THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

COURSE SCHEME

FOR

B.E. – COMPUTER SCIENCE & ENGINEERING
(Dera Bassi)

2018

First Semester						
S. No.	**Course Number**	**Course Title**	**L**	**T**	**P**	**Cr**
1		APPLIED PHYSICS	3	1	2	4.5
2		COMPUTER PROGRAMMING - I	3	0	2	4.0
3		ELECTRICAL & ELECTRONIC ENGINEERING	3	1	2	4.5
4		ENERGY AND ENVIRONMENT *				
5		MATHEMATICS-I	3	1	0	3.5
6		ENGINEERING DRAWING	2	4	0	4.0
	Total		**14**	**7**	**6**	**20.5**

* Offered via MOOCs

Second Semester						
S. No.	**Course Number**	**Course Title**	**L**	**T**	**P**	**Cr**
1		APPLIED CHEMISTRY	3	1	2	4.5
2		COMPUTER PROGRAMMING-II	3	0	2	4.0
3		MECHANICS	2	1	2	2.5
4		WORKSHOP/MANUFACTURING PRACTICES	1	0	4	3.0
5		PROFESSIONAL COMMUNICATION	2	0	2	3.0
6		MATHEMATICS-II	3	1	0	3.5
	Total		**14**	**3**	**12**	**20.5**

APPLIED PHYSICS

L	T	P	Cr
3	1	2	4.5

Prerequisite(s): None

Course Objectives:
To introduce students to the basic physical laws of electromagnetic waves, wave optics, lasers, fiber optics and quantum mechanics and, make them aware about their applications. To introduce students about experimental data collection and its interpretation.

Interaction of Radiation with Matter: Scalar and vector fields; Gradient, divergence, and curl; Gauss's, Stokes' and Green's theorems; Concept of Displacement current; Maxwell's equations; Electromagnetic wave equations in free space, dielectric and conducting media, skin depth and its application.

Optics: ***Interference:*** Parallel and wedge-shape thin films, Applications as Non-reflecting coatings, Newton rings, Measurement of wavelength and refractive index. ***Diffraction:*** Single and Double slit diffraction, and Diffraction grating, Applications - Dispersive and Resolving Powers. ***Polarization:*** Production, detection, Optical and specific rotation, Applications – Anti-glare automobile headlights, Adjustable tint windows.

Lasers and fiber optics: Basic concepts, Laser properties, Ruby, He-Ne, and Semiconductor lasers, Introduction of optical fiber, types of optical fibers, acceptance angle, numerical aperture, V-number and losses in fiber. Application of Laser and optical fiber.

Quantum Mechanics and Engineering Applications: Wave function, Steady State Schrödinger wave equation, Expectation value, Infinite and finite potential well, Tunneling effect (Qualitative idea), Introduction to low-dimensional systems: quantum well, wire, dot. Density of states in zero-, one-, and two-dimensional systems (qualitatively). Application in Quantum computing.

Laboratory Work:
1 To study induced e.m.f. as a function of velocity of a magnet (verification of Faraday's Law).
2 Determination of wavelength of sodium light using Newton's rings method.
3 Determination of dispersive power of sodium-D lines using diffraction grating.
4 Determination of specific rotation of cane sugar solution.
5 Study and proof of Malus-law in polarization.
6 Determination of beam divergence and beam intensity of a given laser.
7 Determination of acceptance angle and numerical aperture of a given optical fiber.
8 Determination of displacement and conducting currents through a dielectric.
9 Determination of Planck's constant.

Micro project: Students will be given physics-based projects/assignments.

Course Learning Outcomes:

Upon completion of this course, students will be able to develop comprehensive, qualitative and analytical understanding of

1. Maxwell's equations and propagation of electromagnetic waves in different medium.
2. Interference, diffraction and polarization of light.
3. Principle, properties and applications of Lasers and optical fibers.
4. Concept of wave function, physical significance and its applications to quantum mechanical problems.
5. Interpretation of experimental data along with error analysis.

