Proposed Syllabus to be implemented from the Academic Year 2010
(uploaded as pre-information for the Workshop)

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First Year First Semester

Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
			L	T	P	Total	
A.	**THEORY**						
1	**HU**	English	2	0	0	**2**	2
2	**Basic Science**	Chemistry -1 (Gr-A) / Physics – 1 (Gr-B)	3	1	0	4	4
3		Mathematics-1	3	1	0	4	4
4	**Engg. Science**	Basic Electrical & Electronic Engineering – 1 (GrA+GrB)	3	1	0	4	4
5		Engg. Mechanics	3	1	0	4	4
Total of Theory						**18**	**18**
B.	**PRACTICAL**						
6	**HU**	Language Laboratory	0	0	2	2	**1**
7		NSS	0	0	2	2	**1**
8	**Basic Science**	Chemistry -1 (Gr-A)/ Physics – 1 (Gr-B)	0	0	3	3	**2**
9	**Engg. Science**	Basic Electrical & Electronic Engineering -1	0	0	3	3	**2**
10		Engg Drawing & Computer Graphics (Gr-1) / Workshop Practice (Gr-2)	1	0	3	4	**3**
Total of Practical						**14**	**9**
Total of Semester						**33**	**27**

First Year Second Semester

Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
			L	T	P	Total	
A. THEORY							
1	**Basic Science**	Basic Computation & Principles of Computer Programming	3	1	0	4	**4**
2		Physics - 1(Gr-A) / Chemistry-1(Gr-B)	3	1	0	4	**4**
3		Mathematics-2	3	1	0	4	**4**
4	**Engg. Science**	Basic Electrical & Electronic Engineering-II	3	1	0	4	**4**
5		Engineering Thermodynamics & Fluid Mechanics	3	1	0	4	4
6		Basic Environmental Engineering & Elementary Biology(2+1) *(Shifted to 2nd Year)*	3	0	0	**3**	**3**
Total of Theory						**24**	**20**
B. PRACTICAL							
7	**Basic Science**	Basic Computation & Principles of Computer Programming	0	0	3	3	**2**
8		Physics – 1 (Gr-A) /Chemistry-1 (Gr-B)	0	0	3	3	**2**
9	**Engg. Science**	Basic Electrical & Electronic Engineering- II	0	0	3	3	**2**
10		Workshop Practice (Gr-1) / Basic Engg Drawing & Computer Graphics (Gr-2)	1	0	3	4	**3**
Total of Practical						**13**	**9**
Total of Semester						**37**	**29**

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 communicate confidently and competently in English Language in all spheres.

Desired Entry Behaviour:

The students must have basic command of English to

1. Use at least 2500 General Purpose Words of English to talk about day-to-day events and experiences of life.
2. Comprehend Lectures delivered in English.
3. Read and understand relevant materials written in English.
4. 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 practical examples. 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 Phonetic symbols, stress, intonation etc.
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;

a) Developing Listening Comprehension through Language Lab Device
b) Developing sub skills of the Listening Skill by Conversational Practice Sessions
c) Giving focus on intelligent and advanced Listening Sessions e.g. Seminars, Paper Presentation, Mock Interviews etc.
d) Conducting Conversational Practice: Face to Face & Via Media

B. Developing Speaking Competence:

a) Helping students in achieving *clarity and fluency* ; manipulating paralinguistic features of speaking (*voice modulation ,pitch , tone stress , effective pauses)*

b) Conducting *Task oriented interpersonal ,informal and semiformal Speaking / Classroom Presentation*

c) 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

C. Developing Reading Comprehension Skill:

a) Developing Reading Skill through Technical & Non Technical Texts as well as Case Studies
b) Guiding students for Intensive & Extensive Reading

D. Developing Writing Competence:

a) Teaching Technical Report, Business Letters, (Expressing Ideas within restricted word limit through paragraph division , Listing Reference Materials through use of Charts , Graphs ,Tables , Using correct Punctuation & Spelling, Semantics of Connectives, Modifiers and Modals, variety of sentences and paragraphs
b) Teaching Organizational Communication: Memo, Notice, Circular, Agenda / Minutes etc.

