IInd Semester Curriculum Structure and Syllabus of F.Y.B.Tech. (Non Electrical Group)

Division 1 To 5 Non Electrical Group

Subject Code	***Subject Name***	Subject Category	Subject Type	Credit
MA-102	*Engineering Mathematics-II*	4 Credits subject	Theory	4
AS-102	*Engineering Physics-II*	3 Credits subject	Theory	3
CE-102	*Engineering Mechanics*	3 Credits subject	Theory	3
ET-102	*Basic Electronics*	3 Credits subject	Theory	3
CT-102	*Fundamentals of Computer Programming*	3 Credits subject	Theory	3
AS-106	*Engineering Physics-II LAB*	1 Credit Laboratory	Lab	1
CE-104	*Engineering Mechanics LAB*	1 Credit Laboratory	Lab	1
CT-104	*Computer Programming LAB*	2 Credits Laboratory	Lab	2
ML-102	*Professional Ethics*	1 Credit subject	Theory	1
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MA-102 ENGINEERING MATHEMATICS - II

Teaching Scheme	Examination Scheme
Lectures : 3hrs / week	Internal: 40 marks
Tutorial: 1 hr/week	End Sem. Exam: 60 marks

Objectives: The basic necessity for the foundation of Engineering & Technology being mathematics, the main aim is, to teach mathematical methodologies & models, develop mathematical skills & enhance thinking power of students.

Unit I : Review and some new techniques of integration (4)
Reduction formulae, Beta & Gamma functions with Properties(without proofs), Differentiation under the Integral sign (both rules (without proofs) with examples).

Unit II : Double Integrals (8)
Double integrals, Examples(Areas, Moments, Center of Mass), Change of order of integration with examples, Double integrals in Polar form.

Unit III : Triple Integrals (8)
Triple integrals in rectangular coordinates, Masses and moments in three dimensions, Triple integrals in spherical and cylindrical coordinates, examples.

Unit IV : Ordinary Differential Equations (6)
Basic concepts and ideas about ordinary differential equations, Exact differential equation, Integrating factors, First order linear differential equation, Bernoulli equation, Applications to basic electric circuits (L-R, R-C, L-C circuits), Orthogonal trajectories.

Unit V: Linear Differential Equations of the second order and their applications: (9)
Homogeneous linear equations of second order, Second order homogeneous equations with constant coefficients, Differential operators, Euler Cauchy Equations, Non-homogeneous Equations, Solution of non-homogeneous equations with constant coefficients using method of undetermined coefficients and method of variation of parameters. Modeling - Mass Spring Systems, Forced Oscillations, Resonance.

Unit VI: Higher Order Linear Differential Equations and Simultaneous Differential Equations **(**5)
Higher order homogeneous and non-homogeneous equations with constant coefficients, Application to elastic beams, Simultaneous differential equations.

Text Books

1. Thomas' Calculus (11th Edition), Pearson Education, Delhi.
2. Advanced Engineering Mathematics (7 Student Edition) by Erwin Kreyszig, Wiley Eastern Ltd.

Reference Books

1. Engineering Mathematics Vol I, II, III by P.N. Wartikar, J. N. Wartikar Pune Vidyarthi Gruha Prakashan.
2. Advanced Engineering Mathematics by C.R. Wylie, McGraw Hill Publications, New Delhi.
3. Advanced Engineering Mathematics (5th edition) by Peter V. O' Neil, Thomson.Brooks / Cole, Singapore.
4. Differential Equations With Applications and Historical Notes by George F Simmons
5. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill Publ.)

Course Outcome:

1. Students will be able to think logically & understand the basic concepts.
2. Demonstrate problem solving for application of multiple integrals in solving Engineering problems.
3. Prepare themselves to understand the more advanced topics in differential equations by learning basics of differential equations.

