraw Hill. 1998
5. Manufacturing Engineering and Technology by S. Kalpakjian, Addison Wesley
6. Elements of Workshop Technology by Hajra Choudhury, Vol-I and Vol-II Media promoters' pub. 2007
7. H.M.T. Production Technology-Hand Book, Tata McGraw Hill. 1980
8. Workshop Technology by W.A.J. Chapman Part I, II & III. 1976, 1998

AUE591 Seminar I (Trg)

Contact: 3P

Credit: 2

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Student will deliver seminar talk regarding training, which they have taken in the preceding summer vacation. They have to submit a report in this respect.

AUE592 Engine component Laboratory.

Contact: 3P

Credit: 2

Identification of tools and their function.

Study of various design of 4-stroke & 2- stroke S.I. & C.I. engines. Dismantling and assembling of engines. Comparison of engine component for various design. Ignition systems, fuel systems in SI and CI Engine, Cooling Systems.

AUE593 Design Practice.

Contact: 3P

Credit: 2

Drawing board exercises compatible to the course of AUE 503 (Design of Machine elements.).

AUE594 Professional Elective Laboratory I.

AUE594 (A) Chassis Component Laboratory

Contact: 3P

Credit: 2

Study and measurement of various design of automobile chassis. Dismantling & Assembling and experimentation (where ever possible) of steering system, braking system, differential mechanism, gear box, transmission system.

AUE- 594(B) Fluid Power Control Laboratory

Contact 3P

Credit: 2

Pneumatic circuit for sorting device, stamping device, valve actuation, toppling device, clamping device

Electro hydraulic circuit to develop system pressure, to actuate double acting cylinder, continuous reciprocation of a double acting cylinder. Speed control of double acting cylinder.

VI Semester

AUE 601 : Automotive Petrol & Diesel Engines

Contacts : 3L

Credit : 3

Introduction: Basic air standard cycle Otto, Diesel & dual fuel cycle, comparison between Otto, Diesel and Dual fuel cycles. Concept of Fuel-air cycles and actual cycles. Comparison of four stroke and two stroke engine operation.

5L

Fuels: Basic properties of SI and CI engine fuels, rating of fuels, equation of combustion, calculation of A/F ratio and equivalence ratio. 3L

Combustion in SI engines: Stages of combustion, flame propagation, rate of pressure rise.

Abnormal combustion: Phenomena of knocking. Effect of engine variables on knock. 3L

SI Engine Fuel System: Air-fuel mixtures, mixture requirements at different loads and speeds. Carburetor and its working principle. Calculation of mass flow rate of fuel and A/F ratio. Essential parts of a carburetor.

4L

Petrol Injection strategies: M.P.F.I. GDI and Port fuelling techniques. 3L

Ignition System: Magneto and Battery ignition systems, Firing order and its significance.

Ignition timing and Spark advance mechanism.

2L

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Combustion in CI engines: Combustion in CI engines and Stages of combustion, ignition delay, factors affecting delay period. Abnormal combustion, Knock in CI engines, comparison of knock in CI & SI engines.

4L

Fuel Injection System: Requirements, function of components, Jerk and distributor type Pumps. Fuel injector, types of injection nozzle, Spray characteristics, injection Timing.

4L

Supercharging and Turbo Charging: Necessity and limitation, Type of supercharging and turbo charging, Relative merits and demerits.

2L

2-stroke engines: Types of two stroke engines - Terminologies and definitions - Theoretical scavenging methods. Types of scavenging pumps Advantages and disadvantages of two stroke engines.

3L

Engine Testing: Performance testing of petrol and diesel engine. Measurement of IP, BP, FP, Mechanical efficiency, Brake thermal Efficiency, Volumetric efficiency and specific fuel consumption. Heat balance chart,

3L

References :

1. V. Ganesan, Internal Combustion Engines, Tata McGraw Hill Co., Third Edition, 2007.
2. K.K. Ramalingam, "Automobile Engineering", Scitech Publications Pvt. Ltd., 2005
3. M.L. Mathur and R.P. Sharma "Internal Combustion engines" Dhanpat Rai Publication ,

AUE-602 POWER UNITS AND TRANSMISSION

Contacts: 3L

Credit: 3

Total periods: 36L

Transmission: Requirements of transmission system, Explain with Lay out of Front wheel drive, rear wheel drive, four wheel drive system, Two and Three wheeler drive arrangement, Hybrid vehicle drive (series, parallel & combination drive lines) 2L

Clutch: Principle, Requirements, Types, Construction and operation of different types of clutch, Clutch operating system, Torque capacity, Performance curve, Clutch plate: requirement, construction and material, Linings: properties, types, material, Over running clutch, Clutch fault and diagnosis, Numerical. 7L

Gearbox: Necessity, Types, Function, Construction and working details of sliding mesh gearbox, constant mesh gearbox, synchromesh gearbox, Determination of gear ratios for vehicles, Gear box design, Gear shifting mechanism, Overdrive gears, Transfer box, Trouble shooting, Numerical 7L

Fluid flywheel: Principle of operation, Construction details. Torque capacity, Performance characteristics 2L

Torque converter: Principle of operation, Construction, Performance characteristics, Multistage and Polyphase torque converters. 3L

Automatic Transmission: Epicyclic (simple and compound planet) gearbox, Determination of gear ratios for vehicles, Construction & operation of four forward & reverse & three forward & reverse automatic gear box, Automatic overdrive, Clutches and brakes in epicyclic gear train, Hydraulic control system for automatic transmission, Numerical. 6L

Hydrostatic drive system: Types, Principles, Advantage & limitation, Construction & working of hydrostatic drive. 2L

Electric drive: Principle of early and modified Ward Leonard control system, Advantage and limitations. 2L

Continuously variable transmission(CVT): Operating principle, basic layout & operation, advantage & disadvantages. 2L

Automatic Transmission Applications: Chevrolet Turboglide, Toyota ECT-i, Mercedes Benz automatic transmission. 3L

References:

1. Heldt.P.M., " Torque converters ", Chilton Book Co., 1992.
2. Josepe Heitner Automotive Mechanics – Principle and Practice, East West Press 2nd edition 1999.

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- Judge.A.W., " Modern Transmission systems ", Chapman and Hall Ltd., 1990.
- De A Automobile Engineering, Galgotia Publication Pvt. Ltd. 2004
- N. K. Giri, "Automotive Mechanics", Khanna Publishers, Delhi, Eighth Edition
- Crouse. W.H., Anglin., D.L., " Automotive Transmission and Power Trains construction ", McGraw-Hill, 1976.

