

# NATIONAL INSTITUTE OF TECHNOLOGY SIKKIM

## SEMESTER- I

**Course Code:** MA11101

**Course Title:** MATHEMATICS – I

L	T	P	C
3	1	0	4

### **Module I: Linear algebra**

Algebra of Matrices, rank and inverse of a matrix, solution of algebraic equations-consistency, Hermitian, skew Hermitian and unitary matrices, eigenvalues and eigenvectors. Vector space-linear dependence of vectors, basis, dimension, linear transformations. **9**

### **Module II: Numerical Analysis**

Numerical Analysis: finite difference, Newton's forward and backward interpolation formulae, Trapezoidal and Simpsons 1/3<sup>rd</sup> rules for numerical integration, Solution of polynomial and transcendental equation-bisection, Newton-Raphson and regula-falsi methods. **11**

### **Module III: Differential equations**

Introduction, formation of differential equation form a given n-parameters family of curve; solution using separation of variables, solution of homogeneous equation, First order differential equation-exact, integrating factor, linear and Bernoulli's equations, higher order differential equation with constant coefficients. **10**

### **Module IV: Partial Differential Equation**

Partial differential equation-formulation and classification of PDE; linear partial differential equation of the first order (Lagrange's method) non-linear PDE of the first order (Charpit's method). **10**

#### **Text Books:**

1. S. L. Ross, Differential Equations, 3<sup>rd</sup> edition, Wiley India, 1984.
2. I.N. Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1957.
3. G. Strang, Linear Algebra and Its Applications, 4<sup>th</sup> edn. Brooks/Cole India, 2006.
4. Conte and De Boor, Elementary numerical analysis: an algorithmic approach, McGraw- Hill, 1972.
5. K. Hoffman & R Kunze, Linear Algebra, 2<sup>th</sup> edn. Pearson Education India, 2003.
6. Numerical Methods By M. K. Jain, S. R. K. Iyengar & R. K. Jain

#### **Reference Books:**

## **NATIONAL INSTITUTE OF TECHNOLOGY SIKKIM**

1. 2. Hoffman K & Kunze R, Linear Algebra, Prentice Hall of India, New Delhi (1971).
2. S.J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> edn., Wiley India, 2009.
- 4.

## **Subject- Engineering Physics**

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>0</b>	<b>0</b>

### **Module 1 (Theory of Relativity)**

**[9]**

Special theory relativity: Frames of reference, Galilean Relativity, Michelson-Morley experiment, postulates of Special Theory of Relativity, simultaneity, length contraction, time dilation, velocity addition, mass energy relation.

### **Module 2 (Quantum Mechanics)**

**[16]**

Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wavefunction, Born interpretation, probability current, Expectation values, Free-particle wavefunction and wave-packets, Uncertainty principle.

Solution of stationary-state Schrodinger equation for one dimensional problems— particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator.

Numerical solution of stationary-state Schrodinger equation for one dimensional problems for different potentials. Scattering from a potential barrier and tunneling. Three-dimensional problems: Particle in three dimensional box and related examples.

### **Module 3 (Laser)**

**[7]**

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne), solid-state lasers (ruby), properties of laser beams: monochromaticity, coherence, directionality and brightness, applications of lasers in science, engineering and medicine.

### **Module 4 (Fibre Optics)**

**[10]**

Optical fibre, physical structure and basic theory, modes in optical fibres, step index and graded index fibres, losses in optical fibres, sources, applications of optical fibres in communication.

### **Reference Books:**

1. Engineering Physics, HK Malik and AK Singh
  2. Engineering Physics, DK Bhattacharya and Poonam Tandon
  3. D. J. Griffiths, Introduction to Quantum Mechanics
  4. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles by Eisberg and Resnick
  5. Optical Electronics, Ajoy Kumar Ghatak and K. Thyagarajan
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# NATIONAL INSTITUTE OF TECHNOLOGY SIKKIM

Course Code: EE 11101

L-T-P-C

Course Title: PRINCIPLES OF ELECTRICAL ENGINEERING

3-0-0-3

## Module 1: Introduction to Electrical Circuits

Electrical circuit components, types of sources – A.C./D.C., current source/voltage source, source transformation; applications of circuit theorems - KCL, KVL, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.

Single phase A.C. circuits - phasor representation, phase difference, impedance, admittance, conductance and susceptance, power in single phase circuits – instantaneous power, average power, active power, reactive power, apparent power, power factor, complex power; three phase A.C. circuits - phase sequence, power in three phase system. Measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, energy meter.