AS-102 ENGINEERING PHYSICS –II (NON E)

Teaching Scheme:
Lectures : 3 hrs/week

Examination Scheme:
100 marks: Assignments/Quiz -40 marks
End-Sem Exam- 60 marks

Unit 1

Electrodynamics: Differential and integral calculus: Concept of gradient, operator, divergence and curl Line, surface and volume integrals Introduction, Coulomb,s law, Electric Field, Continuous charge distribution,Gauss theorem,Magnetic fields and forces(introduction 5 min) Biot Savarts law, Ampers circuital law

Unit 2

Structure of Solids and its Characterizations :

Introduction
Crystalline state
Space lattice
Crystal structure basis and lattice
Unit cell and primitive cell in two dimensional lattice
Miller indices
Interplaner distance of lattice plane
Crystal systems (leniently) (cubic, monoclinic,……Triclinic)
Atomic radius (simple cubic, fcc, bcc)
No. of atoms in unit cell
Coordination number
Packing fraction
Reciprocal lattice
X-ray diffraction: Braggs law, x-ray spectrometer, analysis(Excluding laue method)

Unit 3
Solid state physics :
Free electron theory, Band theory of solids, Classification of solids on the basis of band theory, Fermi-Dirac probability function, Position of Fermi level in intrinsic (with derivation) and extrinsic semiconductors, Semiconductor conductivity, Hall effect

Unit 4
Thermodyanamics and statistical mechanics: Microscopic and macroscopic systems, Basic postulates of statistical mechanics, Probability ensembles, Partition function, Fermi dirac, Bose Einstein and Maxwell Boltzmann statistics. Reversible and irreversible processes, Laws of thermodyanamics; Zeroth, first , second, Third, Statisctcal interpretation of basis thermodynamic variables; energy, work, pressure, entropy, Helmotz free energy.

Unit 5

Thermal properties of solids : Thermal vibrations, specific heat of solids, Classical theory : Dulong petit law, Einsteins theory of specific heat, Debye's theory of specific heat:vibrational modes, density of vibrational mode, debye's approximation.

Unit 6

Magnetism and superconductivity : Origin of Magnetic Moment, Diamagnetism, Paramagnetism;Langevin's Theory, Ferromagnetism; Weiss Theory(Spontaneous magnetization and Domain hypothesis), Antiferromagnetism, Ferrimagnetism.
Principle of superconductivity, Meissner effect, Properties of superconductors, Type-I and Type-II superconductors.

Text Books:

- Solid State Physics, S. O. Pillai, New Age International Publishers.
- Fundamentals of statistical Mechanics, B. B. Laud, New Age International Publishers

Reference Books

- *Solid state electronic devices, Ben G. Streetman, Sanjay Banerjee* Pearson Prentice-Hall
- Semiconductor devices, physics and technology, S. M. Sze, Wiley
- Fundamentals of Statistical and Thermal Physics by F. Reif Levant Pub.
- Text Book of Engineering Physics by Avadhanulu & Kshirsagar, S. Chand Pub.

Course Outcomes: The student is expected to:

1. Understand Crystal structure analysis by X-ray diffraction
2. Understand Fermi-Dirac probability function, position of Fermi level in intrinsic and extrinsic Semiconductors, Semiconductor Conductivity
3. Fermi Dirac, Bose Einstein and Maxwell Boltzmann statistics
4. Statistical interpretation of basis thermodynamic variables; energy, work, pressure, entropy, Helmholtz free energy.
5. Langevin's Theory, Weiss Theory and Principles of superconductivity

CE-102 ENGINEERING MECHANICS

Teaching Scheme:
Lectures : 3 hrs/week

Examination Scheme:
T1 & T2 : 40 marks
End Sem. Exam: 60 marks

Objectives:
This is a basic engineering course common to all branches to inculcate in the students, problem solving abilities and to enhance their analytical abilities..

Unit 1 **(7 hrs)**

Introduction to the principles of mechanics, General force system, Moment of a force about a point and about an axis, Equivalent force systems: Resultant of a force system, 3 D and 2 D cases, Properties of surfaces: Centroid, Second moment of area, Products of inertia.

Unit 2 **(7 Hrs)**

Equilibrium: 3 D and 2 D cases, Beams, Trusses, frames and cables.