SYLLABUS -- DETAILED OUTLINES

A. ENGLISH LANGUAGE GRAMMAR: 8L
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 2L
Practicing Technical & Non Technical Texts for Global/Local/Inferential/Referential comprehension; 4L

C. TECHNICAL COMMUNICATION
The Theory of Communication –Definition & Scope 2L
Barriers of Communication 2L
Different Communication Models 2L
Effective Communication (Verbal / Non verbal) 2L
Presentation / Public Speaking Skills 2L
(MCQ Practice during classes)

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 40

MARKS SCHEME (Written Examination) Total Marks 70

1. 10 Multiple Choice Questions(Communication & Eng. Grammar)
Marks 10
2. 3 Short Type Questions (Grammar) Marks 15
3. 3 Essay type Questions on Technical Communication (Technical Report / Business Letter / Job Application /
Organizational Communication etc,) Marks 45

MARKS SCHEME (Internal Examination) Total Marks 30

1. Testing Reading Ability Marks 5
2. Testing Speaking Ability Marks 5
3. Testing Listening Ability Marks 5
4. Testing Communicative Competence Marks 5
5. 2 Unit Tests (5+5=) Marks 10

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)

References:

D. Thakur: Syntax Bharati Bhawan , 1998
Dr. K. Alex: Soft Skills S. Chand & Company, 2009(Reprint 2010) Longman Dictionary of Contemporary English
(New Edition) for Advanced Learners

Basic Science

Chemistry-1(Gr-A/Gr-B)
Code:
Contacts: 3L + 1T = 4
Credits: 3.5/4

Chemical Thermodynamics

Concept of Thermodynamic system: 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: physical significance, mathematical expression (ideal and real gas), Enthalpy: physical significance, mathematical expression (ideal and real gas) 3L

C_p and C_V: definition and relation; adiabatic changes; reversible and irreversible processes; 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

2^{nd} law of thermodynamics; Joule Thomson and throttling processes; inversion temperature .

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

Work function and free energy: physical significance, mathematical expression for ideal and real gases obeying Vander waals' equation, Gibbs Helmholtz equation.

Condition of spontaneity and equilibrium reaction. 2L

Electrochemistry

Conductance

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration.

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 $AgNO_3$. 2L

Electrochemical cell

Cell EMF and its Thermodynamic significance, single electrode potentials and its applications; hydrogen half cell, quinhydrone half cell and calomel half cell.

Storage cell, fuel cell. Application of EMF measurement. 3L

Reaction Dynamics

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

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

Catalysis: Homogeneous catalysis and heterogeneous catalysis. 3L

Instrumental Methods of Analysis

Introduction to instrumental methods such as IR, UV,VIS, NMR and Mass spectrometry. 4L

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.

Polymerization processes (addition and condensation polymerization), degree of polymerization, Co-polymerization, stereo-regularity of polymer, crystallinity and amorphicity of polymer.

Preparation, structure and use of some common polymers: plastic(PE, PP, PVC, bakelite), rubber (natural rubber, SBR, NBR), fibre(nylon 6.6, polyester).

Conducting and semi-conducting polymers. 5L

Solid state Chemistry

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

Role of silicon and germanium in the field of semiconductor.

Transistor , rectifier and photovoltaic cells;

The process for preparing microminiaturized semiconductor devices: integrated circuits (IC) 5L

Industrial Chemistry

Solid, liquid and gases fuels; constituents of coal, carbonization of coal. Coal analysis: Proximate and ultimate analysis.

Classification of coal, petroleum (LPG, CNG), gasoline, octane number, aviation fuel, diesel, cetane number.

Natural gas, water gas, Coal gas, bio gas.

Bio-diesel. 5L

Or

Physics-1(Gr-B/Gr-A)
Code: PH-101
Contacts: 4L
Credit: 3+1

Module 1:

Oscillation:

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

1.2 Damped vibration – differential equation and its solution, Critical damping, Logarithmic decrement, Quality factor. 3L

1.3 Forced vibration – differential equation and its solution, Amplitude and Velocity resonance, Sharpness of resonance. Application 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 (No deduction necessary) 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 is necessary). Missing orders. Rayleigh criterion, Resolving power of grating and microscope. (Definition and formulae) 5L

Module 3:

Optics 2

3.1Polarization: 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

4L

3.2 Laser **:** Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient (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 Fiber optics:Optical Fibers – Core and cladding, total internal reflection step index and graded index fiber, Calculation of Numerical aperture and acceptance angle, losses in the fiber, applications.

2L

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 required) , Wien's law, Ultraviolet catastrophy, 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).

6L

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.

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

6L

Mathematics
Code: M101
Contacts: 3L + 1T = 4
Credits: 3.5/4

(All Streams except Optometry, Food Technology, and Pharmacy)

Note 1: The whole syllabus has been divided into three 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 the whole syllabus for alternatives.

