ACADEMIC (1-BOARD OF STUDIES) SECTION

संलग्नित अभियांत्रिकी महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील **B. Tech. I Year** चा अभ्यासक्रम शैक्षणिक वर्ष २०२०—२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७—२०२०**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित अभियांत्रिकी महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील **B. Tech. I Year** चा अभ्यासक्रम शैक्षणिक वर्ष २०२०—२१ पासून लागू करण्यात येत आहेत.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहे. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड — ४३१ ६०६.
जा.क्र.:   शैक्षणिक—१/परिपत्रक/पदवी— अभ्यासक्रम/
अभियांत्रिकी/ २०२०—२१/५९४

दिनांक : २४.०८.२०२०.

स्वाक्षरित/—
उपकुलसचिव
शैक्षणिक (१—अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१)   मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२)   मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३)   प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४)   साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५)   सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Proposed Curriculum For F. Y. B. Tech.

From Academic Year 2020-21

Swami Ramanand Teerth Marathwada University, Nanded

Course Code, Abbreviations and Definition:

L	Lecture
T	Tutorial
P	Practice
BSC	Basic Science Courses
ESC	Engineering Science Courses
HMC	Humanities and Social Sciences including Management Courses
MAC	Mandatory courses
LAB	Laboratory course

CONTENTS:

STRUCTURE – A

Proposed F. Y. B. Tech. Curriculum Structure, Academic year 2020-21

Semester-I					
Course Code	Course Title	L	T	P	Credits
BSC 101	Physics	3	0	2	4
BSC 103	Mathematics-I	3	1	0	4
ESC 105	Basic Electrical Engineering	3	0	2	4
ESC 106	Engineering Graphics	2	0	4	4
ESC 109	Engineering Mechanics	2	0	0	2
LAB 112	Engineering Exploration	0	0	4	2
	Total	13	01	12	20
Semester-II					
Course Code	Course Title	L	T	P	Credits
BSC 102	Chemistry	3	0	2	4
BSC 104	Mathematics-II	3	1	0	4
ESC 107	Programming for Problem Solving	3	0	2	4
ESC 108	Workshop/Manufacturing Practices	1	0	4	3
HMC 110	Professional Communication	2	0	2	3
MAC 111	Environmental Sciences	0	0	2	Audit
Total		12	01	12	18

STRUCTURE – B

Proposed F. Y. B. Tech. Curriculum Structure, Academic year 2020-21

Semester-I					
Course Code	Course Title	L	T	P	Credits
BSC 102	Chemistry	3	0	2	4
BSC 103	Mathematics-I	3	1	0	4
ESC 107	Programming for Problem Solving	3	0	2	4
ESC 108	Workshop/Manufacturing Practices	1	0	4	3
HMC 110	Professional Communication	2	0	2	3
MAC 111	Environmental Sciences	0	0	2	Audit
Total		12	01	12	18
Semester-II					
Course code	Course Title	L	T	P	Credits
BSC 101	Physics	3	0	2	4
BSC 104	Mathematics-II	3	1	0	4
ESC 105	Basic Electrical Engineering	3	0	2	4
ESC 106	Engineering Graphics	2	0	4	4
ESC 109	Engineering Mechanics	2	0	0	2
LAB 112	Engineering Exploration	0	0	4	2
	Total	13	01	12	20

Physics (BSC 101) (Credits 04)

Course Code	BSC 101			
Category	Basic Science Course			
Course Title	Physics (Theory and Lab.)			
Scheme and Credits	L	T	P	Credits
	3	0	2	4

Course Objectives:

1. This course provides an introduction and in-depth examination to wave models of optical propagation. This class considers properties and behavior of light in conditions when the wave nature of light becomesdominant.
2. This course will develop familiarity with the physical concepts and facility with themathematical methods of quantummechanics.
3. This course will cultivate skills for formulating and solving physicsproblems.
4. This course will provide students with a background and understanding of the fundamentals of the solid statephysics.

Unit 1: Particle Nature of Waves (07 Hrs.)
Planck's quantum theory of light, Explanation of laws of photoelectric emission in terms of quantum nature of light. Compton effect again in terms of quantum nature of waves.

Unit 2: Wave Nature of Particles (07 Hrs.)
De Broglie's concept of matter waves, Davisson –Germer experiment, G. P. Thomson's experiment.

Unit 3: Wave Optics (08 Hrs.)
Huygens's principle, superposition of waves and interference of light, Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer.
Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Unit 4: Quantum Mechanics (08 Hrs.)
Fundamental difference between Newtonian mechanics and quantum mechanics, Uncertainty principle, Derivation of wave equation propagating along a stretched string and its solution. The wave function. requirements that must fulfill. Schrodinger equation (time dependent and steady-state form in one and three dimensions) expectation values, operators, Eigen values, Eigen functions. Particle in a one dimension rigid box i) energy quantization, ii) Wave function & iii) momentum quantization.