Unit 3 **(7hrs)**

Friction forces: Laws of Coulomb friction; simple contact friction problems; Belt friction, Principle of virtual work: Application to beams and simple mechanisms.

Unit 4 **(7 hrs)**

Kinematics of particles: Basic concepts; Rectangular components; Normal and tangential components; Radial and transverse components; Relative motion; Dependant motion: Kinematics of rigid bodies: Translational motion; Rotation about a fixed axis; General plane motion; Instantaneous centre of rotation.

Unit 5 **(7 hrs)**

Kinetics of particles: Newton's second law; Impulse momentum principle; Central impact; Energy principles.

Unit 6 **(7 hrs)**

Introduction, Free vibration, Torsional vibration, Energy methods, Forced vibration without damping under sinusoidal loading.

Text Books:

- Irving H. Shames, Engineering Mechanics, Prentice Hall, New Delhi 1997.
- Beer and Johnston , Mechanics for Engineers, Statics and Dynamics, McGraw Hill
- Timoshenko and Young, Engineering Mechanics, McGraw Hill Publication.

Course Outcome:

1. Demonstrate a working knowledge Engineering Mechanics.
2. Demonstrate problem solving ability for rigid body mechanics.
3. Exhibit various applications of Newtonian Mechanics

ET- 102 BASIC ELECTRONICS

Teaching Scheme:
Lectures : 3 hrs/week

Examination Scheme:
End Sem Exam – 60 marks
Quizzes: 40 marks

Objectives:
To create awareness amongst students regarding electronic and communication devices, circuits and systems used in industry, laboratories and day-to-day applications.

Unit 1 **(8 hrs)**

Semiconductor Devices and Applications: Introduction to P-N junction Diode, Full-wave bridge rectifier, capacitor filter, Zener diode and characteristics, Zener diode as voltage regulator, Regulated power supply, Introduction to BJT, BJT as a Single stage CE amplifier, Frequency response and bandwidth, LED and LCD Displays.

Unit 2 **(6hrs)**

Feedback and OPAMP: Principle of feedback, block schematic of feedback amplifier, Effect of negative feedback on amplifier parameters, Op-Amp as black box, Ideal Op-Amp, Study of practical op-amp IC 741, Linear applications: Inverting and Non-inverting, Summing, Difference amplifier, unity gain buffer.

Unit 3 **(6hrs)**

Timing Circuits and Signal Generators: RC-timing circuits, IC 555 and its applications as Astable and Mono-stable multi vibrators, Positive feedback, Barkhausen's criteria for Oscillations, R-C oscillators, IC 8038 as function generator IC.

Unit 4 **(6 hrs)**

Digital Electronics Fundamentals: Difference between analog & digital signals, Boolean algebra, Basic & Universal Gates, Symbols, Truth tables, Expressions, Logic simplification, Logic ICs, Adder/Subtractor, Multiplexers/de-multiplexers, Flip-Flops, Asynchronous counters.

Unit 5 **(6 hrs)**
Introduction to Microprocessors: Shift registers, Memory (RAM, ROM, PROM, EPROM), Architecture and instruction set of 8085 microprocessor, Programming examples for simple applications

Unit 6 **(8 hrs)**

Introduction to Electronic Communication Systems: Block schematics, modulation schemes, Wired and wireless channels, Broadcast radio, principle of Systems such as cellular telephony and its generations up to 4G, Data networks and Internet, Convergence.erformance parameters of an amplifier, Analysis of one circuit for each
Feedback topology.

Text Books:

- Malvino; Electronic Principles; PHI.
- R. P. Jain; Modern Digital Electronics; Tata Mc Graw Hill; Third Edition

Reference Books:

- Frenzel; Communication Electronics; WIE.
- Allen Mottershed; Electronic Devices & Circuits; PHI.

Course Outcomes:

1. Students will develop an understanding of the fundamental principles of electronics and will be able to apply this knowledge to analog and digital electronic circuits.
2. Students will get acquainted with types of memory and the timing circuits.
3. Students will have a good foundation on basic microprocessor- principles and practices.
4. Students can understand the concepts of wired and wireless communication systems.