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## Module 2: Electric Motors

Principle of operation of electric generator and motors, DC and AC types of motors, special machines - working principle and types of stepper motors, working principle of DC and AC type servo motors, Universal motor, applications of stepper motors, servo motors, universal motors e.g. robotics, automation, electric vehicles.

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## Module 3: Power Systems

Structure and components of an electrical energy system – introduction to generation, transmission, distribution, conventional and non-conventional energy sources, renewable energy generation, DC power versus AC power, DC transmission versus AC transmission, preliminary protection systems – fuse, MCB, earthing, lightening arrestor.

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## Module 4: Sensors

Applications of sensors – inertial sensing, linear and rotary displacement sensors, acoustic and thermal sensing - ultrasonic sensor, infrared thermography, navigation sensors – GPS, motion capture systems, force and torque sensors, tactile and pressure, gas sensors, potentiometer, optical encoder, photoelectric sensor, Hall effect sensor, inductive and capacitive proximity sensor, pressure sensor - piezoelectric sensor.

15

## References:

1. A. K. Sawhney, A course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co.
2. A. Chakrabarti and S. Nath, Basic Electrical and Electronics Engineering, Tata McGraw-Hill Education.
3. J. W. Nilsson and S. Riedel, Electric Circuits, Pearson.
4. R. L. Boylestead and L. Nashelsky, Electronic Devices and Circuit Theory, Pearson.
5. M. M. Mano and M. D. Ciletti, Digital Design, Pearson.
6. E. W. Golding and F. C. Widdis, Electrical Measurements and Measuring Instruments, Wheeler.
7. C. S. Rangan, G. R. Sarma, and V. S. V. Mani, Instrumentation Devices and Systems, McGraw-Hill.
8. K. S. S. Kumar, Electric Circuits and Networks, Pearson.
9. S. Sedra and K. C. Smith, Microelectronic Circuits, Oxford University Press.
10. Fraden, J. Handbook of Modern Sensors: Physics, Designs, and Applications, Springer, 2010.
11. E. A. Doebelin, Measurement Systems: Application and Design, Mc-Graw Hill.

<b>CS11101</b>	<b>Computer Programming and Problem Solving</b>	<b>2-0-0</b>	<b>2</b>
<b>Module 1[3L]:</b> Problem Solving Skills, Identify the Problem, Analyze the problem, Identify Decision Criteria, Develop Multiple Solutions, Choose the Optimal Solution, Problem Implementing Solutions.			
<b>Module 2 [3L]:</b> Overview of C language, Basic Structure of C program, Constants, Variables and Data Types, User-defined Data Types, Operators and Expressions, Precedence and Associativity.			
<b>Module 3[10L]:</b> Input-Output Operations, Decision Making, Branching and Looping Statements, Arrays, Character Arrays and Strings.			
<b>Module 4[12L]:</b> User-defined Functions, Structures, Unions, Debugging Strategies.			
<b>Module 5[12L]:</b> Pointers, Dynamic Memory Allocations, File Management, Introduction to Preprocessor Commands and Macro Processing, argv, argc.			
<b>Books:</b>			
<ol style="list-style-type: none"> <li>1. C Programming by Deital and Deital.</li> <li>2. Programming in ANSI C, E. Balaguruswamy, 5<sup>th</sup> Edition McGraw Hill.</li> <li>3. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall.</li> <li>4. Programming With C, Byron Gottfried, McGraw Hill.</li> </ol>			

<b>CS 11201</b>	<b>Computer Programming Laboratory</b>	<b>0-0-4</b>	<b>2</b>
<ul style="list-style-type: none"> <li>• Input and Output programs</li> <li>• Control Loop programs</li> <li>• Conditional Execution programs</li> <li>• Structure and Nesting programs</li> <li>• Functions and Prototype programs</li> <li>• Array programs</li> <li>• Pointer programs</li> </ul>			
<b>Books:</b>			
<ol style="list-style-type: none"> <li>1. C Programming by Deital and Deital.</li> <li>2. Schaum's Outline of Programming with C by Byron Gottfried</li> <li>3. Programming in ANSI C by E. Balagurusamy</li> </ol>			