Module I

Matrix-I: Introduction to matrices and their basic properties. Transpose of a matrix, verification of the properties of transposes: $\left[\left(A^T\right)^T = A,\ \left(cA+dB\right)^T = cA^T + dB^T,\ \left(AB\right)^T = B^T A^T\right]$, Symmetric and Skew symmetric matrices and their properties. **3L**

Matrix-II: Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of 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. **5L**

Matrix-III: 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 A^n, A^T, kA, A^{-1}, Caley-Hamilton theorem and its applications, Diagonalisation of a square matrix with real and distinct eigen values (up to 3rd order). **6L**

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 $\left(y_n\right)_0\Big)$. **2L**

Mean Value Theorems & Expansion of Functions: Rolle's theorem(statement only) and its application, Mean Value theorems – Lagrange & Cauchy (statement only) and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders (statement only) 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 a positive integer or a fraction (assuming that the remainder $R_n \to 0$ as $n \to \infty$ in each case). **5L**

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

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 of two variables and related problems, Lagrange's multiplier method – problems up to three variables only. **7L**

Module III

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**

Three dimensional co-ordinate geometry: Direction cosines, Direction ratios, Equations of plane, straight line; Elementary ideas of the equations of the surfaces like sphere, cylinder and cone. Concept of cylindrical polar and spherical polar coordinates. **5L**

Vector Analysis: Scalar and vector fields – definition and terminologies; dot and cross products, scalar and vector triple products and related problems; 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 48 Lectures

Suggested Reference Books

1. **Advanced Engineering Mathematics**, Erwin Kreyszig, (Wiley Estern)
2. **Engineering Mathematics**, Babu Ram, (Pearson Education)
3. **Advanced Engineering Mathematics**, H. K. Dass (S.Chand & Co.)
4. **Engineering Mathematics**, B.S. Grewal (S. Chand & Co.)
5. **A Text book on Engineering Mathematics**, Vol. I, Pulak Kundu (Chhaya Prakashani)
6. **Engineering Mathematics**, Vol. I, Pal & Das (U.N. Dhar)
7. **Higher Engineering Mathematics**, John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
8. **Mathematics Handbook**: for Science and Engineering, L. Rade and B. Westergren (5^{th} edition, 1^{st} Indian Edition 2009, Springer)
9. **Calculus**: M. J. Strauss, G. L. Bradley and K. L. Smith (3^{rd} Edition, 1^{st} Indian Edition 2007, Pearson Education)
10. **A text Book of Engineering Mathematics-I:** S. K. Adhikari (Dhanpat Rai and Co. (P) LTD)
11. Engineering Mathematics: S. S. Sastry (PHI, 4^{th} Edition, 2008)

Subject Name: MATHEMATICS

Code: M 101A

Contacts: 3L +1T = 4

Credits: 3

(For Optometry, Pharmacy and Food Technology)

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

Note 2: <u>Structure of the question paper</u>

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Module I

Matrix-I: Introduction to matrices and their basic properties. Transpose of a matrix, verification of the properties of transposes: $\left[\left(A^T \right)^T = A,\ \left(cA + dB \right)^T = cA^T + dB^T,\ \left(AB \right)^T = B^T A^T \right]$, Symmetric and Skew symmetric matrices and their properties. **4L**

Matrix-II: Determinant of a square matrix, Minors and Cofactors, Product of determinants. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties. **8L**

Matrix-III: Solution of simultaneous linear equations using Cramer's rule and Matrix inversion method. **4L**

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). **4L**

Mean Value Theorems & Expansion of Functions: Rolle's theorem(statement only) and its application, Mean Value theorems – Lagrange & Cauchy (statement only) and their application, Taylor's theorem with Lagrange's form of remainder (statement only) and its application. Expansion of functions by Taylor's and Maclaurin's theorem (for the functions exp(x), sin x , cos x, log (1+x), (1+x)^n only). **5L**

Integration: Standard integrals, Integration by rational fraction and integration of the following types: $\int \frac{dx}{a+b\cos x}$, $\int \frac{dx}{a\cos^2 x + b\sin x\cos x + c\sin^2 x}$, $\int \frac{a\cos x + b\sin x + c}{a'\cos x + b'\sin x + c'}dx$, $\int \frac{dx}{P\sqrt{Q}}$

where P is linear and Q is is either linear or quadratic. Definite integral and its properties, Definite integral as a limit of a sum. **7L**

Module III

Differential equation: Formation of differential equations, Degree and order of differential equations. **2L**

***Ordinary Differential Equation (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. **5L**

***ODE-Higher order and first degree*:** General linear ODE of order two with constant coefficients $\left(f(D)y = F(x),\ D \equiv \frac{d}{dx} \right)$, C.F. & P.I., D-operator methods for finding P.I. where $F(x) = e^{ax}, \sin ax, \cos ax, x^m, x^m e^{ax}, e^{ax}\sin ax, e^{ax}\cos ax.$