CT-102 FUNDAMENTALS OF COMPUTER PROGRAMMING

Teaching Scheme:
Lectures : 3 hrs/week
Practical : 3 hr/week

Examination Scheme:
T1 & T2 : 40 marks
End Sem. Exam: 60 marks

Objectives:

- Introduction to computer technology with emphasis on computer programming
- Building logical approach to solve practical problems using computers

Unit 1 **(4 hrs)**

Introduction :

1. **Introduction to computers**
   - Brief history of computers
   - Computer hardware: various parts such as CPU, input/output devices etc.
   - Types of computers: single user (PC), multi-user/client-server etc.
   - General concepts related to software
     - System software, application software
     - Free and Open Source vs. Proprietary software
     - World-wide Web, e-mail, office applications, newsgroups etc.

2. **Overview of programming environments**
   - Example of a popular proprietary operating system such as Microsoft Windows
   - Example of a popular open source operating system such as GNU/Linux

Unit 2 **(10 Hrs)**

C' language syntax and basic problem solving

1. **Introduction to following 'C' language constructs:**
   - Basic program structure of a typical 'C' program
   - I/O statements
   - Variables and Constants
   - Operators
   - Control flow statements and blocks: if-else, switch
   - Loop statements: for, while, do-while, break and continue

2. **Application of the above constructs to solve the following elementary programming problems**
   - Exchanging the values of two variables
   - Summation of a set of numbers
   - Sine function computation

- Generation of the Fibonacci sequence
- Finding the square root of a number
- The greatest common divisor of two integers
- Generating prime numbers
- Raising a number to large power

Unit 3 **(8 hrs)**

Array Techniques, Functions and Problem solving using Arrays and Functions

1. 'C' language syntax related to Arrays and Functions

- Defining array variables (one, two and multi-dimensional)
- Defining and calling functions
- Global, local and static variables

2. Solving problems using Arrays and Functions

- Finding the maximum number in a set
- Array order reversal
- Removal of duplicates from an ordered array
- Selection sort
- Bubble sort

Unit 4 **(10 hrs)**

Introduction to Data Structures

1. 'C' syntax for following constructs/features

- Pointers and addresses
- Pointers and dynamic arrays
- Structures and Unions
- File handling

2. Programs using data structures

- Create a linked list
- Insert element into an existing linked list
- Delete element(s) from a linked list
- Traverse a linked list
- Reading (writing) structures from(to) a file

Unit 5 **(4 hrs)**

Recursive Algorithms

- Concept of Recursion
- Factorial computation
- Tower of Hanoi problem
- Finding (n, r) (Combinations of n things taken r at a time)
- Finding maximum number from an array of numbers

Unit 6 **(4 hrs)**

Introduction to Object Oriented Programming paradigm

1. Concepts related to Object Oriented Programming paradigm
   - Classes, Objects
   - Private and Public variables and methods
   - Inheritance

2. Sample programs using OO Programming language (C++/Java)

Text Books:

- How to solve it by Computer by R.G. Dromey, Pearson Education
- Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill
- Object-Oriented Programming With C++ By E. Balaguruswamy, Tata Mc-Graw Hill

Reference Books:

- The 'C' programming language by Kernighan and Ritchie, Prentice Hall
- Computer Programming in 'C' by V. Rajaraman , Prentice Hall

Course outcomes:

This course is one of the fundamental courses for all Engineering disciplines as computer programming has become an indispensable part of every branch of technology. This course

1. Introduces the fundamental concepts related to computer programming – development of step-by-step procedure to solve a complex problem by breaking it down into smaller manageable problems
2. Introduces 'C', one of the widely used higher level languages
3. Emphasizes the use of computer as a programmable device to handle repetitive tasks that make the problems tedious for human beings
4. Stresses on logic building, the skill that is independent of programming environment, required for programming.