AUE 603: Metrology and Measurement

Contacts: 3L

Credit: 3

Basic concepts: Definition of terms, calibration, standards, generalized measurement systems, static and dynamic performance characteristic; Analysis of experimental data; Instrumentation for measurement of position and displacement, force, temperature, proximity and range. Concept of feedback; Open and close loop control systems, transducers and devices for engineering applications, digital readouts, data acquisition and processing.

12L

Metrology: Introduction, Measuring instruments, Measuring range, Sensitivity, Repeatability, Precision and Accuracy.

3L

Standards : Definitions of line standard, end standard and wavelength standard, Sub divisions of standards. Slip gauges.

2L

Measurement of angles : Introduction, Bevel vernier protractor, Sine bar, Angel gauges, Spirit level, Autocollimator, Angle dekkor, Rotary tables, Precision polygon, Calibration of polygons.

3L

Measurement of internal and external tapers.

2L

Measurement of threads : Introduction, Screw thread terminology, Pitch error, Angle error, Measurement of major and minor diameter, Measurement of effective diameter by one wire, two wire and three wire method. Best size wire.

4L

Measurement of surface finish : Introduction, Surface texture, Surface roughness terminologies, Methods of measuring surface finish, Stylus probe instruments, Taylor-Hobson talysurf, Sample length or cutoff length, Analysis of surface traces.

4L

Gear measurements : Introduction, Terminology of gear tooth, Errors in manufacturing gears, Rolling test, Measurement of tooth thickness, Parkinson gear tester.

2L

Inspection of straightness, flatness, and alignment.

Interferometry and use of optical flats.

Measurement of coordinates using Coordinate Measuring Machine.

4L

References:

- Mechanical measurements by T. G. Beckwith, N. L. Buck and R. D. Marangoni, 5th ed, Pearson, 1993.
- Engineering Metrology by R. K. Jain-20th Edition, Khanna, 2007
- A Text Book of Engineering Metrology by I. C. Gupta-5th wedition, Dhanpat Rai, 2004
- Fundamentals of Dimensional Metrology by C. Dotson, R. Harlow and R. Thomson.-4th edition;Thomson, 2003
- Instrumentation, Measurement and Analysis by B. C. Nakra and K. K. Chaudhari, TMH,1985
- Measurement System- Application and Design by E. O. Doebelin, 4th ed, MGH, 1990
- A course in electronics & electrical measurement & instrumentation, J B Gupta-13th Edition,EKataria,2008
- Electrical and electronics measurement and instrumentation- R.K. Rajput, S. Chand, 2010

AUE 604(A) : Vehicle Body Engineering

Contacts: 3L

Credit: 3

Car body details: Saloon car, Hatch back car, convertible, limousine, SUV, MUV 3L

Bus body details: Single Decker and double Decker bus, Mini bus. 3L

Commercial vehicle body details: Flat platform, Drop side, Tipper body, Tanker body. 3L

Interior Ergonomics : Interior car space nomenclature. Driver and passenger ergonomics with seating space arrangements for cars. Different types of car seats. Seat comfort, suspension seats, split frame seating, seat adjustment mechanisms. Dash board instruments, electronic displays. Visibility, driver's visibility, methods of improving visibility. Different types of car doors and window regulators. 5L

Aerodynamic effect: Pressure distribution on vehicle surface. Air resistance on vehicle, Wind tunnel testing. Flow visualization around vehicle. Effects of Drag and Lift on vehicle motion. Methods of reducing air drag. Effect of side force and wind thrust. 5L

Safety aspect: Driver's safety, Impact protection basics, Physics of impact between deformable bodies, occupant and cargo restraint, passive restraint systems, Use of air bags, side impact analysis. Bumper system. Energy absorbent foams.

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Mechanisms in vehicle applied to safety. Prototype making, initial tests, vehicle crash tests on full scale model. 5L

Body materials: Different types of ferrous and non-ferrous materials used in vehicle such as cast iron. Steel, Alloy steel, plastic, G.R.P, semi-rigid polyurethane. 5L

Painting: Corrosion of vehicle body. Anticorrosion method. Paint and painting process. 2L

Body repairing: Repairing of small dents, Repairing of rusted body panels, Repairing of front end collision, Rear end collision, Side collision, Roll-over damage. Repairing shop equipments. 3L

References:

1. J.Powloski - "Vehicle Body Engineering" - Business Books Ltd, London -1989
2. Crouse W and Anglin D, Automotive Mechanics Tata McGraw hill publication 10th edition, 2004
3. Jack E Rjavee, Automotive Technology- A system approach, Thomson Asia Pte Ltd, Singapore, 3rd edition, 2004
4. K Sing Automobile Engineering vol-I Standard Publishers Distributor 2003

ME 604(B) :Mechatronics

Contacts: 3L

Credits : 3

Introduction to Mechatronics: Definition, Mechatronics in manufacturing, products and design. Comparison between Traditional and Mechatronics approach. 3L

Electronics: Review of fundamentals of electronics, logic gates and their operations, Data conversion devices, sensors, microsensors, transducers, electrical contacts, actuators, and switches, contactless input devices, signal processing devices; relays, output devices. Drives: Stepper motors, servo drives. 10L

Mechanical: Ball screws, linear motion bearings, transfer systems.

Hydraulics: Hydraulic elements, actuators and various other elements. Design of hydraulic circuits. 3L

Control Systems: Open loop and closed loop control, block diagrams, transfer functions, Laplace transforms; Mathematical model of physical system; PI and PID controllers, 8085 microprocessor, PLC controller and Ladder diagrams, hydraulic and pneumatic controllers; Time domain analysis, transient response of first and second order systems; Introduction to nonlinear control; State space analysis, optimal and adaptive control; Introduction to discrete-time systems and Z-transform. Design and fabrication of Mechatronics systems. 15L

References :

1. Automatic Control Engineering by F.H.Raven, 5th ed., McGrawHill International.
2. Modern Control Engineering by K.Ogata, 3rd ed., Prentice Hall.
3. Mechatronics, Bolton, Pearson Education
4. Automatic Control Systems by B.C.Kuo, 6th ed., Prentice Hall.
5. Mechatronics , HMT Ltd., TMH.
6. Machine design for mobile and industrial applications by G.W.Kurtz, J.K.Schueller, P.W.Claar, SAE.
7. Mechatronics, Mohali, TM

AUE 605A : Design of automotive system

Contacts : 3L

Credit : 3

Engine design: 10L

Piston; design of piston, piston pin, piston ring.

Cylinder; design of cylinder block, cylinder head

Connecting rod; design of connecting rod small end and big end shank.

Valve; design of inlet and exhaust valve.

