SEMESTER II

Second Semester		
Course Number	**Course Title**	**Lecture – Tutorial – Practical -Credits**
CH102	Chemistry-II	3-0-0-6
CS101	Introduction to Computing	3-0-0-6
CS110	Computing Laboratory	0-0-3-3
EE103	Basic Electronics Laboratory	0-0-3-3
MA102	Mathematics-II	3-1-0-8
ME101	Engineering Mechanics	3-1-0-8
PH110	Physics Laboratory	0-0-3-3
PH102	Physics – II	2-1-0-6
	Total L-T-P-C	**14-3-9-43**

MA 102 Mathematics II (3 1 0 8)

Pre-requisites: Nil

Linear Algebra: Vector spaces (over the field of real and complex numbers). Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices. Bilinear and quadratic forms.

Ordinary Differential Equations: First order ordinary differential equations, exactness and integrating factors. Variation of parameters. Picard's iteration. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

Power series methods for solutions of ordinary differential equations. Legendre equation and Legendre polynomials, Bessel equation and Bessel functions of first and second kind.

Systems of ordinary differential equations, phase plane, critical point, stability.

Texts:

1. K. Hoffman and R. Kunze, Linear Algebra, Prentice Hall, 1996.
2. T. M. Apostol, Calculus, Volume II, 2nd Edition, Wiley, 1969.
3. S. L. Ross, Differential Equations, 3rd Edition, Wiley, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall, 1995.
5. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th Edition,Wiley, 2001.

References:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.

ME 101 Engineering Mechanics (3 1 0 8)

Pre-requisites: Nil

Rigid body static: Equivalent force system. Equations of equilibrium, Free body diagram, Reaction, Static indeterminacy and partial constraints, Two and three force systems.

Structures: 2D truss, Method of joints, Method of section. Frame, Beam, types of loading and supports, Shear Force and Bending Moment diagram, relation among load-shear force-bending moment.

Friction: Dry friction (static and kinematics), wedge friction, disk friction (thrust bearing), belt friction, square threaded screw, journal bearings (Axle friction), Wheel friction, Rolling resistance.

Center of Gravity and Moment of Inertia: First and second moment of area and mass, radius of gyration, parallel axis theorem, product of inertia, rotation of axes and principal M. I., Thin plates, M.I. by direct method (integration), composite bodies.

Virtual work and Energy method: Virtual Displacement, principle of virtual work, mechanical efficiency, work of a force/couple (springs etc.), Potential Energy and equilibrium, stability.

Kinematics of Particles: Rectilinear motion, curvilinear motion rectangular, normal tangential, polar, cylindrical, spherical (coordinates), relative and constrained motion, space curvilinear motion.

Kinetics of Particles: Force, mass and acceleration, work and energy, impulse and momentum, impact.

Kinetics of Rigid Bodies: Translation, fixed axis rotation, general planner motion, work- energy, power, potential energy, impulse-momentum and associated conservation principles, euler equations of motion and its application.

Texts/References:

1. I. H. Shames, Engineering Mechanics: Statics and dynamics, 4th Ed, PHI, 2002.
2. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I - Statics, Vol II – Dynamics, 3rd Ed, Tata McGraw Hill, 2000.
3. J. L. Meriam and L. G. Kraige, Engineering Mechanics, Vol I – Statics, Vol II – Dynamics, 5th Ed, John Wiley, 2002.
4. R. C. Hibbler, Engineering Mechanics, Vol I and II, Pearson Press, 2002.
5. Andy ruina and Rudra Pratap, Introduction to Statics and Dynamics

EC 103 Basic Electronics laboratory (0 0 3 3)

Experiments using diodes and bipolar junction transistor (BJT): design and analysis of half -wave and full-wave rectifiers, clipping circuits and Zener regulators, BJT characteristics and BJT amplifiers; experiments using operational amplifiers (op-amps): summing amplifier, comparator, precision rectifier, astable and monostable multivibrators and oscillators; experiments using logic gates: combinational circuits such as staircase switch, majority detector, equality detector, multiplexer and demultiplexer; experiments using flip-flops: sequential circuits such as non-overlapping pulse generator, ripple counter, synchronous counter, pulse counter and numerical display.

References:

1. A. P. Malvino, Electronic Principles. New Delhi: Tata McGraw-Hill, 1993.
2. R. A. Gayakwad, Op-Amps and Linear Integrated Circuits. New Delhi: Prentice Hall of India, 2002.
3. R.J. Tocci: Digital Systems; PHI, 6e, 2001.

CS 101 Introduction to Computing (3 0 0 6)

Pre-requisites: Nil
Introduction: What is a program? Digital computer fundamentals; languages; OS. Imperative programming: Types; Operations; Expressions; Control-flow constructs; Functions and program structure; I/O operations; Files etc.
Basic data structure: Arrays; lists, pointers, records etc.
The C programming language will be used to describe the algorithms. Exposure to FORTRAN, programming environments will also be provided.

Text:

1. Rajaraman V., Computer Programming in C, Prentice Hall India, 1994.

Reference:

1. Kernighan B. and Ritchie D., The Programming Language, Prentice Hall India, 1995.

CS 110 Computer Laboratory (0 0 3 3)

Laboratory experiments will be set in consonance with the material covered in CS 101. This will include assignments in a programming language like C.