AS-106 LABORATORY II – PHYSICS – II

Teaching Scheme
Practical: 2-hrs/week

Examination Scheme
Term work: 50 Marks
Oral + Experiment:50 Marks

List of Experiments:

1. Characteristic of GM counter
2. Measurement of e/m of an electron by Thomson's method
3. Band gap of a semiconductor by four probe method
4. Structural study of crystalline material
5. Hall effect in Semiconductor
6. Magnetoresistance measurement of semiconductor
7. Linear or mass attenuation coefficient by GM counter
8. Measurement of magnetic susceptibility by Quinke's method
9. Hysteresis loop trace
10. Study of Biot-Savart's law

Course Outcomes:

1. Measurement of resistivity and band gap of Semiconductors
2. Measurement of linear attenuation coefficient
3. Parameters for classification of magnetic materials
4. Basic understanding of electromagnetic force

CE-104 ENGINEERING MECHANICS LAB

Teaching Scheme :	**Examination Scheme**
Lab: 2 hrs/ week	Term work: 75 Marks
	Oral : 25 Marks

Objective

To verify the principles of mechanics experimentally and to develop in the students the skill of using graphical methods and computer programming for the solution of mechanics problems.

There shall be 6 experiments and 6 assignments (Based on the graphical methods and computer programming) on 6 units of the theory course.

Course Outcome:

1. Identify when theory applies and when theory is limited by simplifying assumptions
2. Identify reasons why actual measurements will differ from theoretical calculations
3. Use the laboratory equipment correctly and safely to perform all experiments

CT-104 FUNDAMENTALS OF COMPUTER PROGRAMMING LAB

List of Experiments :

Instructors will have flexibility in framing assignments so as to cover all the topics discussed in the class. The programs mentioned in the theory syllabus are listed below for ready reference:

- Exchanging the values of two variables
- Summation of a set of numbers
- Sine function computation
- Generation of the Fibonacci sequence
- Finding the square root of a number
- The greatest common divisor of two integers
- Generating prime numbers
- Raising a number to large power
- Finding the maximum number in a set
- Array order reversal
- Removal of duplicates from an ordered array
- Selection sort
- Bubble sort
- Create a linked list
- Insert element into an existing linked list
- Delete element(s) from a linked list
- Traverse a linked list
- Reading (writing) structures from(to) a file
- Factorial computation
- Tower of Hanoi problem
- Finding (n, r) (Combinations of n things taken r at a time)
- Finding maximum number from an array of numbers

Sample programs using OO Programming language (C++/Java

Course outcomes:

This laboratory course

1. Makes students familiar with computer systems as a programmer
2. Makes them familiar with debugging techniques
3. Enables them to see the usage of computer as a programmable device to handle repetitive and tedious tasks
4. makes them proficient in 'C', a widely used higher level language

ML-102 PROFESSIONAL ETHICS AND HUMAN VALUES

Teaching Scheme:
Lectures : 1 hrs/week

Examination Scheme:
T1 & T2 : 40 marks
End Sem. Exam: 60 marks

Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer .
- To appreciate ethical dilemma while discharging duties in professional life.

Unit 1 **(2 hrs)**

HUMAN VALUES : Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage – Empathy – Self-Confidence – Character .

Unit 2 **(3 Hrs)**

ENGINEERING ETHICS : Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment

Unit 3 **(3 hrs)**

ENGINEERING AS SOCIAL EXPERIMENTATION : Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

Unit 4 **(3 hrs)**

SAFETY, RESPONSIBILITIES AND RIGHTS : Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

Unit 5 **(3 hrs)**

GLOBAL ISSUES : Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-

Text Books:

- Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
- Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

Reference Books:

- Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
- Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
- John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
- Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

Semester II

Course Outcomes

1. Understand the need, basic guidelines, content and process for value education.
2. Understand the need of self and body, harmony of self with body.
3. Understand the harmony in the family, difference between respect and differentiation.
4. Understand the harmony in nature, interconnectedness and mutual fulfillment in nature, holistic perception of harmony.
5. Understand natural acceptance of human values, competence in professional ethics.