Flywheel; mass of flywheel, stresses of flywheel, design of rim, arms and hub. 4L

Gear; Design considerations of gears - strength of gear teeth, Lewis equation, dynamic tooth load, wear load. Design of spur gear, helical gears, herring bone gears, bevel gears and worm gears. **Gear box;** differential gear box, gear train, layout of gear box. 7L

Clutch; types of clutch, material of friction surface, design of single and multi disc clutch, cone clutch, calculation of heat generation and heat dissipation. Design of clutch operating system. 5L

Journal bearing, ball and roller bearing; bearing material, boundary layer lubrication, design factor of bearing, hydrostatic hydrodynamic theory, heat balance of bearing.

types of roller bearings, bearing life, static load capacity, dynamic load capacity. 5L

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Brake; types of brake, design of disc brake, & expanding brake, calculation of heat generation. Design of break system including master cylinder, wheel cylinder, drum & disc brake. 5L

References :

1. Computer Aided Mechanical Design and Analysis by V.Ramamurhti, 3rd ed., TMH.
2. Mechanical Analysis and Design by A.H.Burr and J.B.Cheatham, 2nd ed., Prentice Hall.1995.
3. Mechanical Engineering Design by J.E.Shigley, McGrawhill.2003
4. Fundamentals of Machine Elements - Hawrock, Jacobson - McGraw Hill1993.
5. Design of machine elements by V. B. Bhandari, Tata McGraw Hill Pub.1994
6. A Text Book of Machine Design by R.S.Khurmi and J.K.Gupta, S.Chand Pub.2005

AUE- 605(B) Material Handling

Contact ; 3P

Credit: 3

Introduction : Scope & importance of material handling. Principles of material handling. Unit load concept.

3L

Classification : Intermittent discharge type equipment such as Power trucks, Fork lift trucks etc. 8L

Continuous discharge type equipment: Belt conveyors, chain conveyor, Roller conveyors. Discharge capacity, Power calculation. Pneumatic and hydraulic conveyors. 15L

Hoisting equipment: Winches, Elevators and cranes.

8L

Reference Books:

1. Apple J.M – Material Handling system design : John Willey & Sons.
2. Allegri T.H - Material Handling principles and practice : CBS Publishers & Distributors, New Delhi.
3. Spivako Vsky A and Dyachkov, V – Conveyors and related Equipment; Peace Publishers, Moscow.

AUE 606 (HU) : Production Management & Operation Research

Contacts: 3L+1T

Credit: 4

Production management objectives, functions and its relations to other management functions of an organization. Classical Production Systems- batch, job, continuous, Mass and flow productions; Cobb- Douglas production function, Planning functions; Organizational policies in respect with production planning and control, Productivity-concept, Craig and Harris productivity measurement model, factors affecting productivity, productivity improvement, Scheduling, and Sequencing techniques for optimal plant facility utilization, Line balancing; fundamental concepts of Material Requirement Planning (MRP) and MRP II.

12L

Operations Management concepts, characteristics, Basic operations management tools- Linear Programming Problems, Graphical approach, Simplex method, Big-M, Two Phase, Duality, Transportation and Assignment problems, Waiting line theory-{ M / M/ 1 : (∞ / FCFS) } model, Inventory management- definition, basic concepts, classical EOQ model, Economic Production Quantity (EPQ) model, Game theory- fundamental concepts, pure and mixed strategies, with and without saddle point problems, Project Management: CPM and PERT

12L

References:

1. Production Systems: Planning Analysis & Control, James L. Riggs, John Wiley & Sons, 1981.
2. Production and Operations Management, Kanishka Bedi, Oxford university press, 2004.
3. Industrial Engg. & Production Management, M. Mahajan, -2nd revised Edition; Dhanpat Rai & Co, 2002
4. Operations Research – Theory and Application, J.K.Sharma - 2nd revised Edition; Macmillan Publishers, 2003
5. Quantitative Techniques in Management, N. D. Vohra- 4th , Tata McGraw-Hill, 2010

AUE691 Metrology & measurement laboratory.

Contact: 3P

Credit: 2

Experiment involving: Measurement of position, displacement velocity, force, temperature proximity / range.

Measurement of various product features using mechanical, pneumatic, optical and electronics

Instruments, interferometer, surface roughness measurement, measurement of threads, gears.

Experiments and exercises involving hardware & software modular based offline and online product gauging and inspection , information recording and processing etc.

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AUE692 Applied thermodynamics & Heat transfer laboratory.

Contact: 3P

Credit: 2

Experiments on: Thermal conductivity of solids, liquids and gasses. Natural forced convection, emissivity and absorptivity. Heat exchanger: LMTD, mass transfer.

AUE 693 : CAD Application in Automotive Engineering - I

Contacts : 3P

Credit : 2

At the end of the course; the students will be able to acquire basic knowledge on automobile part designing using design software apart from automobile production.

.INTRODUCTION:

Introduction to Automobile CAD software's; Generation of software's; History of CAD/CAM/CAE; industrial looks on CAD software's; Historical development.

.PART DESIGN FUNDAMENTALS:

Introduction to Design tools like Extrude; Revolve; Shell; Pad etc needed to generate solid models using various software; Material addition and subtraction about axis and plane; types of geometrical dimensional limits; numerous approaches to specify solid feature creation.

ASSEMBLY DESIGN FUNDAMENTALS:

Design tools needed to create and manage assemblies and sub assemblies; analyzing and modeling an assembly; designing in context; process to insert parts from given and maintained catalogue. Assembly modeling of automotive mechanicals like: Connecting Rod, Piston and its accessories

GENERATIVE SURFACING AND OPERATION:

Introduction to Surface; Surface modeling tools like Datum points; Datum curves; Splines etc; Surface operation tools like boundary; trim; split etc used to create final surface products. Modeling of complicated shaped solid using surface modeling with exercise. Surface modeling of exterior parts like bonnet, trunk lid etc.

MODELING OF CYLINDER; PISTON and CONNECTING ROD:

Choice of material for cylinder and piston; piston friction; piston slap; design of cylinder; piston; piston pin; piston rings; piston failures; lubrication of piston assembly; material for connecting rod; determining minimum length of connecting rod; small end and big end design; shank design; design of big end cap bolts; connecting rod failures.

MODELING OF CRANKSHAFT; VALVES AND FLYWHEEL:

Material for crankshaft; design of crankshaft under bending and twisting; balancing weight calculations; design aspects of intake and exhaust manifolds; inlet and exhaust valves; valves springs; tappets; valve train. Materials and design of flywheel.

Overview of **FINITE ELEMENT MODELING and ANALYSIS** with exercise.