CS11102	Introduction to Computer Systems	2-0-0	2
<b>Module 1 [6L]:</b> Number System and Codes: Data Representation, Concept of Radix and Representation of Numbers in Radix $r$ with Special Case of $r=2, 8, 10$ and $16$ ; Conversion from Radix $r_1$ to Radix $r_2$ ; General Concept of $r$ 's and $(r-1)$ 's Complements; Signed and Unsigned Representation of Integer, 1's, 2's Complement and Floating Point and their Machine Representation. Binary Arithmetic; Character Representation-ASCII, EBDIC, UNICODE.			
<b>Module 2 [6L]:</b> Programming Languages and Translators – Concept of High-Level, Assembly and Low Level Languages, Relative Merits & Demerits, Working of Assembler, Interpreter and Compiler. Problem Solving through Algorithm, Flow-chart, Pseudo Code.			
<b>Module 3 [6L]:</b> Introduction: Stored Program Architecture of Computers and Block Diagram, Evolution of Processors (In terms of word Length & Speed, Instructions per Second), Hardware and Software, Classification of Computer System, Computer Architecture- RISC vs CISC, Concept of Primary & Secondary Memory, Storage Devices Classification, Hierarchy, Working Principle, Access Methods, Structure of Hard Disk System & Organization of Data; Cache Memory.			
<b>Module 4 [6L]: Introduction to Multiprogramming:</b> Multitasking, Multiprocessor, Time-sharing, Batch-processing, Interactive Computing; Distributed, Client-Server, Peer-to-Peer Systems. <b>Introduction to Operating System:</b> Need for Operating System, Functions of Operating System (Functions of Process Management, Memory Management, File Management and Device Management), An Introduction to Linux OS and Commands. Classification of Software's: System Software, Application Software. Open Source Software.			
<b>Books:</b> 1. Computer Fundamentals by P. K. Sinha & Priti Sinha, BPB Publications, 1992. 2. Introduction to Computers by Norton Peter, 4th Ed., TMH, 2001 3. Fundamentals of Computers by Reema Thareja, Oxford University Press, 2014. 4. Introduction to Computers by V. Raja Raman, PHI, 5. Introduction to Computers by Alex Leon & Mathews Leon, Vikas Publishing House, 1999. 6. Comdex Computer Kit by Vikas Gupta, Wiley Dreamtech, Delhi, 2004			

**HS11101 - English Language & Literature – 3-0-0-3****Module 1: Basics of English Grammar and Phonetics 12**

Synonyms, Antonyms, One word substitution, Idioms and Phrases, Article and Preposition, Subject Verb Agreement, Basics of phonetics

**Module 2: Language through Literature 13**

**Essays:** 1. *Of Studies* by Francis Bacon, 2. *On Doing Nothing* by J.B Priestley, 3. *English in India* by R. K. Narayan

**Poems:** 1. **Ode to the West wind** by P. B. Shelley 2. **Where the Mind is Without Fear** by Rabindranath Tagore 3. **The Tyger** by William Blake 4. **Marriage of True Mind** by William Shakespeare

**Module 3: Writing for practical purposes 10**

Film Appreciation, Poetry Appreciation, Letter Writing, Paragraph Writing, Essay Writing,

**Module 4: Non-detail Study**

**Wings of Fire:** A.P.J. Abdul Kalam

**Or**

**Malgudi Days:** R.K. Narayan

**Reference Book**

1. Swan, Michael. Practical English Usages. Oxford University Press.
2. Wood, F.T. A Remedial English Grammar for Foreign Students. Macmillan.
3. Pleasures of Reading: An Anthology of Poems, Orient Longman.
4. Selected Essays and Short Stories, Oxford University Press.
5. Selected Poems, Oxford University Press.

## **Engineering Physics Laboratory (PH11201)**

L	T	P	C
0	0	2	1

### **1. FOUR PROBE:**

To determine the band gap energy and the resistivity of semiconductor by Four Probe Method.

### **2. LASER DIODE:**

- i) To study the shape of the laser beam cross section and to evaluate beam spot size.
- ii) To find the divergence angle of laser beam.
- iii) To study the polarizing nature of laser.

### **3. MAGNETIC FIELD:**

- i) To study the variation of magnetic field with distance along the axis of a circular current carrying coil and to calculate diameter of the coil.
- ii) To study the principle of superposition of magnetic field and in particular to study the axial variation of the magnetic field due to both the coils when the distance between them is a) Less than the radius of the coils. b) Equal to it. c) More than it.

### **4. HALL EFFECT:**

To calculate the Hall Coefficient, Carrier Density, Carrier Mobility of the sample material.

### **5. NEWTON'S RING:**

Determination of the radius of curvature of the lower surface of a plano-convex lens by using Newton's Ring apparatus.