9L

Total 48 Lectures

Suggested Reference Books:

1. **Advanced Engineering Mathematics**, Erwin Kreyszig, (Wiley Eastern)
2. **Engineering Mathematics**, Babu Ram, (Pearson Education)
3. **Advanced Engineering Mathematics**, H. K. Dass (S.Chand & Co.)
4. **Engineering Mathematics**, B.S. Grewal (S. Chand & Co.)
5. **Higher Engineering Mathematics**, John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
6. **Mathematics Handbook**: for Science and Engineering, L. Rade and B. Westergren (5th edition, 1st Indian Edition 2009, Springer)
7. **Calculus**: M. J. Strauss, G. L. Bradley and K. L. Smith (3rd Edition, 1st Indian Edition 2007, Pearson Education
8. **Integral Calculus**: B. C. Das and B. N. Mukherjee, (U. N. Dhar & Sons Pvt. Ltd.)

Engineering Science

Basic Electrical and Electronics Engineering-I
Code: Contacts: 3L + 1T = 4
Credits: 3.5/4

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

Introduction:
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, mass action law and continuity equation. 5L

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. 3L

Simple diode circuits, load line, linear piecewise model; rectifiers: half wave, full wave, its PIV, DC voltage and current, ripple factor, efficiency. 2L

Introduction to Transistors:
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, early effect. 4L

Biasing and Bias stability: calculation of stability factor; CE, CB, CC and their properties; small signal low frequency operation of transistors; equivalent circuits h parameters as a two port network.
Transistors as amplifier: expression of voltage gain, current gain, input impedance and output impedance, frequency response for CE amplifier with and without source impedance. 8L

Introduction to Field Effect Transistor:
Structure and characteristics of MOSFET, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles. 5L

22L

Recommended Books:

Text:

1. Sedra & Smith: Microelectronics Engineering.
2. Millman & Halkias: Integrated Electronics.

References:

1. Malvino: Electronic Principle.
2. Schilling & Belove: Electronics Circuits.
3. Millman & Grabal: Microelectronics.
4. Salivahanan: Electronics Devices & Circuits.

Engineering Mechanics
Code:
Contacts: 3L + 1T = 4
Credits: 3.5/4

Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice
1.	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
2.	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
3.	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+1T	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
4.	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
5.	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
6.	Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadralateral, 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

Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice
7.	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
8.	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 -3rd Part Chapt: 1.1, 1.2.1 to 1.2.3, 1.2.6, 1.2.7
9.	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;
10.	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;
11.	Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy applied to particle and rigid bodies; 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

Practical

HU

HU 101 (Practical)
LANGUAGE LABORATORY
CONTACTS: 2P
CREDIT: 1
LANGUAGE LABORATORY PRACTICE

a) Honing 'Listening Skill' and its sub skills through Language Lab Audio device; 6P

b) Honing 'Speaking Skill' and its sub skills; 4P
c) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech; 4P

d) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone & Role Play Mode); 4P

e) 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; 6P

g) Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages;
Learning Global / Contextual / Inferential Comprehension; 6P

h) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions 6P

Total Practical Classes 38

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

NSS/NCC/NSO
Code Credits: 1

To be introduced.

Basic Science

Chemistry-1(Gr-A/Gr-B)
Code:
Contacts:
Credits: 2

1. Acid –base titration (estimation of commercial caustic soda)
2. Red-ox titration (estimation of iron using permanganometry)
3. Complexometric titration (estimation of hardness of water using EDTA titration)
4. Chemical Kinetics (determination of relative rates of reaction of iodide with hydrogen peroxide at room temperature (clock reaction).
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
   (a) determination of the strength of a given HCl solution by titration against a standard NaOH solution.
   (b) analysis of a mixture of strong and weak acid by strong base.
8. Preparation of a homo-polymer by free radical initiated chain polymerization and determination of its molecular weight by viscosity average molecular weight method.
9. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

Or

Physics-1(Gr-B/Gr-A)
Code:
Contacts:
Credits: 2

To be introduced.