Text Books

1 *Griffiths, D.J., Introduction to Electrodynamics, Prentice Hall of India (1999) 3rd ed.*
2 *Jenkins, F.A. and White, H.E., Fundamentals of Optics, McGraw Hill (2001) 4th ed.*
3 *Ghatak A. and Thyagarajan K., Fiber Optics and Lasers, Macmillan India Limited (2006).*
4 *Beiser, A., Concept of Modern Physics, Tata McGraw Hill (2007) 6th ed.*
5 *Poole, C. P. and Owens, F. J., Introduction to nanotechnology, John Wiley &Sons(2003)*

Reference Books

1 *Wehr, M.R, Richards, J.A., Adair, T.W., Physics of The Atom, Narosa Publishing House (1990) 4th ed.*
2 *Keiser G., Optical Fiber Communications, Tata McGraw Hill (2013) 5th ed.*
3 *Verma, N.K., Physics for Engineers, Prentice Hall of India (2014)1st ed.*
4 *Pedrotti, Frank L., Pedrotti, Leno S., and Pedrotti, Leno M., Introduction to Optics, Pearson Prentice HallTM (2008) 3rd ed.*

COMPUTER PROGRAMMING – I

L	T	P	Cr
3	0	2	4.0

Course objective: This course is designed to explore computing and to show students the art of computer programming. Students will learn some of the design principles for writing good programs.

Computers Fundamentals: Classification of Computers, Application of Computers, Basic organization of computer, Input and Output Devices, Binary Number System, Computer memory, ComputerSoftware.

Algorithms and Programming Languages: Algorithm, Flowcharts, Pseudocode, Generation of Programming Languages.

C Language: Structure of C Program, Life Cycle of Program from Source code to Executable, Compiling and Executing C Code, Keywords, Identifiers, Primitive Data types in C, variables, constants, input/output statements in C, operators, type conversion and type casting. Conditional branching statements, iterative statements, nested loops, break and continue statements.

Functions: Declaration, Definition, Call and return, Call by value, Call by reference, showcase stack usage with help of debugger, Scope of variables, Storage classes, Recursive functions, Recursion vs Iteration.

Arrays, Strings and Pointers: One-dimensional, Two-dimensional and Multi-dimensional arrays, operations on array: traversal, insertion, deletion, merging and searching, Inter-function communication via arrays: passing a row, passing the entire array, matrices. Reading, writing and manipulating Strings, Understanding computer memory, accessing via pointers, pointers to arrays, dynamic allocation, drawback ofpointers.

Linear and Non-Linear Data Structures: Linked lists, stacks and queues.

Laboratory work: To implement Programs for various kinds of programming constructs in C Language.

Course learning outcomes (CLOs):
On completion of this course, the students will be able to

1. Comprehend concepts related to computer hardware and software, draw flowcharts and writealgorithm/pseudocode.
2. Write, compile and debug programs in C language, use different data types, operators and console I/O function in a computerprogram.
3. Design programs involving decision control statements, loop control statements, case control structures, arrays, strings, pointers, functions and implement the dynamics of memory by the use ofpointers.
4. Comprehend the concepts of linear and Non-Linear data structures by implementing linked lists, stacks andqueues.

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1	MST	20
2	EST	45
3	Sessionals (Assignments/Projects/ Tutorials/Quizzes/Lab Evaluations)	35

ELECTRICAL ENGINEERING

L	T	P	Cr
3	0	2	4.0

Course Objective: To introduce the concepts of DC and AC circuits. To make the students understand the concepts and working of single-phase transformers, electrical machines and power converters. To provide an overview of electronic devices components.

DC Circuits: Kirchhoff's voltage and current laws; power dissipation; Voltage source and current source; Mesh and Nodal analysis; Star-delta transformation; Superposition theorem; Thevenin's theorem; Norton's theorem; Maximum power transfer theorem; Transient response of series RL and RC circuits.

AC Circuits: Sinusoidal sources, RC, RL and RLC circuits; Concept of Phasors, Phasor representation of circuit elements; Complex notation representation; Single phase AC Series and parallel circuits; power dissipation in ac circuits; power factor correction; Resonance in series and parallel circuits; Balanced 3-phase circuit - voltage, current and power relations; 3-phase power measurement.