### **6. QUINCKE'S METHOD:**

Measurement of Susceptibility of a liquid or a solution by Quincke's Method.

### **7. PLANCK'S CONSTANT:**

Determination of Planck's Constant by using LED.

### **8. MAGNETORESISTANCE:**

Measurement of Magnetoresistance of Semiconductors.

### **9. To study the forward and reverse characteristics of a p-n junction and Zener Diode.**

### **10. To calculate the Coercivity, Saturation Magnetization, Retentivity of a sample by using Hysteresis Loop Tracer.**

# NATIONAL INSTITUTE OF TECHNOLOGY SIKKIM

**Course Code: EE 11201**

**L-T-P-C**

**Course Title: ELECTRICAL WORKSHOP**

**0-0-2-1**

## **Suggestive list of experiments:**

1. Familiarization with Electrical and Electronic components
  - a. Different types of cables/wires and switches and usage of those
  - b. Wiring tools, lighting and wiring accessories, various types of wiring
2. Assembling of a given Electrical circuit
  - a. On a bread board
  - b. Soldering components, solders, tools, heat sink
  - c. Complete one given circuit using PCB; e.g. doorbell
  - d. Wiring of a multi-pin extension board
3. Wiring for light (e.g. fluorescent lamp/CFL/LED light) or Fan
  - a. controlled by one switch
  - b. controlled by two SPDT switch
4. Electric shock phenomenon and preventions
  - a. Earthing and its construction
  - b. Usage of different types of fuses e.g. MCB, ELCB
  - c. Wiring of fluorescent lamp controlled by one switch from panel with MCB
5. Working with measuring devices
  - a. Ammeter, voltmeter, wattmeter and multi-meter
  - b. Single phase and three phase energy meters
6. Exploration of domestic appliances and components e.g. mixer machine, electric iron, fan motor, pump motor, battery
7. Wiring of backup power supply e.g. inverter for domestic installations
8. Hands on with Microcontroller and IoT devices e.g. PIC, ATMega, Arduino, Raspberry Pi and peripheral components
9. Hands on with sensors and development of applications as a short term project e.g.
  - a. Inertial sensors; applications - drone, control, navigation
  - b. Hall effect sensors, applications – current measurement, magnetic field intensity measurement
  - c. Piezoelectric sensors; applications – pressure measurement, force measurement, weight measurement
  - d. Ultrasonic sensors; applications – distance measurement, water level measurement
  - e. Infrared PIR motion sensor; applications – thermal imaging, military applications
  - f. Tactile and Pressure; applications – touch sensitive applications, pressure measurement
  - g. Gas sensors; application – smoke detection.

**Course Title: WORKSHOP PRACTICE**  
**Course Title: ME12201**  
**Pre-requisite: Nil**

**L-T-P-C**  
**0-0-3-2**

### Course Content

**Introduction to Mechanical Workshop:** Study of Workshop rules and safety considerations indifferent machinery usages and machine tools.

**Carpentry:** Study of tools and joints – planning, chiselling, marking and sawing practice, one typical joint- Tee halving/Mortise and Tenon/ Dovetail

**Fitting:** Study of tools- chipping, filing, cutting, drilling, tapping and threading about male and female joints, stepped joints- one simple exercise of single V joint for welding exercise.

**Sheet Metal work:** Study of tools, selection of different gauge sheets, types of joints, fabrication of a tray or a funnel

**Lathe Exercise:** Study of the basic lathe operations, a simple step turning exercise.

**Welding Practice:** Study and practice of manual metal arc welding (MMAW). Exercise of Butt joint/Lap Joint/Corner Joint/Tee Joints.

### Text Books/References

1. Chapman W.A.J., Workshop Technology. Parts 1 & 2, 4th Edition, Viva Books P. Ltd., New Delhi, 2002
2. Hajra Choudhury, Workshop Technology Vol 1 & 2, Media Promoters & Publishers Pvt. Ltd, Bombay, 2004
3. Welding Handbook. Miami, American Welding Society, 2000
4. Metals Handbook. Vol 6, Welding, Brazing & Soldering. Metals Park, Ohio, American Society of Metals, 1998

# NATIONAL INSTITUTE OF TECHNOLOGY SIKKIM

## SEMESTER-II

**Course Code: MA12101**

**Course Title: Mathematics-II**

L	T	P	C
3	1	0	4

### **Module I: Laplace and Fourier Transform**

Laplace and inverse Laplace Transform, Existence of Laplace Transform, Linear property, Convolution Theorem, Solution of ordinary differential equation by Laplace Transform.