Reference:

1. Rao, P. N. and Tiwari, N. K., "Computer Aided Manufacturing", Tata McGraw-Hill 2008.
2. Groover, Mikell P., "CAD/CAM", Pearson Education; 2008.
3. Joseph Edward., "Mechanical Engg. Design", McGraw Hill.
4. Norton, R. L., "Machine Design – An Integrated Approach", Addison Wesley.
5. Shyam and Tickoo, "CATIA V5 R20 Engineers Designing".

AUE695 (A) Vehicle maintenance laboratory.

Contact: 3P

Credit: 2

Dismantling and fitting of wheel assembling. Brake bleeding and fuel system bleeding. Door assembling and window regulator study. Tappet valve clearance adjustment. Air brake system & antilock braking system study and fault detection. Study of fuel spray nozzle.

AUE695 (B) Mechatronics laboratory.

Contact: 3P

Credit: 2

Experiments on open & closed loop positional control, using positional and velocity feedback.

Use of analog and digital servo systems, PID control.

Experiments in pneumatic & hydraulic drives and actuators.

Use of logic gates,

Microprocessor and PLC programming for simple control operations.

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Seventh Semester

A. Theory							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr. Points
			L	T	P	Total	
1.	AUE701	Vehicle Dynamics	3	0	0	3	3
2	AUE702	Automotive Electrical & Electronics System.	3	0	0	3	3
3	AUE703	Professional Elective IV	3	0	0	3	3
4	AUE704	Professional Elective V	3	0	0	3	3
5	AUE705	Free Elective I	3	0	0	3	3
Total Theory			15	0	0	15	15
B. Practical							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr. Points
			L	T	P	Total	
6	AUE791	ETPM Lab.	0	0	3	3	2
7	AUE792	Project Part I	0	0	6	6	2
8	AUE793	Seminar II (Trg.)	0	0	2	2	2
9	AUE783	Group Discussion	0	0	2	2	2
Total Theory			0	0	13	13	8
Total Semester			15	0	13	26	23

List of Professional Elective IV

- AUE 703 (A) Combustion & Pollution Control in Automobile.
AUE 703 (B) Robotics and Robot application.

List of Professional Elective V.

- AUE 704 (A) Transport Management.
AUE 704 (B) Modern Vehicle Technology

List Of Free Elective I

- AUE 705 (A) Non-Destructive Testing Methods.
AUE 705 (B) Maintenance Engineering.

Eighth Semester

A. Theory							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr.Points
			L	T	P	Total	
1	AUE801(HU)	Engineering Economy & Financial Management.	2	0	0	2	2
2	AUE802	Professional Elective VI	3	0	0	3	3
3	AUE803	Free Elective II	3	0	0	3	3
Total Theory			8	0	0	8	8
B. Practical							
Sl. No.	Field	Subjects	Contact Hours /Week				Cr.Points
			L	T	P	Total	
4	AUE 891	Automotive Elect. & Electronics Lab	0	0	3	3	2
5	AUE892	Auto Scanning Lab.	0	0	3	3	2
6	AUE 893(Project)	Project Part II	0	0	12	12	6
7	AUE 894	Comprehensive Viva Voce	0	0	0	0	2
	AUE 881	Deign Lab	0	0	6	6	4
Total Theory			0	0	24	24	16
Total Semester			8		24	32	24

List of Professional Elective VI

- AUE 802 (A) Off Road Vehicle.
AUE 802 (B) Vehicle Air Conditioning.
AUE 802 (C) CAD/CAM and modern manufacturing methods(To be taken from ME802A)

List Of Free Elective II

- AUE 803 (A) Alternative Fuel.
AUE 803 (B) Quality & Reliability Engineering.(To be taken from ME802D)

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VII Semester

AUE 701: Vehicle Dynamics

Contacts : 3L

Credit : 3

Resistance to motion, air gradient and friction resistance, Tractive effort draw bar pull, Tractive effort vs speed graph, Gear ratio selection, power calculation of vehicle. 6L

Stability of vehicle: stability analysis, when vehicle is moving on level ground, reaction and maximum tractive effort for the front wheel, rear wheel and all wheel driven vehicle. Stability analysis when vehicle traveling on both longitudinally and laterally inclined road. Stability of vehicle when taking turn on level and inclined road. 6L

Forces on suspension: Load on suspension in fore and aft direction. Load on suspension both for rigid and independent suspension system. Effect of braking and accelerating on suspension, Conditions for maximum load on suspension, considering gyroscopic effect. Stability of 2 wheelers and 3 wheeler vehicle. 8L

Vehicle Handling: Slip angle, Over steer and under steer and its relation with slip angle, Ackerman angle, Steady state and transient cornering, Lateral force developed during cornering. Cornering stiffness, Power consumed by tyre. 5L

Gyroscope: Precisional motions and gyroscopic stability, gyroscopic couple, effect on stability of four wheel vehicle. 3L

Riding characteristic: Effect of inflation pressure on tire, tire life, tire wear. Over loading and wrong loading Driving habit. Wheel wobble and its effect. 3L

Effect of braking: Braking torque inside the drum brake and disc brake system, Force analysis on brake pedal, master cylinder and wheel cylinder, Wheel braking torque on the surface of tyre, requirement of antilock braking system. 5L

References :

- 1 . Giri N K Automobile Mechanics, Khanna Publication 8th edition 2006
- 2 . Giri N K Automotive Technology Khanna Publication 1st edition 2004
3. Gupta K M Automobile Engineering vol. I & II, Umesh Publication 1st edition Reprint 2006
4. De. A., "Automobile Engineering", Galgotia Publications Pvt. Ltd., Revised edition 2010
4. De. A., "Vehicle Dynamics", Galgotia Publications Pvt. Ltd., 2010

AUE 702 : Automotive Electrical Systems and Electronics

Contacts : 3L

Credit : 3

Starting system: Condition of starting, Behavior of starter during starting, and its characteristics, Principle and construction of starter motor, working of different starter device units, care and maintenance of starter motor. Starter Switches. 5L

D.C Machine: Main construction Features, Armature Winding, Commutator, Basic principle of d.c generator, Slip-ring, Commutation, Operating characteristics and application of dc generator, armature reaction, total loss in dc generation, Working principle of dc motor, Types of dc motor and its characteristics, speed control of dc motor, Three point starter- basic construction and working principle. 5L

Lighting system & Accessories: Details of head light and side light, Head light aiming, Speedometer, Odometer, Horn, Horn-Relay, Wiper system, Trafficator, Positive and Negative Earth System, Principle of transformer and its application, Stepper- motor, Different types of relay and its application. 5L

Automotive Electronics: Transfer function, Application of control system in automobile industry, open-loop system and closed-loop system, vehicle motion control, Various Microcontroller based operation in a vehicle. 3L