Single Phase Transformers: Magnetic materials; B-H characteristics; Electromagnetic induction; Constructional features of transformer; Operating principle and applications; Equivalent circuit, phasor analysis and calculation of performance indices.

Electrical Machines: Generation of rotating magnetic fields; Construction and working of three-phase induction motor; Significance of torque-slip characteristics; Working of single-phase induction motor; Types of single-phase induction motor; DC motor operating principle, construction, energy transfer, speed-torque relationship; DC generator operating principle, reversal of energy transfer, applications.

Electronic Devices: Semiconductor diode, equivalents circuits**,** load line analysis; Diode as a switch and rectifier; Breakdown Mechanisms, Zener diode-operation and applications; Opto-electronic devices, Silicon controlled rectifier- operation, construction, characteristics; Bipolar junction transistor-construction, operation, amplifying action; Field effect transistor-construction, characteristics of Junction FET.

Power Converters: DC-DC buck and boost converters, duty ratio control, Single-phase and three-phase voltage source inverters.

Laboratory Work: Network laws and theorems, Measurement of R,L,C parameters, A.C. series and parallel circuits, Measurement of power in 3 phase circuits, Open circuit and short circuit tests on single- phase transformer, Starting method of DC machines, Demonstration of cut-set sections of DC machines and Induction motor, BJT Characteristics, Rectifier circuit.

Course Learning Outcome (CLO):

After the completion of the course the students will be able to:

- Apply networks laws and theorems to solve electric circuits.

- Analyze transient and steady state response of DC circuits.
- Signify AC quantities through phasor and compute AC system behaviour during steady state.
- Explain and analyse the behaviour of transformer.
- Elucidate the principle and characteristics of DC and AC machine**.**
- Get an exposure to the working of electronic devices and power electronic converters.

Text Books:

1. *Hughes, E., Smith, I.M., Hiley, J. and Brown, K., Electrical and Electronic Technology, PHI (2008).*
2. *Nagrath, I.J. and Kothari, D.P., Basic Electrical Engineering, Tata McGraw Hill (2002).*
3. *Naidu, M.S. and Kamashaiah, S., Introduction to Electrical Engineering, Tata McGraw Hill (2007)*
4. *Floyd, Electronic Devices, Pearson Education, (2012).*

Reference Books:

1. *Chakraborti, A., Basic Electrical Engineering, Tata McGraw–Hill (2008).*
2. *Bimbhra P.S., Power Electronics, Khanna Publishers (2012).*
3. *Del Toro, V., Electrical Engineering Fundamentals,* Prentice–Hall of India Private Limited *(2004)*

Evaluation Scheme:

S N	Evaluation Elements	Weightage (%)
1	MST	25
2	EST	40
3	Sessional (Assignments/Projects/Tutorials/Quizes/Lab Evaluations)	35

MATHEMATICS - I

L	T	P	Cr
3	1	0	3.5

Course Objectives: To provide students with skills and knowledge of differential equations, sequence and series and calculus of several variables which would enable them to devise solutions for given situations they may encounter in their engineering profession.

Ordinary Differential Equations: Review of first order differential equations, Exact differential equations, Second and higher order differential equations, Solution techniques using one known solution, Cauchy - Euler equation, Method of undetermined coefficients, Variation of parameters method, Operator method, Engineering applications of differential equations.

Sequences and Series: Introduction to sequences and Infinite series, Tests for convergence/divergence, Comparison test, Ratio test, Root test, Integral test, Alternating series, Absolute convergence and Conditional convergence.

Series Expansions: Power series, Taylor's and Maclaurin theorem with remainder, Taylor series, Maclaurin Series, Convergence of Taylor series, Error estimates.

Partial Differentiation: Functions of several variables, Limits and continuity, Chain rule, Change of variables, Partial differentiation of implicit functions, Directional derivatives and its properties, Maxima and minima by using second order derivatives and by method of Lagrange's multipliers.

Multiple Integrals: Double integral (Cartesian), Change of order of integration in double integral, Polar coordinates, graphing of polar curves, Change of variables (Cartesian to polar), Applications of double integrals to areas and volumes, evaluation of triple integral (Carteasian).