Engineering Science

Basic Electrical and Electronics Engineering-I
Code: 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

List of Experiments:

1. Familiarization with Electronic Components such as Resistors, Inductors, capacitors, Diodes, Transistors etc. and Electrical Devices such as DC power supplies, multimeters, trainer kits etc. [1]
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc. [1]
3. Study on V-I characteristics of Junction Diode [1]
4. Study on V-I characteristics of Zener Diode [1]
5. Study on Half-wave and Full-wave Rectifiers [1]
6. Study on characteristics of Field- Effect Transistors [1]
7. Study on characteristics of BJTs [1]

Engineering Drawing & Computer Graphics(Gr-A)
Code: Contacts:
Credits: 3

1. LINES, LETTERING, DIMENSIONING, SCALES; Plain scale, Diagonal scale, Comparative scale, Vernier scale. - 6 hrs

2. GEOMETRICAL CONSTRUCTION AND CURVES; Construction of polygons, Parabola, Hyperbola, Ellipse, Cycloid, Involute, Archemedian spiral.- 6hrs.

3. PROJECTION OF POINTS, LINES, SURFACES; Orthographic projection- 1^{st} and 3^{rd} angle projection (More thrust to give on 1^{st} angle projection), Projection of lines inclined to planes, Projection of surfaces– Pentagon, Hexagon. - 6hrs

4. PROJECTION OF SOLIDS; Cube, Pyramid, Prism, Cylinder, Cone. - 3hrs

5. ISOMETRIC VIEW AND ISOMETRIC PROJECTION; Prism, Cylinder, Cone and simple solid objects. - 3hrs

6. SECTIONAL VIEWS OF SOLIDS, TRUE SHAPE OF A SECTION. - 3 hrs

7. THREADS; BSW and Metric. - 3hrs

8. DEVELOPMENT OF SURFACES; Cube, Prism, Cylinder, Truncated cone. - 3hrs

9. COMPUTER AIDED DRAFTING (Using AutoCAD and 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 & Sons).
- Venugopal, K., “Engineering Drawing & Graphics + AutoCAD”, New Age International

Or

Workshop Practice(Gr-B)
Code: Contacts:
Contact Hours Per week: 1L+3P= 4
Credits: 3

Objectives: To identify, specify and use various tools, instruments and materials and make appropriate jobs with own hands in fitting, pattern making and machining.

Theoretical

Foundry	3L:	definition; classification and application; patterns: purpose, material and design; moulding: classification & application, sand mould design; melting, pouring, solidification and extracting.
Joining (welding & brazing)	3L:	definition; major classification; principles; methods; applications. Gas welding; Arc welding; forge welding; friction welding; resistance welding; thirmit welding; TIG & MIG
Machining & Fitting	6L:	Definition & purpose of machining; Definition and functions of machine tools; Machining requirements; Cutting tools: material & geometry; Machining process parameter: cutting velocity, feed and depth of cut; Different machining operations

Practical

Foundry 9P:

i) making one simple pattern (wooden)
ii) making a sand mould with gating system
iii) melting & pouring – demonstration only

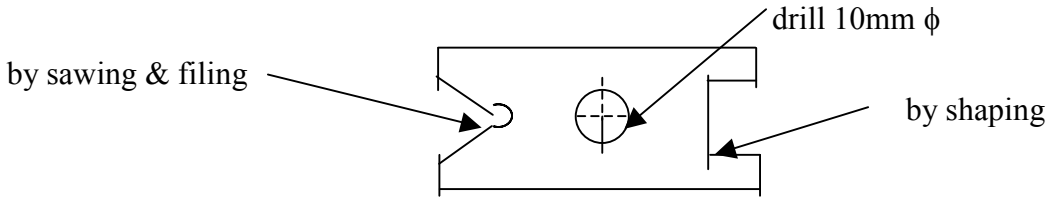
Welding & Brazing 9P:

i) Gas welding – demonstration & a simple job
ii) Manual arc welding – demonstration and a joint (butt joint)
iii) Resistance welding (preferably spot or butt welding);
iv) Brazing – joining two dissimilar metal pieces

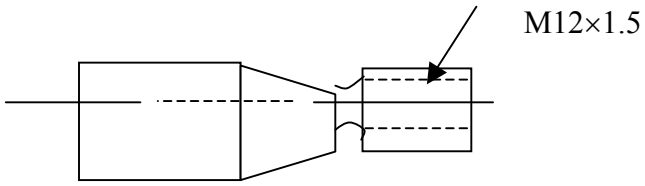
Machining & Fitting 18P:

(i) Fitting – cum machining

Prepare following shape from 50×30×6mm M.S. plate



(ii) A Turned job : Prepare from 20ϕ×50 mm M.S. rod



Books Recommended

1. Workshop Technology (Part 1) by Chapman, Viva
2. Workshop Technology (Part 1) by Hazra Choudhury, MP Publications

Second Semester

Theory

Basic Science

Basic Computation & Principles of Computer Programming
Code: M (CS) 212
Contacts: 3L + 1T = 4
Credits: 3.5/4

Note 1: The whole syllabus has been divided into four 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 the whole syllabus for alternatives.