Fourier series, Fourier transforms, properties of Fourier Transform, sine and cosine transforms  
Inverse Fourier Transform. 13

### **Module I: Vector Calculus**

Vector Calculus: Scalar and vector fields, level surfaces, directional derivative, Gradient, Curl, divergence, Laplacian, line and surface integrals, theorems of Green, Gauss and Stokes(statement only).

**8**

### **Module III: Probability**

Random experiments, sample space, events, probability and conditional probability, Baye's theorem, Probability space, random variables, probability distribution and density functions, expectation (mean and variance). Standard distributions: Binomial distribution, Poisson. Continuous distributions: uniform, normal and exponential. 10

### **Module IV: Single variable calculus**

Rolle's Theorem, Mean Value Theorem, Maxima and Minima, Sequences, Limits of a sequence and its properties, Series of positive terms, Necessary condition for convergence, Comparison test, D Alembert's ratio test, Cauchy's root test, Taylor Series. 9

### **Text Books:**

1. G. B. Thomas Jr. and R. L, Finney, Calculus and Analytic Geometry, 9<sup>th</sup> edition, Pearson Education, India, 1996.
2. Robert Bartle & Donald Sherbert, Introduction to Real Analysis, John Wiley & Sons(2014).
3. T. M. Apostol, Calculus- Vol 2, 2<sup>nd</sup> Edition, Wiley India, 2003.

## **NATIONAL INSTITUTE OF TECHNOLOGY SIKKIM**

4. D. Bhatta and L. Debnath, Integral Transforms and their applications, 3<sup>rd</sup> edn., CRC, 2014.

### **References:**

1. Johnson, R. A., Miller and Freund's Probability and Statistics for Engineers, 6th edition. PHI, 2004.
2. S. R. Ghorpade and B.V. Limaye, An Introduction to Calculus and Real Analysis, Springer India, 2006.
3. Levin R. I. & Rubin D. S., Statistics for Management, 7th edition, PHI, New Delhi, 2000.
4. S.M. Ross, Introduction to Probability and statistics for Engineers, 3rd edition, Academic Press, Delhi, 2005.

## **CY11101 / CY12101: ENGINEERING CHEMISTRY**

L	T	P	C
3	0	0	3

### **Module 1: Energy and Fuels (14 hours)**

Sources of Energy, Fuels- classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants. Renewable sources of Energy (Solar Energy): Photovoltaic Cells and how it converts Light into Electricity.

### **Module 2: Electrochemistry and Corrosion: (8 hours)**

Basic idea about Electrode Potentials and Cells, Galvanic vs. Electrolytic Cell, Nernst Equation, Battery, Fuel Cells. Corrosion-types, Electrochemical theory, Different forms of wet corrosion, Galvanic (or Corrosion) series, Corrosion control, Techniques of metal Coating (Organic, Inorganic), Cathodic protection, Corrosion inhibitors.

### **Module 3: Solid State (12 hours)**

The solid state, Structures of Simple ionic compounds, Close packing in solids, bcc, fcc, structures of rock salt - cesium chloride- spinel - normal and inverse spinels, Stoichiometric Defect, controlled valency & Chalcogen semiconductors, Non-elemental semiconducting Materials, Preparation of Semiconductors-steps followed during the preparation of highly pure materials and further treatments. Semiconductor Devices-p-n junction diode. Steel and important alloys.

### **Module 4: Nanoscience & Nanotechnology (8 hours)**

Introduction, scope of Nanoscience & Technology, Types of nanomaterials, Categories of nanomaterials, Nanotechnology, Quantum dots, Organic nanoparticles, Inorganic-organic Hybrid nanoparticles, Nano-intermediates, Nanocomposite materials.

#### **Text Books**

T1: Wiley Engineering Chemistry, 2nd Edition, Wiley (India)

T2: Engineering Chemistry, 2nd Edition, O.G. Palanna, McGraw Hill Education (India) Pvt. Ltd., Chennai, 2017

#### **Reference Books**

R1: Engineering Chemistry, P.C. Jain, M. Jain, Dhanpat Rai Publishing Company, New Delhi, 2005.

R2: A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, Dhanpat Rai & Co, New Delhi, 2007.