Unit 5: Introduction to Molecular Bonding (07 Hrs.)
Particle in double delta-function potential, Molecules (hydrogen molecule, valence bond and molecular orbitals picture), singlet/triplet states, chemical bonding, hybridization.

Unit 6: Introduction to Solids (08 Hrs.)
Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands, Numerical solution for energy in one-dimensional periodic lattice by mixing plane waves.

References:

1. Serway, Moses, and Moyer, *Modern Physics*, Cengage Learning, 3[rd]Edition(2004).
2. Resnick and Eisberg, *Quantum Mechanics of Atoms, Molecules, Solids, Nuclei*, 2[nd]Edition, Wiley Student Edition (1985).
3. J. D. Griffith, *Introduction to Quantum Mechanics*, 2[nd]Edition, Pearson Publication(1983).
4. C. Kittel, *Introduction to Solid State Physics*, 7[th]Edition, Wiley Student Edition(1996).
5. Ashcroft and N. D. Mermin, *Solid State Physics*, 10[th]Edition, Philadelphia, Pa: Saunders College (1976).
6. S. M. Sze, *Introduction to Semiconductor Devices,* 3[rd]Edition, Wiley Interscience(2002).
7. M. V. Avadhanulu, P. G. Kshirsagar, *A Textbook of Engineering Physics*, Revised Edition, S. Chand Publisher(2004).

Course Outcomes:

We expect students to understand few basic concepts of Modern/ Microscopic/ Mesoscopic theory physics.

CO1. Wave nature of particles, particle natures of waves/ wave particle duality.
CO2. To explain some fundamental experiments of physics.
CO3. Foundation as well as Comprehensive background of Quantum mechanics.
CO4. Few fundamental properties of atoms, molecules and solids (metals, Semiconductors and technologically important materials).

List of Physics Practical

Lab 1

1. To determine the conductivity of graphiterod.
2. Measurement of energy band gap of semiconductor by four probemethod.
3. To determine the velocity of ultrasonic sound by using ultrasonicinterferometer.
4. To study Hall Effect and calculate hall coefficient and carrier chargedensity.
5. To determine laws of photoelectriceffect.
6. Determination of operating voltage of G. M.Tube.
7. Determination of half-life period of Indium.
8. Determination of dead time of G. M. Tube by singlesource.
9. Millikan's oil dropexperiment.
10. Solar cellcharacteristics.
11. To study PN junction diodecharacteristics.
12. To study Zener diodecharacteristics.

Lab 2

1. Determination of wavelength of laser by using Michelson'sinterferometer.
2. To determine wavelength of sodium light by using diffractiongrating.
3. Determination of specific rotation of sugar solution by Polarimeter.
4. Measurement of Numerical aperture of fiber optics by scanningmethod.
5. Measurement of bending losses inside thefiber.

Mathematics –I (BSC 103) (Credits 04)

Course Code	BSC 103			
Category	Basic Science Course			
Course title	Single Variable Calculus and Linear Algebra			
Scheme and Credits	L	T	P	Credits
	3	1	0	4

Course Objectives:

1. To familiarize the prospective engineers with techniques in Calculus and LinearAlgebra.
2. To equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in theirdisciplines.

Unit 1: Differential Calculus (07 Hrs.)
Review of limits, continuity, differentiability, linearization and differentials. maxima and minima, Mean value theorem, concavity. Taylor's theorem.

Unit 2: Integral Calculus (08 Hrs.)
Riemann integrals, fundamental theorem of calculus, improper integrals, beta and gamma functions and their properties, applications to areas and volumes, transcendental functions, indeterminate forms and L'Hospital's rule.

Unit 3: Sequence and Series (09 Hrs.)
Convergence of sequences and series, tests for convergence, power series, Taylor's series and its convergence, series for exponential, trigonometric and logarithmic functions.

Unit 4: Matrices (06 Hrs.)
Matrices and matrix operations (review), rank of a matrix, determinants and rank of a matrix in terms of determinants, geometry of linear equations, systems of linear equations, Gauss elimination, Gauss-Jordan elimination.

Unit 5: Vector Spaces (08 Hrs.)
Real vector spaces, subspaces, linear independence, coordinates, basis, dimension, linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of linear transformation, rank-nullity theorem, composition of liner maps, matrix associated with linear map.

Unit 6: Eigenvalues and Eigenvectors (07 Hrs.)
Eigenvalues and eigenvectors, characteristic polynomials, Cayley-Hamilton theorem, eigenvalues of special matrices (orthogonal, unitary, Hermitian, symmetric, skew-symmetric, normal), algebraic and geometric multiplicity, diagonalization.