Course Learning Outcomes: Upon completion of this course, the students will be able to

1. solve the differential equations of first and 2nd order and basic application problems described by these equations.
2. determine the convergence/divergence of infinite series, approximation of functions using power and Taylor's series expansion and error estimation.
3. To compute the partial derivatives, directional derivatives and their use in finding maxima and minima.
4. Evaluate multiple integrals and their applications to engineering problems.

Text Books:

1) Thomas, G.B. and Finney, R.L., Calculus and Analytic Geometry, Pearson Education (2007), 9^{th} ed.

2) Stewart James, Essential Calculus; Thomson Publishers (2007), 6th ed.

Reference Books:

1) Wider David V, Advanced Calculus: Early Transcendentals, Cengage Learning (2007).
2) Apostol Tom M, Calculus, Vol I and II, John Wiley (2003).

Evaluation Scheme:

Sr.No.	Evaluation Elements	Weight age (%)
1.	MST	30
2.	EST	45
3.	Sessionals (May include assignments/quizzes)	25

ENGINEERING DRAWING

L	T	P	Cr
2	4	0	4.0

Course Objectives: This module is dedicated to graphics and includes two sections: manual drawing and AutoCAD. This course is aimed at to make the student understand dimensioned projections, learn how to create two-dimensional images of objects using first and third angle orthographic projection as well as isometric, perspective and auxiliary projection, to interpret the meaning and intent of toleranced dimensions and geometric tolerance symbolism and to create and edit drawings using drafting software AutoCAD.

Engineering Drawing

1. Introduction
2. Orthographic Projection: First angle and third angle projection system
3. Isometric Projections
4. Auxiliary Projections
5. Perspective Projections
6. Introduction to Mechanical Drawing
7. Sketching engineering objects
8. Sections, dimensions and tolerances

AutoCAD

1. Management of screen menus commands
2. Introduction to drawing entities
3. Co-ordinate systems: Cartesian, polar and relative coordinates
4. Drawing limits, units of measurement and scale
5. Layering: organizing and maintaining the integrity of drawings
6. Design of prototype drawings as templates.
7. Editing/modifying drawing entities: selection of objects, object snap modes, editing commands,
8. Dimensioning: use of annotations, dimension types, properties and placement, adding text to drawing

Micro Projects /Assignments:

1. Completing the views - Identification and drawing of missing lines in the projection of objects
2. Missing views – using two views to draw the projection of the object in the third view, primarily restricting to Elevation, Plan and Profile views
3. Projects related to orthographic and isometric projections
    a. Using wax blocks or soap bars to develop three dimensional object from given orthographic projections
    b. Using wax blocks or soap bars to develop three dimensional object, section it and color the section
    c. Use of AUTOCAD as a complementary tool for drawing the projections of the objects created in (1) and (2).
4. Develop the lateral surface of different objects involving individual or a combination

of solids like Prism, Cone, Pyramid, Cylinder, Sphere etc.

5. To draw the detailed and assembly drawings of simple engineering objects/systems with due sectioning (where ever required) along with bill of materials.
   e.g. Rivet joints, simple bearing, wooden joints, Two plates connected with nut and bolt etc.

Course Learning Outcomes (CLO):

Upon completion of this module, students will be able to:

1. creatively comprehend geometrical details of common engineering objects
2. draw dimensioned orthographic and isometric projections of simple engineering objects.
3. interpret the meaning and intent of toleranced dimensions and geometric tolerance symbolism;
4. create the engineering drawings for simple engineering objects using AutoCAD
5. manage screen menus and commands using AutoCAD
6. operate data entry modes and define drawings geometrically in terms of Cartesian, polar and relative coordinates in AutoCAD
7. create and edit drawings making selections of objects, discriminating by layering and using entities, object snap modes, editing commands, angles and displacements using AutoCAD

Text Books:

1. *Jolhe, D.A., Engineering Drawing, Tata McGraw Hill, 2008*
2. *Davies, B. L., Yarwood, A., Engineering Drawing and Computer Graphics,* Van Nostrand Reinhold *(UK), 1986*

Reference Books:

1. *Gill, P.S., Geometrical Drawings, S.K. Kataria& Sons, Delhi (2008).*
2. *Gill, P.S., Machine Drawings, S.K. Kataria& Sons, Delhi (2013).*
3. *Mohan, K.R., Engineering Graphics, Dhanpat Rai Publishing Company (P) Ltd, Delhi (2002).*
4. *French, T. E., Vierck, C. J. and Foster, R. J., Fundamental of Engineering Drawing & Graphics Technology, McGraw Hill Book Company, New Delhi (1986).*
5. *Rowan, J. and Sidwell , E. H., Graphics for Engineers, Edward Arnold, London (1968).*

APPLIED CHEMISTRY

L	T	P	Cr
3	1	2	4.5

Prerequisite(s): None

Course objective: The course aims at elucidating principles of applied chemistry inindustrial systems, water treatment, engineering materials, organic synthesis and analyticaltechniques.

Crystal Field Theory and Band structure of Solids

Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures

Molecular Spectroscopy

Principles of spectroscopy and selection rules, Electronic and Vibrational spectroscopy, Beer-Lambert's Law, Computation of electronic and vibrational spectra.

Use of Free Energy in Chemical Equilibria

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria.

Water Treatment and Analysis

Hardness and alkalinity of water: Units anddetermination, Methods of softening of water: Zeolite process, Ion exchange process, mixed beddeionizer, Reverse Osmosis technique.

Stereochemistry

Representations of 3 dimensional structures, Structural isomers and stereoisomers, Configurations and symmetry and chirality, Enantiomers, Diastereomers, Optical activity, Absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Organic Reactions and Synthesis of a Drug Molecules

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction. Synthesis of a commonly used drug molecule, Introduction to green chemistry.

Novel Materials

Nanomaterials and its application in telecommunication. Organic Light Emitting Diodes, liquid crystals, conducting polymers.

Laboratory Work:

Electrochemical measurements: Experiments involving use of pH meter, conductivitymeter, potentiometer.

Physical properties of liquids: Determination of Viscosity and Surface tension

Computing the Infrared and UV-Vis spectra of small molecules

Water and its treatment: Determination of hardness, alkalinity, chloride in aqueousmedium and removal of hardness.

Organic Synthesis and Characterization: Synthesis of drugs and their characterization

Course Learning Outcomes: After the completion of the course, the students should be able to

1. Demonstrate different water treatment methods like Zeolite process, ionexchange and reverse osmosis technique.
2. Demonstrate the chemical and magnetic properties of transition metal complexes using crystal field theory
3. Rationalise bulk properties and processes using thermodynamic considerations
4. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
5. List major chemical reactions that are used in the synthesis of molecules
6. Use laboratory techniques like pH metry, potentiometry, conductometry, volumetry, thin layer chromatography.

Recommended books:

TextBooks

1. *Ramesh, S. and Vairam S. Engineering Chemistry, Wiley India (2012)1sted.*
2. *Puri, B.R., Sharma,L.R., and Pathania, M.S. Principles of Physical Chemistry,Vishal Publishing Co.(2008).*
3. *Aggarwal, S. Engineering Chemistry: Fundamentals and Applications, CambridgeUniversity Press (2015).*
4. *Sienko, M. J. and Plane, R. A. Chemistry: Principles and Applications, ACS Publication (1980)*

ReferenceBooks

1. *Brown, H., Chemistry for Engineering Students, Thompson,1sted*
2. *Sivasankar, B., Engineering Chemistry, Tata McGraw-Hill Pub. Co. Ltd, New Delhi(2008).*
3. *Shulz, M.J., Engineering Chemistry, Cengage Learnings (2007)1sted.*
4. *Atkins, P. and de Paula J., Atkin's Physical Chemistry, Oxford University Press (2014)*

Evaluation Scheme:

S.No.	Evaluation	Marks
1.	MST	25
2.	EST	40
3.	Sessional (May include Project/Quizes/Assignments/Lab Evaluation)	35

COMPUTER PROGRAMMING – II

L	T	P	Cr
3	0	2	4.0

Object Oriented Programming with C++: Class declaration, creating objects, accessing objects members, nested member functions, memory allocation for class, objects, static data members and functions. Array of objects, dynamic memory allocation, this pointer, nested classes, friend functions, constructors and destructors, constructor overloading, copy constructors, operator overloading and typeconversions.