R3: Engineering Chemistry, B.K. Sharma, Krishna Prakashan Media (P) Ltd

# **Electronics Devices and Circuits (EC12101)**

L	T	P	C
3	0	0	3

## **Module 1:**

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

## **Module 2:**

PN junction— pn junction diode, V-I characteristics of junction diode, static and dynamic resistance, diode capacitance. Applications- Rectifiers, Clipper and clamper circuit, Voltage regulator, Zenor diode, LEDs, LCD, Photo diodes, Solar cells.

## **Module 3:**

Bipolar Junction Transistors (BJT): PNP and NPN transistors, basic transistor action, input and output characteristics of CB, CE and CC configurations.

Uni-junction Transistor (UJT): Construction, working and I-V characteristics of UJT.

Thyristor Devices: Basic construction and Characteristics of Thyristor,

Semiconductor Controlled Device (SCR): Characteristics and two transistor model of SCR.

Field Effect Transistors (FET): Construction of JFET, idea of channel formation, pinch-off voltage, Transfer and output characteristics.

MOSFET: MOS Diode, Basic Construction of MOSFET and working, I-V characteristics, enhancement and depletion modes. Complimentary MOS (CMOS).

## **Module 4:**

Introduction to Operational Amplifiers: Ideal Op amp, Inverting and Non inverting opamp circuit, Op amp application.

## **References:**

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4. Solid State Electronic Devices by Streetman and Banerjee.
5. Millman'S Integrated Electronics 2E, Tata McGraw-Hill Education.

## Second Semester

CS12101	Foundation of Computing	3-0-0	3
<b>Module 1 [12L]:Linear Data Structure</b> Introduction of Data Structure; Need and Applications; Abstract Data Type; Dynamic Memory Allocation; Array; Linked List; Stack and Queues; Priority Queues - Implementation and Applications.			
<b>Module 2 [6L]: Sorting, Searching;</b> Sorting techniques- need; Types of Sorting, selection sort, Quick Sort; Searching techniques: need; Linear Search, Binary Search; Implementation and Applications of all.			
<b>Module 3[6L]:</b> Introduction to Logic: Propositional Logic, Predicate Logic.			
<b>Module 4[8L]:Computer Networks and Internet Basics</b> Computer Networks and Internet, Categories of Networks: Wired, Wireless, Sensor, LAN, WAN, PAN; network topologies need, and type, network switching: Packet and Circuit Switching, Protocol Layers and their functions (example protocol on each layer), Application Layer Protocols, E-mail, FTP, WWW and HTTP. Introduction to Cyber Security and Forensics with needs.			
<b>Module 5[8L]:</b> Introduction to Machine Learning, Artificial Intelligence and Fuzzy logic, Internet of Things, Natural Language Processing, Big Data, Mobile Computing, Cloud Computing.			
<b>Books:</b> <ol style="list-style-type: none"><li>1. Data structures in C by H. Sahani</li><li>2. Computer Networking: A Top-Down Approach Featuring Internet by J. F. Kurose and K. W. Ross, 3/e, Pearson Education, 2005.</li><li>3. Machine Learning by Tom Mitchel, TMH</li></ol>			
<b>Reference:</b> <ol style="list-style-type: none"><li>4. Data Structures by Tanenbaum</li><li>5. Data Communications and Networking by Forouzan</li></ol>			

L	T	P	C
2	0	0	2

**Module 1: Basics of Environmental Studies**

Multidisciplinary nature of environmental studies. Renewable and non-renewable resources and problems associated with overexploitation – forests, water, minerals, food, energy, land. Role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles. Concept of an ecosystem, Structure and functions of an ecosystem, Producers, consumers and decomposers, Energy flow, Ecological succession, Food chains, food webs and ecological pyramids, Types, characteristic features, structure and functions of the following ecosystems – forests, grasslands, deserts, and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity – Definition, Genetic, species and ecosystem diversity. Conservation : general information, types and importance. Biogeochemical cycles: Carbon, Nitrogen, Sulfur etc.

**Module 2: Environmental Pollution and Protection**

Environmental pollution – Definition, causes, effects and control measures, Types of pollution: (general) for water, soil, marine, noise, nuclear and thermal pollution. Bioplastics and advantages, Air pollution and control – sources, pollutants and their health effects, particulate and gaseous pollution control devices (fundamentals). Solid waste management – Generation, on site handling and storage, transfer and transport, processing, resource recovery, treatment and disposal. Role of an individual in prevention of pollution. Case studies. Social Issues and the Environment - from unsustainable to sustainable development. Environmental ethics - Issues and possible solutions. Legislation in India - Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Other acts, Issues involved in enforcement of environmental legislation, Public awareness.