Module-I

Errors and Approximation: Computer representation of numbers, Fixed and floating point arithmetic. Exact and approximate numbers, Errors: Absolute, Relative and Percentage errors; Truncation, Significant and Round-off error; General formula for estimation of error (statement only) and its application in fundamental operations of arithmetic. Overflow and underflow, Propagation and control of truncation errors; Pitfalls (hazards) in numerical computations (ill conditioned and well conditioned problems). **4L**

Interpolation: Forward and backward differences; Operators: $\Delta, \nabla, E, \delta, \mu$ and their relationships. Interpolation and Extrapolation, Error in interpolation (statement only), Newton's forward & backward Interpolation formula, Lagrange's Interpolation formula. **6L**

Module-II

Numerical Solutions of Algebraic and Transcendental Equations: Iterative methods, Condition of convergence (statement only), Order of convergence (definition only); Extraction of simple roots using Bisection, Secant, Regula-Falsi and Newton-Raphson methods; Order of convergence of these methods (statement only). **6L**

Solution of Simultaneous Linear Equations: Gauss Elimination method (reducing to upper triangular matrix), Gauss-Seidal Iterative method (statement of the sufficient condition for its convergence). **4L**

Module-III

Numerical Integration: Concept of numerical integration; Numerical integration using Trapezoidal rule (composite), Simpson's $\frac{1}{3}$ rule (composite) and statement of the corresponding orders of error; Weddle's rule with order of error (statement only). **5L**

Numerical Solution of Initial Value Problems of First Order Ordinary Differential Equations: Euler's Method; Modified Euler's Method; Runge-Kutta Method (4th order). **5L**

Numerical Computation of Eigen values & Eigen vectors: Computation of largest eigen value and the corresponding eigen vector of a real symmetric matrix using Power method. **2L**

Module-IV

Overview of C Programming Language: Character set, Constants, Variables and Data types; Operators and expressions, I/O statements, Control statements (branching and looping); Recursion; Function; Array; Pointers; Structures and Unions; Various types of File Access Methods: Sequential, Indexed Sequential, Random, Binary. (Programming examples of numerical methods (algorithms) mentioned in Modules I, II and III are to be implemented.) **16L**

Total 48 lectures

Suggested Reference Books:

1. **Numerical Mathematical Analysis**, J. B. Scarborough, (Oxford & IBH Pub. Co.)
2. **Introductory Numerical Analysis**, Dutta & Jana (Shreedhar Prakashani)
3. **Numerical Analysis and Programming with C**, Pulak Kundu (Chhaya Prakashani)
6. **Numerical Methods (Problems and Solution),** Jain, Iyengar, & Jain (New Age Int. (P) Ltd.)
7. **Numerical Methods in Computer Applications** – P.U. Wayse. EPH
8. **Programming with C**, Byron Gottfried (TMH)
9. **Programming in ANSI C**, Balaguruswamy (TMH)
10. **Computer Oriented Numerical Methods:** P. Thangaraj (PHI, 2008)
11. **Engineering Mathematics: S. S. Sastry** (PHI, 2008, 4th edition).
12. **Introduction to Numerical Analysis:** A. Gupta and S. C. Bose (academic Publishers, Calcutta).

Chemistry-1(Gr-B/Gr-A)
Code:
Contacts: 3L + 1T = 4
Credits: 3.5/4

Or

Physics-1(Gr-A/Gr-B)
Code:
Contacts: 3L + 1T = 4
Credits: 3.5/4

Mathematics
Code: M201
Contacts: 3L + 1T = 4
Credits: 3.5/4
(All Streams except Optometry, Food Technology, and Pharmacy)

Note 1: The whole syllabus has been divided into three 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 the whole syllabus for alternatives.

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). **7L**

***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. **9L**

Module II

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.

Tree: Definition and properties, binary graph, spanning tree, 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. **16L**

Module III

***Improper Integral*:** Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. **4L**

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. **12L**

Total 48 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:** Babu Ram, (Pearson Education)

7. **Advanced Engineering Mathematics:** H. K. Dass (S. Chand & Co.)

8. **Engineering Mathematics:** B.S. Grewal (S. Chand & Co.)