Inheritance and Polymorphism: Single inheritance, multi-level inheritance, multiple inheritance, runtime polymorphism, virtual constructors anddestructors.

File handling: Stream in C++, Files modes, File pointer and manipulators, type of files, accepting command line arguments.

Templates and Exception Handling: Use of templates, function templates, class templates, handling exceptions.

Introduction to Windows Programming in C++: Writing program for Windows, using COM in Windows Program, Windows Graphics, User Input

Laboratory work: To implement Programs for various kinds of programming constructs in C++ Language.

Course learning outcomes (CLOs):
On completion of this course, the students will be able to

1. Write, compile and debug programs in C++, use different data types, operators and I/O function in a computerprogram.
2. Comprehend the concepts of classes, objects and apply basics of object oriented programming, polymorphism andinheritance.
3. Demonstrate use of filehandling.
4. Demonstrate use of templates and exceptionhandling.
5. Demonstrate use of windows programming concepts usingC++

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1	MST	20
2	EST	45
3	Sessionals (Assignments/Projects/ Tutorials/Quizzes/Lab Evaluations)	35

UES009: MECHANICS

L	T	P	Cr

2 1 0 2.5

Course Objectives:

The objective of this module is to help students develop the techniques needed to solve general engineering mechanics problems. Students will learn to describe physical systems mathematically so that their behavior can be predicted.

Course Contents:

Review of Newton's laws of motion and vector algebra

Equilibrium of bodies: Free-body diagrams, conditions of equilibrium, moment due to a force, static indeterminacy.

Plane trusses: Analysis of forces in members of a truss by method of joints and method of sections.

Friction: Sliding, belt, screw and rolling.

Properties of plane surfaces: First moment of area, centroid, second moment of area etc.

Virtual work: Principle of virtual work, calculation of virtual displacement and virtual work.

Work and energy: Work and energy, work-energy theorem, principle of conservation of energy, collisions, principles of momentum etc.

Dynamics of Rigid Bodies: Newton's Laws, D' Alembert's Principle, Energy Principles.

Experimental project assignment/ Micro project: Students in groups of 4/5 will do project on**Model Truss Bridge**

Experiment: This will involve construction of a model truss bridge using steel wire and wood.

Course Learning Outcomes

The students will be able to

1. Determine resultants in plane force systems
2. Identify and quantify all forces associated with a static framework
3. Solve problems in kinematic and dynamic systems

Text Books

1. *Bhattacharyya, B., Engineering Mechanics, Oxford University Press (2014).*
2. *Beer, Johnston, Clausen and Staab, Vector Mechanics for Engineers, Dynamics, McGraw-Hill Higher Education (2003).*

Reference Books

1. *Hibler, T.A., Engineering Mechanics: Statics and Dynamics, Prentice Hall (2012).*
2. *Shames, I. H. Engineering Mechanics: Dynamics, Pearson Education India (2006).*
3. *Timoshenko and Young, Engineering Mechanics, Tata McGraw Hill Education Private Limited, (2006).*

Evaluation Scheme

S.No.	**Evaluation Elements**	**Weightage (%)**
1.	MST	30
2.	EST	45
3.	Sessional (May include Assignments/Projects/Tutorials/Quiz)	25

WORKSHOP/MANUFACTURING PROCESSES

L	T	P	Cr
2	0	3	3.5

Course Objectives: This course introduces the basic concepts of manufacturing via machining, forming, joining, casting and assembly, enabling the students to develop a basic knowledge of the mechanics, operation and limitations of basic machining tools. The course also introduces the concept of metrology and measurement of parts.

Machining Processes: Principles of metal cutting, Cutting tools, Cutting tool materials and applications, Geometry of single point cutting tool, Introduction to multi-point machining processes – milling, drilling and grinding, Tool Life, Introduction to computerized numerical control (CNC) machines, G and M code programming for simple turning and milling operations, introduction of canned cycles.