**Module 3: Human Population Health and Environment**

Human population and the environment – Population growth and characteristics , commonly occurred diseases (air borne, water borne etc. ), Family welfare programme, Environment and human health, Human rights, HIV/AIDS, techniques of water purification electro-dialysis, reverse osmosis, water conservation, rain water harvesting etc.

**Module 4: Disaster Management**

Basic objective of Disaster and safety management, floods, earthquakes, cyclone and landslides: Causes, Effects and Management, Rules and regulations of safety departments, Safety activities of the ILO (International Labour Organization). National Safety Rules and Practical applications.

## **HS12101 - Human Values and Effective Communication – 3-0-0-3**

### **Module1:Human Values through Literature** 10

Source Material: Any one of the prescribed novels:

1.**Kanthapura** by Raja Rao

2.**The Guide** by R.K. Narayan

Value of self, others and society, culture – Indian and Western, gender empowerment, nationalism, humanism, professionalism, honesty, happiness, integrity, reliability, spirituality, compliance with law and social norms.

### **Module 2: Communication** 12

Communication: definition, process of communication, types and forms of communication, barriers to communication, role and importance in the corporate world, tools of communication and group discussion.

### **Module 3: Communication for practical purposes** 13

Developing reading, writing, listening and speaking skills, Importance & barriers to them.

Interview: definition, types, forms, plan and preparation.

Presentation: definition, types and forms.

Proposal: definition, types and forms.

Public speaking: types and forms.

Visual communication: types and forms

### **Reference Book:**

1. Raman, M & S. Sharma. *Technical Communication: Principles and Practice*. OUP, New Delhi, 2015.
2. Kumar, S & Lata, P. *Communication Skills*. OUP, New Delhi, 2015
3. Rao, Raja. *Kanthapura*. Orient Paper Back, New Delhi, 1970.
4. Narayan, R.K. *The Guide*. Penguin Classics, New Delhi, 2006.

**CY11201 / CY12201: ENGINEERING CHEMISTRY LABORATORY**

L	T	P	C
0	0	2	1

Programme – B.Tech (Common to All)

Subject Credit – 1.0

1. Determination of the alkalinity in a given water sample
2. Determination of available chlorine in the given sample of bleaching powder
3. Alkaline Hydrolysis of Benzamide to Benzoic Acid
4. Estimation of Fe(II) in Mohr's Salt solution using standard  $K_2Cr_2O_7$  solution.
5. Conductometric titration of an unknown acid solution using a standard base solution.
6. Determination of total hardness of water
7. Estimation of sodium carbonate and sodium bicarbonate in a given mixture
8. Calculation of viscosity coefficient of sucrose solution using Ostwald's Viscometer
9. Standardization of  $KMnO_4$  by oxalic acid
10. Estimation of Fe(II) in Mohr's Salt solution using standard  $KMnO_4$  solution.
11. Standardization of  $Na_2S_2O_3$  solution with standard  $K_2Cr_2O_7$

CS12201	Computing Laboratory	0-0-2	1
<p>1) You are required to write the programs in c on the integer array for following operations</p> <ul style="list-style-type: none"> <li>a. To insert the elements in the integer array and to display the number of negative elements of the array and also to display the prime elements of the array.</li> <li>b. Write function that can find the largest element in the array. Array must be used as parameter.</li> <li>c. Write a program that invokes the above function (b) to find the largest element and print it out.</li> <li>d. Write function that can find the largest element in the integer array using pointer arithmetic.</li> <li>e. Write a program that invokes the above (d) function to find the largest element and displays the result out.</li> </ul> <p>2) You are required to write the program in C to:</p> <ul style="list-style-type: none"> <li>a. Define a structure with two fields: width and height for rectangle. Input an array of rectangle, then display each area and perimeter of each rectangle in array.</li> <li>b. Use the pointer to loop around the array for the same (a).</li> </ul> <p>3) Write a program in c that receives a number n and return a pointer to the character string containing the name of the corresponding month.</p> <p>4) You are required to define a structure named UP with the following three members:</p> <ul style="list-style-type: none"> <li>• A character array city[] to store names.</li> <li>• A long integer to store the population of the city.</li> <li>• A float member to store the literacy level.</li> </ul> <p>Then write a program to do the following:</p> <ul style="list-style-type: none"> <li>a. To read the details of 5 cities randomly using an array variable.</li> <li>b. To sort the list alphabetically.</li> <li>c. To sort the list based on literacy level.</li> <li>d. To sort the list based on population.</li> <li>e. To display the sorted lists.</li> </ul> <p>5) As you have studied structure and pointer in the last semester. You are required to write programs using structure containing a pointer member name to represent the information about a person.</p> <ul style="list-style-type: none"> <li>a. To read the information about a person and to print it on the screen.</li> <li>b. To initialize data of several employees and print it in tabular format. Use the function emp_print() the data of a single employee.</li> <li>c. To create and print a list of persons and their mobile number. Use nested structure and pointer members.</li> </ul> <p>6. Write a program to implement a single link list to perform the following operations</p> <ul style="list-style-type: none"> <li>a. Insertion at the beginning, at end and at any position of the list.</li> <li>b. Deletion at the beginning, at end and at any position of the list.</li> <li>c. Traverse the single link list</li> </ul> <p>7. Write a program to implement stack using static and dynamic representation and perform Insertion and Deletion.</p> <p>8. Write a program to implement queue using static and dynamic representation and perform Insertion and Deletion.</p> <p>9. Write a program to implement binary tree using link list.</p> <p>10. Write a program to implement linear and binary search.</p> <p>11. Write a program to sort a list of elements using bubble sort and selection sort.</p>			