Reference:
Kernighan B., Ritchie D., The Programming Language, Prentice Hall India, 1995.

PH 102 Physics II (2 1 0 6)

Pre-requisites: Nil
Vector Calculus: Gradient, Divergence and Curl. Line, Surface and Volume integrals. Gauss's divergence theorem and Stokes' theorem in Cartesian, Spherical polar and cylindrical polar coordinates. Dirac Delta function. Electrodynamics: Coulomb's law and Electrostatic field, Fields of continuous charge distributions. Gauss's law and its applications. Electrostatic Potential. Work and Energy. Conductors, capacitors. Laplace's equation. Method of images. Dielectrics. Polarization. Bound charges. Energy in dielectrics. Boundary conditions. Lorentz force. Biot-Savart and
Ampere's laws and their applications. Vector Potential. Force and torque on a magnetic dipole. Magnetic materials. Magnetization, Bound currents. Boundary conditions. Motional EMF, Ohm's law. Faraday's law. Lenz's law. Self and Mutual inductance. Energy stored in magnetic field. Maxwell's equations.
Optics: huygens' principle. Young's experiment. Superposition of waves. Concepts of coherence sources. Interference by division of wavefront. Fresnel's biprism, Phase change on reflection. Lioyd's mirror. Interference by division of amplitude. Parallel film. Film of varying thickness. Colours of thin films. Newton's rings. The Michelson interferometer. Fraunhofer diffraction. Single slit, double slit and N-slit patterns. The diffraction grating.

Text:

1. D. J. Griffiths, Introduction to Electrodynamics, Prentice Hall, New Delhi, 1995.
2. F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill, 1981.

Reference:

1. R. P. Feynman, R. B. Leighton and M. Sands, The Feynman Lecture in Physics, Vol I, Narosa Publishing House, New Delhi, 1998
2. I. S. Grant and W. R. Philips, Electromagnetism, John Wiley, 1990.
3. E. Hecht, Optics, Addison-Wesley, 1987.

PH110 Physics laboratory (0 0 3 3)

Instructions to Students, Introduction to Error Analysis

Decay of Current in Capacitive Circuit, Forced and Damped Oscillations, Compound Pendulum, Study of Hall Effect, Speed of Light in Glass, Magnetic Field along the Axis of Coil, Fraunhofer Diffraction: Single Slit, Velocity of Sound in Air, Photovoltaic Effect: Solar Cell

CH102	Chemistry	3-0-0-6	Pre-requisites: Nil

Syllabus

Module 1: Polymer Chemistry

Unit 1: Polymer Chemistry in Everyday Life

1. Introduction to polymer chemistry.
2. Plastics, reinforced plastics & rubbers: production of household goods.
3. Polymers in medicine and drugs, surgery and cosmetics.

Module 2: Introduction to Chemical Biology

Unit 1: Biochemical evolution and cell

1. Molecular evolution of Life: Biochemical evolution, the first cell.
2. Cell Structure and types, Different organelles and function, cell division.
3. Basic concept of Embryonic stem cell.

Unit 2: Methods in Chemical Biology

1. Chemical Methods to synthesize artificial Proteins and peptides.
2. Chemical Methods to synthesize artificial DNA and RNA.

Unit 3: Recombinant DNA Technology

1. Recombinant DNA technology-concept of Cloning.
2. Concepts of Gene and genome, Gene transfer and Gene therapy
3. DNA fingerprinting: application in Forensic Science (crime investigation & parental testing).

Module 3: Chemistry of Environment

Unit 1: Environment and Ecosystem: Basics

1. Basic idea and definition of environment and ecosystem and important components.
2. Environmental protection and Hazards- importance and identification of sources.

Unit 2: Technology for Air and Water Pollution Control

1. Air Pollutants and their effect on Health.
2. Sources of air pollution- artificial and natural, “Clean Air Act”.
3. Technology for air pollution control: Particulate control, Scrubbers, catalytic converters, VOC abatement.
4. Water pollution categories: point and non point source.
5. Industrial and domestic waste water management.

Unit 3: Alternative Energy Sources

1. Biofuels: alcohol, hydrogen production technology, Biofuels from Jatropa.
2. Green energy: sources, efficiency and sustainability; Energy from Biomass and solid waste.
3. Renewable energy resources: solar, wind, hydro, geothermal, ocean, fuel cells.

Text Books

1. ***Polymer Chemistry,*** Malcolm P. Stevens, Oxford University Press Inc., 3rd Edition, 1998.
2. ***Chemistry of the Environment,*** Bailey, Clark, Ferris, Krause & Strong, 2nd Edition, Academic Press (Elsevier).
3. ***Environmental Engineering,*** R. Srinivasan, Prentice Hall of India Pvt. Ltd.
4. ***Biotechnology,*** B. D. Singh, Kalyani Publishers, 1st Edition, 2005.

References:

1. ***Renewable Energy Sources and Emerging Technologies,*** D. P. Kothari, Rakesh Ranjan and K. C. Saigal, Prentice Hall of India Pvt. Ltd.
2. ***Polymer Science and Technology*** – 2nd edition, Fried Joel R., PHI Learning.
3. ***Biotechnology: An Introduction,*** Susan R. Bernum, Wadsworth Pub. Co.