Metal Casting: Principles of metal casting, Introduction to sand casting, Requisites of a sound casting, Permanent mold casting processes.

Metal Forming: Forging, Rolling, Drawing, Extrusion, Sheet Metal operations.

Joining Processes: Electric arc, Resistance welding, Soldering, Brazing.

Laboratory Work:

Relevant shop floor exercises involving practices in Sand casting, Machining, Welding, Sheet metal fabrication techniques, CNC turning and milling exercises, Experiments on basic engineering metrology and measurements to include measurements for circularity, ovality, linear dimensions, profiles, radius, angular measurements, measurement of threads, surface roughness.

Basic knowledge and derivations related to above measurements, uncertainties, statistical approaches to estimate uncertainties, Line fitting, static and dynamic characteristics of instruments will be discussed in laboratory classes.

Assignments: Assignments for this course will include the topics: Manufacturing of micro-chips used in IT and electronics industry and use of touch screens. Another assignment will be given to practice numerical exercises on topics listed in the syllabus.

Micro Project: Fabrication of multi-operational jobs using the above processes as per requirement by teams consisting of 4-6 members. The use of CNC machines must be part of micro project. Quality check should be using the equipment available in metrology lab.

Course Learning Outcomes (CLO):

Upon completion of this module, students will be able to:

1. analyze various machining processes and calculate relevant quantities such as velocities, forces, powers etc.;
2. suggest appropriate process parameters and tool materials for a range of different operations and workpiece materials;
3. understand the basic mechanics of the chip formation process and how these are related to surface finish and process parameters;
4. recognize cutting tool wear and identify possible causes and solutions;
5. develop simple CNC code, and use it to produce components while working in groups.
6. perform calculations of the more common bulk and sheet forming, casting and welding processes and given a particular component.
7. select the most appropriate manufacturing process to achieve product quality through the efficient use of materials, energy and process.

Text Books:

1. *Degarmo, E. P., Kohser, R. A. and Black, J. T., Materials and Processes in Manufacturing, Prentice Hall of India (2002).*
2. *Kalpakjian, S. and Schmid, S. R., Manufacturing Processes for Engineering Materials, Pearson Education Asia (2000).*

Reference Books:

1. *Chapman, W. A. J., Workshop Technology, Vol.1 & II, Arnold Publishers (2001).*
2. *Zimmer E. W. and Groover, M. P., Computer Aided Designing and Manufacturing, Prentice Hall of India (2008).*
3. *Pandey, P. C. and Shan, H. S., Modern Machining Processes, Tata McGraw Hill (2004).*
4. *Mishra, P. K., Non-Conventional Machining, Narosa Publications (2006).*
5. *Campbell, J. S., Principles of Manufacturing, Materials and Processes, Tata McGraw Hill Company (1995).*
6. *Lindberg, A. R., Process and Materials of Manufacture, Prentice Hall of India (1998).*

Evaluation Scheme:

Sr. No.	Evaluation elements	Weightage (%)
1	MST	25
2	EST	40
3	Sessional: (may include the following) Assignment, Sessional (includes Regular Lab assessment and Quizzes Project (including report, presentation etc.)	35

PROFESSIONAL COMMUNICATION

L	T	P	Cr
2	-	2	3

Course objective: To introduce the students to effective professional communication. The student will be exposed to effective communication strategies and different modes of communication. The student will be able to analyze his/ her communication behavior and that of the others. By learning and adopting the right strategies, the student will be able to apply effective communication skills, professionally and socially.

Detailed Contents:

1. Communication

1.1 Meaning
1.2 Barriers
1.3 7 Cs of effective communication
1.4 Interpersonal Communication skills.

2. Technical Communication Skills in English
2.1 Paragraph development
2.2 Forms of writing
2.3 Abstraction and Summarization of a text
2.4 Technicalities of letter writing
2.5 Internal and external organizational communication
2.6 Technical Reports
2.6 Proposals.

3. Professional Communication Skills in English (Oral)
3.1 Power point presentations
3.2 Group Discussions

4. **Professional Communication Skills in English (Written):**
4.1 Designing Effective Job Application
4.2 Resumes

Laboratory work:

1. Pre -assessment of oral and written communication and feedback.
2. Training in oral and written English through language software
3. Training for Group Discussions through simulations and role plays
4. Training for effective presentations.
5. Project based team presentations.