9. **A Text book on Engineering Mathematics:** Vol. II, Pulak Kundu (Chhaya Prakashani)

10. **Engineering Mathematics:** Vol. II, Pal & Das (U.N. Dhar)

11. **Higher Engineering Mathematics**: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)

12**. Calculus**: Strauss, Bradley and Smith (3rd edition, Pearson Education)

13. **Integral Transforms for Engineers**: L. C. Andrews and B. K. Shivamoggi (Prentice-Hall of India)

14. **Engineering Mathematics (Volume 2):** S. S. Sastry (Prentice-Hall of India)

Mathematics
Code: M201A
Contacts: 3L + 1T = 4
Credits: 3.5/4
(For Optometry, Pharmacy and Food Technology)

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

Note 2: <u>Structure of the question paper</u>

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 the whole syllabus for alternatives.

Module I

Three dimensional co-ordinate geometry: Three dimensional co-ordinates, Direction cosines, Direction ratios; Equations of planes and straight lines; Elementary ideas of the equations of spheres. **6L**

Vector Algebra: Preliminary ideas of vectors, Vector addition, Position vector of a point in 3-D, Scalar and vector products of two vectors. **4L**

Module II

Probability: Random experiment, Events, Sample space; Classical and axiomatic definition of probability; Complement of an event, Union and intersection of two or more events, Collectively exhaustive events, Mutually exclusive events; Theorem of total probability; Compound events, Conditional probability, Multiplication theorem of probability, Stochastically independent events; Baye's theorem. **10L**

***Probability Distribution*:** Random variable, Discrete and continuous random variables; Probability distribution, Probability mass function and probability density function, Distribution function; Expectation, variance and their properties, Binomial, Poisson, Uniform, Normal and Standard Normal distributions, Mean and variance of these distributions; Poisson distributions as a limiting case of Binomial distribution (without proof), Normal approximation to Binomial distribution (without proof). **8L**

Module III

Elements of Statistics: Introduction, Primary and secondary data, Population and sample, Census and sample survey, Representation of data – Chart and diagram, Graph, Bar diagram, Pie chart. **2L**

Frequency Distribution: Variables and attributes, Frequency distribution of attributes, Frequency distribution of discrete and random variables, Cumulative frequency, histogram, frequency polygon and histogram. **3L**

Measures of Central Tendency and Dispersions: Mean, Median, Mode, Quartiles and Percentiles; Range, Mean deviation, Standard deviation; Coefficient of variation. **4L**

Moments, Skewness and Kurtosis: Raw and central moments; Skewness and its measures; Kurtosis and its measures.

3L*Correlation and Regression:* Bivariate data and its analysis, Scatter diagram, Concept of bivariate distribution; Correlation between two variates, Karl Pearson's coefficients of linear correlation, Properties of correlation coefficient; Concept of Rank Correlation, Spearman's rank correlation coefficient. Interpretation and significance of regression, Linear regression–two lines of regression, Coefficients of regression and their properties. **8L**

Total 48 Lectures

Suggested Reference Books:

1. **Basic Statistics**: A.M Goon, M.K Gupta & B, Dasgupta, World Press

2. **Complete Business Statistics**: Amir D. Aczel & Jayavel Sounderpandian, Tata McGraw- Hill

3. **Fundamentals of Mathematical Statistics**: S. C. Gupta & V. K. Kapoor, S. Chand & Sons

4. **Basic Statistics**, B. L. Agarwal, New Age International (P) Ltd.

5. **Analytical Co-ordinate Geometry**: Ghosh & Chakraborty, U. N. Dhar & Sons

6. **Higher Engineering Mathematics**, John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)

9. A brief course in mathematical Statistics: E. A. Tanis and R. V. Hogg (Pearson Education)

Engineering Science

Basic Electrical and Electronics Engineering-II
Code:
Contacts: 3L + 1T = 4
Credits: 3.5/4

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 lone 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

Feed Back Amplifier and Oscillators:

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, Barkhausion criteria. 5L

Operational Amplifier:

Introduction to integrated circuits, operational amplified and its terminal properties.
Application of operational amplifier; inverting and non-inverting mode of operation, voltage summing, difference, constant gain multiplier, voltage follower, comparator, integrator, differentiator, Schmitt trigger; Logarithmic amplifier. 6L

Introduction to Digital Electronics:

Introduction to binary number; Basic Boolean algebra; Logic gates; Complex logic CKTs; Multivibrators; Introduction to flip flops and basic memory elements. 6L

Introduction to Instruments:

Digital Multimeter; CRO; Function Generator. 5L

22L

Recommended Books:

Text:

3. Sedra & Smith: Microelectronics Engineering.
4. Millman & Halkias: Integrated Electronics.

References:

5. Malvino: Electronic Principle.
6. Schilling & Belove: Electronics Circuits.
7. Millman & Grabal: Microelectronics.
8. Salivahanan: Electronics Devices & Circuits.