Transducer & Sensors: Introduction, Mechanical spring devices, Resistive transducer, Capacitive Transducer, Strain gauges, Thermistor, Thermocouples, LVDT, RVDT, Photoelectric transducer, Digital displacement transducer, Oxygen

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Sensors, Position sensors-Fuel metering/vehicle speed sensor and detonation sensor- Altitude sensor, Flow sensor, Solenoids. 5L

Electronic Fuel Injection and Ignition System: Introduction, Feed back carburetor system, Multi port injection, Ignition system controls, Electronic Ignition System, Advantage of Electronic Ignition System., Solid-State ignition system. 5L

Digital Engine control System: Engine cranking and warm up control, Acceleration enrichment, Integrated engine control system, Exhaust emission control engineering. 3L

Reference:

1. Judge. A. W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 1992
2. Young, A. P., & Griffiths. L., Automoboles Electrical Equipment, English Language Book Society & New Press, 1990.
3. Crouse. W. H., Automobile Electrical Equipment, McGraw Hill Book Co Lnc., New York, 1980.
4. Spreadbury. F. G. Electrical Ignition Equipment, Constable & Co. Ltd., London 1962.
5. Kholi. P. L., Automotive Electrical Equipment, Tata McGraw-Hill Co. Ltd. New Delhi, 1975.
6. J.B. Gupta., Electrical Machine.
7. Automotive hand Book, Robert Bosch, Bently Publishers, 1997.

AUE 703 (A) Combustion & Pollution Control in Automobile.

Contacts : 3L

Credit : 3

Introduction: General Scenario on automotive Pollution, Pollutants-sources-formation-effects-transient operational effects on pollution. 3L

Engine Combustion and Pollutant Formation: HC, CO, NO_x, Particulate Matters, Aldehyde emissions, Effect of operating variables on emission formation. 3L

Emission Control Efforts: Supply of fuel – establishment of national test centers, construction of road networks. 3L

Emission Standards : Evaluation of Emission Standards – Mandatory Tests for Emission measurement – Type Approval & Production Conformity Tests – Driving Cycles, Bharat Stages & Euro emission standards. 5L

Control Techniques for SI and CI: Design changes, optimization of operating factors, Control of Crankcase emission, Evaporative emission, Exhaust emission - exhaust gas recirculation, air injector PCV system, thermal reactors, catalytic converters. 8L

Test Procedure & Instrumentation for Emission Measurement: Test procedures- Measurements of invisible emissions -ORSAT apparatus, NDIR analyzer, Flame ionization detectors, Chemiluminescent analyzer, Gas analyzer, Measurements of visible emissions – Comparison methods & Obscure methods - Smoke meters, Emission standards. 10L

Reference:

1. B.P. Pundir, “Engine Emissions”, Narosa Publishing House, 2007.
2. V. Ganesan, Internal Combustion Engines, Tata McGraw Hill Co., 2004.
3. K.K. Ramalingam, “Automobile Engineering”, Scitech Publications Pvt. Ltd., 2005
4. Amitosh De, “Automobile Engineering”, Galgotia Publications Pvt. Ltd., 2004
5. Dr. N.K. Giri, “Automobile Mechanic”, Khanna Publishers, 2006
6. Heywood. J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co., 1995.
7. Automobiles and Pollution SAE Transaction, 1995.

AUE703(B): ROBOTICS AND ROBOT APPLICATIONS

Contacts: 3L

Credit: 3

INTRODUCTION: Robot definition, Robotic systems - Its role in automated manufacturing; Robot anatomy; Robot classifications and specifications; Basic Robot motions -Point to point control, Continuous path control. 4L

COMPONENTS AND OPERATIONS: Robot kinematics, Forward and Reverse transformation, Homogeneous Transformations. Robot Actuators and Control; Pneumatic, Hydraulic and Electrical drives and Controls used in Robots. Robot End-effectors, Mechanical, Magnetic and Vacuum Grippers, Gripping forces RCC and Design features of grippers. 14L

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SENSING AND MACHINE VISION: Robot Sensors, Different types of Contact and Non-contact Sensors; Robot Vision and their interfaces. 5L

ROBOT PROGRAMMING: Robot Languages and Programming Techniques. 8L

INDUSTRIAL APPLICATIONS: Applications of Robots in Materials Handling, Machine loading/unloading, Inspection, Welding, Spray painting and Finish coating, and Assembly, etc. 5L

Reference:

1. Industrial Robotic Technology - Programming and Application by M.P.Groover et. al., McGrawHill
2. Robotics for Engineers by Y.Koren, McGrawhill.
3. Robots Modelling Control and Applications with Software by P.G.Ranky and C.Y.Ho, Springer Verlag Berlin.
4. Robotics Technology and Flexible Automation by S.R.Deb, TMH.
5. Robotics Control, Sensing, Vision and Intelligence by K.S. Fu., R.C. Gonzalez, C.S.G.Lee, McGraw Hill.

AUE 704(A) : Transport Management

Contacts: 3L

Credit : 3

Automobile Industry:

History and development of the automobile industry; Market trends; Current scenario in Indian auto industry; Auto ancillary industries; Role of the Automobile industry in National growth – Society/ Association and Partnership. 3L

Vehicle maintenance

Vehicle Maintenance: Objectives of Maintenance; Type of Maintenance -Scheduled and unscheduled maintenance - Planning and scope - Evaluation of PMI programme – Work scheduling - Overtime - Breakdown analysis - Cost of Operation - Maintenance Cost; Indirect & Direct Cost. Preventive maintenance system in transport industry- tyre maintenance procedures- Causes for uneven tyre wear; remedy maintenance procedure for better fuel economy, Fleet maintenance programme. 4L

Motor vehicle Act:

i) Driving licence: Necessity; age limit to obtain D.L; learners D.L; permanent D.L: grant; restrictions; renewal; endorsement; disqualification; suspension; fees; documents; educational qualifications required for driving two wheelers, cars, trucks; buses; oil tankers; carriers; driving on hills; Driving schoolbus: requirements; Effectiveness of different DLs; Maintenance of state registers of D.L; Conductors licence: necessity; grant; age limit; disqualifications; revocation; uniforms.

ii) Vehicle registration: Necessity; area of registration; time given for registration; format and documents to be attached and fees; period of registration; renewal; suspension; Temporary and permanent registration; vehicle fitness; refusal; NOC; registration for embassy vehicles; production of vehicle at the time of registration; Migration of vehicle from one state to other; Hire purchase; lease or hypothecation; transfer of registration on sale; removal of hypothecation clause; Transfer of ownership; Change of residence or place of business; death of owner; sale or purchase; Alteration in motor vehicle; age limit of vehicles; attachment of trailers; Maintenance of state registers of motor vehicles, uniforms.