Minor Project (if any): Team projects on technical report writing and presentations.

Course learning outcome (CLO):

1. Apply communication concepts for effective interpersonal communication.
2. Select the most appropriate media of communication for a given situation.
3. Speak assertively and effectively.
4. Write objective organizational correspondence.
5. Design effective resumes, reports and proposals .

Text Books:

1.*Lesikar R.V and Flately M.E., Basic Business Communication Skills for the Empowering the Internet Generation. Tata Mc Graw Hill. New Delhi (2006).*

2.Raman,M& Sharma, S.,Technical Communication Principles and Practice, Oxford University Press New Delhi.(2011).

3.Mukherjee H.S.,Business Communication-Connecting at Work,Oxford University Press New Delhi, (2013).

Reference Books:

1.*Butterfield, Jeff.,Soft Skills for everyone,Cengage Learning New Delhi,(2013).*

2.*Robbins, S.P., &Hunsaker, P.L.,Training in Interpersonal Skills,Prentice Hall of India New Delhi,(2008).*

3.*DiSianza,J.J &Legge,N.J.,Business and PrfofessionalCommunication,Pearson Education India New Delhi,(2009).*

4. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1.	MST	25
2.	EST	35
3.	Sessionals (Group Discussions; professional presentations;paneldiscussions;publicspeaking;projects,quizzes)	40

Mathematics - II

L	T	P	Cr
3	1	0	3.5

Course Objectives: To introduce students the theory and concepts of linear algebra, Laplace transformation, Fourier series and Fourier transformation which will equip them with adequate knowledge of mathematics to formulate and solve problems analytically.

Linear Algebra:

Matrices: Elementary transformations, Rank of a matrix using row reduced echelon form, Solution of system of linear equations, Matrix inversion, Different types of matrices (symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian, unitary).

Vector Space: Linear spaces, Subspaces, Basis and dimension, Linear transformation, range , kernel of linear map, rank and nullity, inverse of linear transformation, rank - nullity theorem, matrix associated with linear transformation and linear transformation associated with a matrix, Eigen-values, Eigen-vectors and their properties and Diagonalization process, Inner product spaces, norm of a vector and Gram-Schmidt orthogonalisation process.

Laplace Transform: Definition and existence of Laplace transformsand its inverse, Properties of the Laplace transforms, Unit step function, Applications to solve initial and boundary value problems.

Fourier series: Introduction, Fourier series on arbitrary intervals, Convergence of Fourier series, half range expansions.

Fourier Transform: Fourier Integral theorem (without proof), Fourier transform of a function, Fourier sine and cosine integral theorem, Fourier sine and cosine transform and their properties.

Course Learning Outcomes: Upon completion of this course, the students will be able to:

5. solve systems of linear equations by using elementary row operations.
6. identify the vector spaces/subspaces and to compute their bases/orthonormal bases. Further, students will be able to express linear transformation in terms of matrix and find the eigen values and eigen vectors.
7. find the Laplace transformations and inverse Laplace transformations for various functions. Using the concept of Laplace transform students will be able to solve the initial value and boundary value problems.
8. find the Fourier series expansions of periodic functions and Fourier integral and transform of various functions.
9.

Text Books:

1) Simmons, G.F., Differential Equations (With Applications and Historical Notes), Tata McGraw Hill (2009).
2) Krishnamurthy, V.K., Mainra, V.P. and Arora, J.L., An introduction to Linear Algebra, Affiliated East West Press (1976).

Reference Books:

1) Kreyszig Erwin, Advanced Engineering Mathematics, John Wiley (2006), 8^{th} ed.
2) Jain, R.K. and Iyenger, S.R.K , Advanced Engineering Mathematics, Narosa Publishing House(2011), 11^{th} ed.

Evaluation Scheme:

Sr.No.	Evaluation Elements	Weight age (%)
1.	MST	30
2.	EST	45
3.	Sessionals (May include assignments/quizzes)	25