Engineering Thermodynamics & Fluid Mechanics
Code:
Contacts: 3L + 1T = 4
Credits: 3.5/4

A. ENGINEERING THERMODYNAMICS

Module 1 : Basic Concepts of Thermodynamics 2L

1.1 Introduction: Microscopic and Macroscopic viewpoints
1.2 Definition of Thermodynamic systems: closed, open and isolated systems
1.3 Concept of Thermodynamics state; state postulate.

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

Module 2 : Heat and Work. 2L

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

Module 3 :Ideal Equation of State, processes; Real Gas

3.1 Definition of Ideal Gas; Ideal Gas Equations of State. 3L
3.2 Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytrophic processes.
3.3 Equations of State of Real Gases: Vander Waal's equation; Virial equation of state.

Module 4: Properties of Pure Substances 3L

4.1 p-v & P-T diagrams of pure substance like H_2O
4.2 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.
4.3 h-s chart of steam (Mollier's Chart)

Module 5: 1st Law of Thermodynamics 5L

5.1 Definition of Stored Energy & Internal Energy
5.2 1st Law of Thermodynamics for cyclic processes
5.3 Non Flow Energy Equation
5.4 Flow Energy & Definition of Enthalpy
5.5 Conditions for Steady State Steady flow; Steady State Steady Flow Energy Equation

Module 6: 2nd Law of Thermodynamics 7L

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

Module 7: Air standard Cycles for IC engines 4L

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

Module 8: Rankine cycle of steam 4L

8.1 Simple Rankine cycle plot on P-V, T-S, h-s planes
8.2 Rankine cycle efficiency with & without pump work

30 L

(Problems are to solved for each module)

B. FLUID MECHANICS

Module 9: Properties & Classification of Fluids 2L

9.1 ideal & real fluids

9.2 Newton's law of viscosity; Newtonian and Non-Newtonian fluids

9.3 Compressible and Incompressible fluids

Module 10: Fluid Statics 1L

10.1 Pressure at a point

Module 11: Measurement of Fluid Pressure 2L

11.1 Manometers

11.1.1 U-tube

11.1.2 Inclined tube

Module 12: **Fluid Kinematics** 1L

12.1 Stream line

12.2 laminar & turbulent flow

12.3 external & internal flow

12.4 Continuity equation

Module 13: Dynamics of ideal fluids 2L

13.1 Bernoulli's equation

13.2 Total head; Velocity head; Pressure head

13.3 Application of Bernoulli's equation

Module 14: Measurement of Flow rate Basic principles 2L

14.1 Venturimeter

14.2 Pilot tube

14.3 Orifice meter

10 L

(Problems are to solved for each module)

Total (30L + 10L = 40L)

Engineering Thermodynamics

Text :

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

References :

1 Fundamentals of Engineering Thermodynamics - Van Wylin & Sontaag, 6th edn, John Willey

2 Engineering Thermodynamics – Russel & Adeliyi (Indian edition), OUP

3 Engineering Thermodynamics – Onkar Singhh, New Age International Publishers Ltd.

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: M (CS) 292
Contacts: Credits: 2

Developing C-programming for the following Problems:

1. ***Assignments on Interpolation:*** Lagrange's Formula, Newton forward & backward formulae.
2. ***Assignments on Numerical Integration:*** Trapezoidal Rule, Simson's 1/3 Rule, Weddle's Rule.
3. ***Assignments on Numerical solution of a system of linear equations:*** Gauss elimination, Gauss-Seidal.
4. ***Assignments on Numerical solution of Algebraic & Transcendental Equations:*** Bisection, Secant, Regular-Falsi, Newton Raphson

Chemistry-1(Gr-B/Gr-A)
Code:
Contacts:
Credits: 2

Or

Physics-1(Gr-A/Gr-B)
Code:
Contacts:
Credits: 2

To be introduced.

Engineering Science

Basic Electrical and Electronics Engineering-II
Code: 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

List of Experiments:

1. Determination of Input-Offset voltage, Input Bias current, Slew Rate of Op-Amps [1]
2. Determination of Common-Mode Rejection Ratio, Bandwidth, Offset null of Op-Amps [1]
3. Study of Op-Amps: Inverting Amplifiers, Non-Inverting Amplifiers, Adders, Integrators, Differentiators etc. [2]

3. Study on Logic-Gates, Realization of Boolean Functions using Logic Gates [1]

4. Study on the characteristics curves for transistor in common base (CB), common emitter (CE) and common collector (CC) mode [2]

Engineering Drawing & Computer Graphics(Gr-B)/Workshop Practice(Gr-A)
Code: Contacts:
Credits: 3