iii) Motor insurance: Types; scope; limitations; liability of insurance Cost; insurance documents-claim form; estimate and bills; Necessity for insurance against third party risk; Requirements and limits of liability of insurance policies; Procedure to be followed for settlement of a claim after an accident; Surveyor and loss assessor; Surveyors report; Certificate of insurance: transfer; Compensation to third party deaths; Motor accident claims tribunal (MACT); Transit insurance.

iv) Vehicle permit & Traffic Regulation: Type of permit, Control of permit, traffic signs and traffic regulation: General provisions; Central Govt. rules and provisions regarding construction; maintenance of vehicle; emissions and safety provisions. Control of traffic – limits of speed; weight; length and height; power to restrict and erect traffic signs; design of traffic signs and its colour scheme; Signals; Safety measures for drivers and pillion riders; Precautions at unguarded railway crossings Schemes for investigation of accidents and wayside amenities; Traffic navigation; global positioning system. 8L

Vehicle parts, supply management and budget: Cost of inventory - Balancing inventory cost against downtime - Time management - Time record keeping - Energy management. Stores management – Function, Objectives, Type of Stores, Stocking & Issuing of Materials; Parts Control – Identification, Methods of Parts Control - Bin tag systems;

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Scientific Inventory Management – Classification of Items (ABC Analysis), Economic Order Quantity (EOQ); Budget - Budget activity, Capital expenditures, Classification of vehicle expenses. 7L

Fleet management and Data processing : Definition of fleet; Description of fleet- luxury cars; buses; trucks; cash vans; tanker, tipper, municipal, fire-fighting vehicles, breakdown service vehicle etc, Management of the Fleet; Data processing systems- Software, Modems ,Computer controlling of fleet activity. 3L

Scheduling and fare structure:

Route planning - Scheduling of transport vehicles - Preparation of timetable – preparation of vehicle and crew schedule - Costs, Fare structure – Fare concessions - Methods of fare collection - Preparation of fare table. 5L

Organization and Management Training and Operations:

Forms of ownership, Principle of transport management -Internal organization, centralized condition, decentralized condition (Engineering, traffic and administration), Staff administration: Industrial relation, Basic principles of supervising, Organizing time and people, Job instruction training, Training devices and techniques, Recruitment, Driver checklist, Tests for driver and mechanic, Welfare, Health and safety. 6L

References:

1. S.K. Sharma & Savita Sharma, “Industrial Engineering & Operation Management”, S.K.Kataria & Sons, 2007-2008.
2. S.L. Bhandarkar, “Vehicle Transport Management”, Dhanpat Rai & Co. (Pvt.) Ltd., 2006
3. Government Publication, The Motor Vehicle Act, 1989
4. JOHN Doke, " Fleet management ", McGraw Hill Co, 1984.
5. S. K. Srivastav,, “Economics of Transport”

AUE 704(B) : Modern Vehicle Technology

Contacts: 3L

Credit: 3

Trends in Automotive Power Plants: Fuel Cell Technology For Vehicles: What is fuel cell, Type of fuel cell, Advantages of fuel cell. Current state of the technology. Potential and challenges. Advantages and disadvantages of hydrogen fuel. Stratified charged / lean burn engines - Hydrogen engines - Electrical and Hybrid Vehicles- Magnetic track vehicles. 8L

Suspension, Brakes and Safety: Air suspension - semi-active and fully active suspension system- advantages of fully active suspension - Antiskid braking system- Retarders- Regenerative braking – safety cage - air bags - crash resistance - passenger comfort 6L

Vehicle Operation and Control: Fundamentals of Automotive Electronics – sensors, actuators, processors- Computer Control for pollution, noise and for fuel economy - Electronic Fuel Injection and Ignition system- Computer controlled carburetor system- Fuel Injection systems – SPFI, MPFI, DI, Pilot Injection, Unit Injection, CRDI; 7L

Two Wheeler Technology: DTS- i, DTS – Fi, DTS – Si; 3L

Latest Engine Technology Features: Advances in diesel engine technology, GDI, Variable Valve Timing, Electromagnetic Valves, Cam less engine 4L

X-By Wire Technology: What is X-By Wire, Advantage over hydraulic systems. Throttle by wire, Brake by wire, Steering by wire, advantages and disadvantages of drive wire technology 4L

42 Volt system: Need; benefits; potentials and challenges; technology Implications for the automotive industry; technological evolution due to adoption of 42 volt systems. 4L

References:

1. K.K. Ramalingam, “Automobile Engineering”, Scitech Publications Pvt. Ltd., 2005

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2. Dr. N.K. Giri, "Automobile Mechanic", Khanna Publishers, 2006
3. *Bosch Hand book*, 3rd edition, SAE, 1993.

AUE 705(A) : Non-Destructive Testing and Application

Contacts : 3L

Credit : 3

Non-Destructive Testing (NDT), Nondestructive Evaluation (NDE), Nondestructive Inspection (NDI)

:

Visual/ Optical Examination: Principal, Procedure, Instrument, Applications.	3L
Liquid Penetrating technique: Principle, Procedure, Applications.	3L
Magnetic Particle Testing : Principle, Procedure, Applications.	3L
Eddy Current Testing : Principle, Procedure, Applications.	3L
Ultrasonic Testing: Principle, Procedure, Applications.	3L
Radiography: Principle, Procedure, Applications.	3L
Thermography: Principle, Procedure, Applications.	3L
Acoustic emission testing : Principle, Procedure, Applications.	3L
Comparison and Selection of NDT Methods : Inspection of Raw materials, Inspection of Secondary Processing, In-service Damage Inspection.	3L
Common Application of NDT : a) Characterization of materials, b) Defect analysis, c) Case study.	
Codes Standards, Specifications and Procedures :	5L

References:

1. Non-Destructive Testing by Warren J.Mcgomnagle, McGrawhill.
2. Non-Destructive Testing by Baldev Raj et. al., Narosa Publishing House.

AUE- 705(B) Maintenance Engineering

Contact ; 3L

Credit: 3

Introduction: Importance of maintenance. Different types of maintenance.

Preventive Maintenance: Design of maintenance schedule for different equipment.

Break down Maintenance: Identification of faults, corrective measures, Method of maintenance.

Overhauling: Case study of engine overhauling, cooling system overhauling, Brake system overhauling.

Maintenance and repair of vehicle body passenger car, bus body coach.

Reference :

1. Herbert E. Fisher – Automotive Engines.
2. Hein Heister – Vehicle and Engine Technology.
3. Automobile Engineering. Vol – 1 – American Technical Society , Chicago.

AUE791: Engine Testing & Pollution Measurement laboratory (ETPM lab.).