## **Electronics Workshop (EC 12201)**

- 1) Familiarization with Electronic components such as Resistors, Capacitors, Diodes, Transistors etc: Colour Coding, Identification of terminals in Diodes etc.
- 2) Familiarization with electronic devices and measuring equipments like Cathode Ray Oscilloscope, Digital Storage Oscilloscope, Function Generator, DC power supply, Multimeter etc.
- 3) Study of measurement of waveform characteristics like Amplitude, Frequency etc. in Oscilloscope.
- 4) Study of measurement of various parameters like Voltage, Current, Frequency, Continuity, Resistance etc. using Multimeter.
- 5) Study of Testing of different kinds of Active and Passive Components using Multimeter.
- 6) Study of V-I characteristics of P-N Junction Diode.
- 7) Study of V-I characteristics of Zener Diode.
- 8) Familiarization with Soldering and De-soldering using a circuit.

### **References:**

1. K. B. Raina and S. K. Bhattacharya, Electrical Design Estimating and Costing, New Age International Publishers, New Delhi.
2. S. L. Uppal, Electrical Wiring, Estimating and Costing, Khanna Publishers.
3. J. H. Watt and T. Croft, American Electricians' Handbook: A Reference Book for the Practical Electrical Man, McGraw-Hill.
4. G. R. Slone, Tab Electronics Guide to Understanding Electricity and Electronics, McGraw-Hill.
5. J. C. Whitaker, The Resource Handbook of Electronics, CRC Press.
6. Electronic Devices and Circuit Theory, Robert L. Boylestad
7. J. C. Whitaker, The Resource Handbook of Electronics, CRC Press.
8. Millman & Halkias: Electronic Devices & Circuits, MGH, 2007

**Course Code:** ENGINEERING GRAPHICS  
**Course Title:** ME12202  
**Pre-requisite:** NIL

**L-T-P-C**  
**0-0-3-2**

### Course Content

**Introduction:** Overview of the course, Examination and Evaluation patterns.

Lines Lettering and Dimensioning: Types of lines, Lettering, Dimensioning, Geometrical Constructions, Polygons, Scales, and Curves.

**Orthographic projection:** Principles of Orthographic projection, Projections of points, Straight Lines and traces, Projections of Laminas, Projections of Solids.

**Section of Solids:** Sectional planes, Sectional views - Prism, pyramid, cylinder and cone, true shape of the section. Development of truncated objects.

**Development of Surfaces:** Draw the development of surfaces for Prisms, Cylinders, Pyramid and Cones.

**Isometric views:** Isometric axis, Isometric Planes, Isometric View, Isometric projection, Isometric views.

### Text Books/References

1. Bhatt N. D, Elementary Engineering Drawing, Charotar Publishing House, Anand, 2002.
2. Dhawan, R. K., A Textbook of Engineering Drawing, S. Chand Publishing, 2012.
3. Narayana K L & Kannaiah P, Engineering Graphics, Tata McGraw Hill, New Delhi, 1992.
4. Luzadder W J, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2001.
5. Venugopal K, Engineering Drawing & Graphics, New Age International Pvt. Ltd., New Delhi, 1994.