Contact:3P

Credit: 2

Performance test of petrol & diesel (4-stroke & 2-stroke) engine both at full and part load.

Morse test of multi cylinder engine.

Heat balance of petrol and diesel engine. Measurement of exhaust emission by gas analyzer.

Diesel smoke measurement.

AUE792 :Project Part I.

Contact: 6P

Credit: 3

Students will be given either individual or group project involving manufacturing / design of automobile components to be supervised by faculty members. This is to expose the students to do work either individually or jointly. A report regarding the project will have to be submitted by the students.

AUE793 :Seminar II (Training).

Contact: 2P

Credit: 2

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Students will deliver seminar talk about the training , which they would doing in preceding summer vacation. They will have to submit a report regarding training.

AUE794: Seminar on Assign topics.

Contact: 2P

Credit: 1

Topic(s) regarding automobile engineering will be allotted to the students. Students will be asked to deliver seminar talk. They will be required to submit a report about the topic(s).

VIII Semester

AUE 801(HU): Engineering Economy and Financial Management

Contacts: 3L

Credit: 3

Engineering Economics:

Interaction between economic theory and production, concept of firm industry and economy. 1L
Consumer behavior, utility ,indifference curves and maps. 2L

Demand functions, Distinction between need, want & Demand. Types of demand and its exceptions.

Determinants of demand , Elasticity of demand along with problems. 2L

Concept of production function including Cobb- Douglas homogeneous function ,isoquant curves, law of production, law of supply ,economics of scale. 2L

Cost functions, short run total and average and marginal cost curves, Long run cost curves as envelope Curves with graphical explanations. 2L

Price and output decision under different markets like monopoly and perfect competition. 1L

Relationship between marginal revenue, price and elasticity. 1L

Financial accounting and Management:

Meaning and definition, Functions of Financial Management , accounting principles and concepts, Rules of double entry system, classifications of accounts- personal , real & nominal , journal –concepts and problems, Ledger posting and balancing of ledger, Trial balance problems, Trading and profit, loss accounts and balance Sheet without adjustments 6L

Ratio analysis – Meaning , purpose and limitation of ratio analysis, classification of various ratios. 2L

Working capital management along with operating cycle concept 3L

Capital budgeting –meaning ,concept and various evaluation methods (pay back period , NPV,IRR,PI) 5L

Break even analysis and marginal costing , Operating and financial leverages with problems. 3L

Cost Accountancy:

Definition and scope of cost accountancy. Types of costs, ascertainment of direct material and labour costs, Preparation of cost sheet . 2L

Overhead classification, methods of absorption of overhead –percentages methods, machine hour rate, man hour rate, and hourly rate method, Allocation and distribution of overheads. 4L

References:

1. Engineering Economy and financial Management by Seikh Salim and Partha Chatterjee (1st Ed. HPH)
2. Managerial economics and financial Analysis by Reddy and Chary(Sept. 2006, SCITECH)
3. Financial Management by A..P Rao. (10th Ed. 2009, EPH)
4. Financial Management by T.Ramachandran (3rd reprint 2007 SCITECH,)
5. Financial Management by S M Inamdar (18th Ed. 2008, EPH)

AUE802(A):Off Road Vehicles

Contacts: 3L

Credit : 3

Introduction: Classification of off road vehicles and their application.

1L

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- Shovels:** types of shovel. Construction details of diesel, electric and hydraulic shovel. Operating principals, operating cycle. Production capacity, cost of production. 10L
- Draglines:** types of Dragline. Construction, Operating cycle, Production capacity, cost of production. 6L
- Dumpers:** types of dumpers, construction and operation. Carrying capacity, matching with shovel capacity. 6L
- Road making and maintenance Machines:** Different types of Dozer, construction and operation dozer capacity grader and its construction. Application of dozer and grader. 6L
- Scraper:** construction operation and application. 3L
- Maintenance:** Maintenance of shovel, draglines, Dumpers, Dozers Graders and Scrapers. 4L

Reference

1. Abrosimov, K. Bran berg, A and Katayer, K. Road Making Machinery, M I R. Publishers Moscow. 1971
2. De, A. Latest Development of Heavy Earth Moving Machinery, Annapurna Publishers, Dhanbad 1995
3. Nichols, Herber L (Jr.), Moving the Earth, Galgotia Publishing House, New Delhi, 1962.
4. Rudnev, V. K. , Digging of soils by earthmover with Power Parts, Oxanian Press Pvt. Ltd., New Delhi, 1985

AUE 802(B):Automotive Air-conditioning.

Contacts : 3L
Credit : 3

Introduction of Air-conditioning system: simple vapour compression refrigeration system(V.C.R.S), , Driers, Lubricants, Refrigeration components and controls: components, condenser, evaporators, valves electrical circuits and devices, etc. 10L

Refrigerants: refrigerants and their properties, 3L

Psychometrics: human comfort, Psychometrics processes 5L

Air-conditioning equipment: components and controls, Installation of Air conditioning system in vehicle

Load estimation : heat transfer from exterior wall, passenger, Equipment and infiltrated air. Heater system for winter conditioning, Requirement of air and air distribution systems, duct design, duct systems. 8L

Power required for Air-conditioning system of passenger car, multi utility and commercial vehicle. 3L

Maintenance and repair: Air-conditioning system . 3L

References:

1. Stoecker W F & Jones J W Refrigeration & Air-conditioning. Tata. Mc Graw- Hill Publishing Company Limited, 1982
2. Giri N K Automotive Technology, Khanna Publishers 2004
3. De A Automobile engineering, Galgotia publishing house 2004

AUE 802(C) : CAD/CAM and modern manufacturing methods

Courses : 3L
Credits : 3

CAD: Design process and introduction to CAD,

Computer Graphics: concept of rasterisation, linear interpolation algorithms (DDA and Bresenham), different geometrical transformations,

Geometric modeling: wire frame, surface and solid modeling; different techniques of solid modeling, Free form surfaces – Bezier Surfaces, B-splines and NURBS.

Concept of a) Engineering analysis, b) Design Evaluation and Review with basics of Rapid prototyping, c) automated drafting.

Benefits of CAD

10L

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CAM: Introduction to Numerical control, Advantages and application, CNC (open loop and closed loop), DNC and Adaptive control Components of NC and CNC machine tool, Manual programming for lathe and Computer-Assisted Part Programming using APT.

10L

GT: Group Technology, different approaches of grouping – PFA Chart ; Rank order clustering , part classification and Coding system, composite part, different GT machine cells and layout ,From-To chart.

6L

FMS: comparison between automated GT and FMS, level of flexibility, Classification, different components, benefits, cutting tool management system in FMS

5L

CIM: Introduction, Functional classification of CIM database, Communication network in CIM, advantages.

5L

References:

1. Automation, Production Systems and Computer Integrated Manufacturing, M. P. Groover, Prentice Hall of India.
2. CAD/CAM, M.P.Groover and W.Zimmers Jr., Prentice Hall of India
3. CAD/CAM, P.N.Rao, Tata McGraw Hill Pub.
4. CAD, CAM, CIM by P.Radhakrishnan and S.Subramanyan, New Age International Publishers.

AUE 803 (A) Alternate Fuels and Energy Systems

Courses : 3L

Credits : 3

Introduction: Important properties(Calorific value , Flash point, fire point, pour point, cloud point,viscosity, Cetane and Octane number etc) of a fuel. General characteristics of SI & CI Engines fuels,estimation of petroleum reserve, need for alternate fuel, availability of various alternative fuels, general useof Alcohols,LPG,Hydrogen,CNG, LNG, Vegetable oils and Biogas.

5L

Solar Energy: Semiconductor and Photovoltaic effect, Solar Cell, advantages & disadvantages of SolarEnergy, application of solar energy.

3L

Alcohols: Properties as engine fuels, merits and demerits, alcohol as SI and CI engine fuel, alcohols with gasoline& diesel blends, Combustion characteristics and emission characteristics in engines.

5L

Natural Gas: Source and composition of CNG, Properties, advantages &disadvantages, performance and emission characteristics of CNG.

5L

LPG: Source, Compositions & Properties, Performance & Emission of LPG. Components of LPG kit .

Hydrogen: Production, Storage ,Handling, Safety ,properties and Performance of Hydrogen.

Vegetable Oils & Bio-diesel: Composition & Properties of various vegetable oils for engines;

10L Transesterification

reaction and bio-diesel production , Performance and emission characteristics of Bio-diesel.

Fuel Cells: Types of fuel cell, advantages & disadvantages and applications.

3L

References:

1. Maheswar Dayal, Energy today & tomorrow, I & B Horishr India,1982
2. V. Ganesan, Internal Combustion Engines, Tata McGraw Hill Co., 2004
3. SAE paper Nos.840367, 841156,841333,841334.
5. The properties and performance of modern alternate fuels SAE paper No 841210.
6. Bechtold.R.L. Alternative Fuels Guide Book, SAE, 1997.

AUE 803(B) : Quality Control and Reliability Engineering

Contacts: 3L

Credit:3

Quality concepts: Quality factors influencing quality, Dimensions of quality, Quality costs, Quality assurance, Quality planning, Organization for quality, Bureau of Indian standards, ISO 9000, Quality circles, KAIZEN-TQM concepts, Quality audit.

8L

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Statistical process control: Statistical tools used in quality in SQC, Variation in processes, Control charts, Variables, Attributes, Establishing and interpreting control charts, \bar{X} , R chart, p chart, c chart, u chart. Process capability, Analysis of process capability.

8L

Acceptance Sampling: Lot-by-lot sampling, types probability of acceptance in single, double, multiple sampling techniques, O.C curves, producers' risk and consumers' risk, AQL, LTPD, AOQL concepts, Standard sampling plans for AQL and LTPD-uses of standard sampling plans.

8L

Life Testing-Reliability System Approach: Life testing-objectives-classification, failure characteristics, Reliability definition, Reliability parameters, Mean time to failure, Maintainability and Availability, Failure data analysis, System reliability-series and parallel systems, Standby system, System reliability in terms of probability of failure-MTBF-Acceptance sampling based on reliability test OC curves.

12L

References:

1. Fundamentals of Quality control and Improvement by Amitava Mitra-2nd; PHI, 2000
2. Statistical Quality Control by D.C. Montgomery- 4th Edition; J. Wiley, 2002
3. Concepts in Reliability Engineering by L. S. Srinath, EWP, 1985.
4. Reliability: For Technology, Engineering, and Management by [Paul Kales](#), Prentice Hall, 1998.

AUE 803(C) : Finite Element Methods and its Application

Contacts : 3L

Credit : 3

Introduction : Review of various approximate methods in structural analysis. Stiffness and flexibility matrices for simple cases. Basic concepts of finite element method. Formulation of governing equations and convergence criteria.

5L

Discrete Elements: Use of bar and beam elements in structural analysis. Computer implementation of procedure for these elements.

5L

Continuum Elements: Different forms of 2D elements and their applications for plane stress, plane strain and axisymmetric problems.

8L

Consistent and lumped formulation. Use of local coordinates. Numerical integration.

ISO Parametric Elements: Definition and use of different forms of 2D and 3D elements. Computer implementation of formulation of these elements for the analysis of typical structural parts.

Solution Schemes: Different methods of solution of simultaneous equations governing static, dynamic and stability problems. General purpose software packages.

10L

References:

1. Segerlind. L.J., Applied Finite Element Analysis, Secon Edition, John Wiley and Sons Inc., New York, 1984.
2. Bathe.K.J. and Wilson. E.L., Numerical methods in finite element analysis, Prentice Hall of India Ltd., 1983.
3. Cook. R.D., Concepts and Applications of Finite Element analysis, 3rd Edition, John Wiley & Sons, 1989.
4. Krishnamurthy. C.S., Finite Element Analysis, Tata McGraw Hill., 1987
5. Ramamurthi.V., Computer Aided Design in Mechanical Engineering, Tata McGraw Hill, 1987.

Elective Papers – III

AUE 821 : Alternate Fuels and Energy Systems

Contacts : 4L

Credit : 4

Introduction: Important

AUE 891 : Automative Electrical & Electronics

Contact : 3p

Credits : 2

Characteristics of amplifiers, study of logic gates, Adder & flip flops. Study of SCR & ic timer.

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D/A and A/D converter. Assembly language programming exercise. Interfacing A/D converter and simple data acquisition. Interfacing stepper motor control and CRT terminal. Micro controller programming and interfacing. Study of battery charging system and setting of regulators and cutout.

AUE 892 : Auto scanning Laboratory

Contact : 3P

Credits : 2

Study of vehicle lifting machine.

Study and experiment on wheel balancing machine. Study & experiment on wheel alignment machine. Study & experiment on head light focusing of vehicles underbody inspection of vehicle either by lifting the vehicle or bringing the vehicle over under ground inspection pit.

AUE 893 : Project Part II

Contact : 12P

Credits : 6

Students will be allotted either new project or continuation of project I from previous semester individually or in a group. They will require to submit report regarding their project work.

AUE 894 : Comprehensive Viva- voce

Contact : 0-0-0

Credits : 2

Students are required to appear before a board of examiners, where they will be tested about the overall knowledge of the entire Automobile Engineering subjects and laboratory work.