References:

1. M. D. Weir, J. Hass, *Thomas' Calculus,* 12thEdition, Pearson India Education Services Pvt Ltd., New Delhi(2016).
2. H. Anton, C. Rorres, *Elementary Linear Algebra with Supplemental Applications,* 11thEdition, Wiley Student Edition, New Delhi (2011).
3. G. Strang, *Linear Algebra and Its Applications,* 4thEdition, Thomson Learning Academic Resource Center, USA(2006).
4. E. Kreyszig, *Advanced Engineering Mathematics*, 9thedition, John Wiley and Sons Inc.,USA (2006).
5. Hughes-Hallett et al., *Calculus - Single and Multivariable,* 3rd Edition, John-Wiley and Sons (2003).
6. G. B. Thomas and R. L. Finney, *Calculus and Analytic Geometry,* 9thEdition, ISE Reprint, Addison-Wesley(1998).
7. J. Stewart, *Calculus,* 5thEdition, Thomson (2003).

Course Outcomes:

Students will be able to

CO1. Learn the basic concepts of differentiability of single variable functions and will apply the knowledge to find extrema and linearization.

CO2. Learn basics of integration and will to apply the concepts to find area and volume of different regions.

CO3. Learn the sequence and series of standard functions using Taylor's series expansion.

CO4. Understand the vector spaces, linear transformation, correspondence between matrix and a linear transformation.

CO5. Understand the eigenvalues and eigenvectors of a matrix and will apply this knowledge for diagonalization.

Basic Electrical Engineering (ESC 105) (Credits 04)

Course Code	ESC 105			
Category	Engineering Sciences			
Course title	Basic Electrical Engineering			
Scheme and Credits	L	T	P	Credits
	3	0	2	4

Course Objectives:
1. To inculcate in students basic ideas and principle of electricalengineering.
2. To impart knowledge of electrical machines applicable in various field ofengineering.
3. Familiarize students with protection equipment and lighting schemes in day to daylife.

Unit 1: DC Circuits (08 Hrs.)
Concepts of e.m.f, Potential difference & current, Battery, Energy Sources: Ideal and practical voltage and current sources, Independent and dependent sources, Ohm's law, Kirchhoff's laws, Simplification of networks using series-parallel combinations and star-delta transformations, Current and Voltage division rule, Mesh Analysis, Nodal Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer theorem, Time domain analysis of RL & RCcircuits.

Unit 2: AC Fundamentals (08 Hrs.)
Sinusoidal voltages and currents, Basic definitions of AC fundamentals. Phase difference, lagging, leading and in phase quantities and phasor representation. Study of A.C. circuit consisting of pure R, L& C. Single phase A.C. circuits: Study of series and parallel R-L, R-C, R-L-C circuits, resonance, Concept of impedance, Admittance in case of above combinations, Waveform and relevant voltage-current phasor diagrams, Concept of active, Reactive, Apparent, Complex power and power factor. Three phase balanced circuits, Voltage and current relations in star and deltaconnections.

Unit 3: Electromagnetism (06 Hrs.)
Magnetic effect of electric current, Cross and dot conventions, Right hand thumb rule, Force on current carrying conductors placed in magnetic field, Fleming's left hand rule, Fleming's right hand rule. Faraday's laws of electromagnetic induction, Statically and dynamically induced e.m.f., Self and mutual inductance, Coefficient of coupling, energy stored in magnetic field.

Unit 4: Transformers (08 Hrs.)
Basic definitions of magnetic circuits, Comparison of electrical and magnetic circuit, B-H curve
Transformer: Theory of operation, Ideal and practical transformer, Open circuit test. Short-circuit test, Efficiency and Voltage Regulation, Auto transformers.

Unit 5: Rotating Electrical Machines (08 Hrs.)
DC Machines: Construction, Working principles, operation, Types & equivalent circuit of DC Generator, DC Motor. AC Machines: Construction, Working principles, Operation, Types & equivalent circuit of 3-phase induction motor, single phase induction motor, Alternators (AC Generators).

Unit 6: Electrical Installation (06 Hrs.)
Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB), Earthing. Types of Batteries, Important Characteristics for Batteries, Power factor improvement.

Text Books:
1. B. L. Theraja and A.K. Theraja, *A Text Book of Electrical Technology,* Volume I and II, S. Chand and company Ltd. New Delhi(2004).
2. D. P. Kothari, I. J. Nagrath, *Basic Electrical Engineering*, 3rd edition, TMH Publishing Co. Ltd., New Delhi(2010).
3. Kulshresta D.C., *Basic Electrical Engineering*, TMH India(2009).
4. Mittle and Mittal, *Basic Electrical Engineering,* TMH India(2005).

References:
1. Hughes Edward, *Electrical and Electronic Technology*, VIII Edition, Pearson Education, New Delhi,(2010).
2. Vincent Del Toro, *Electrical Engineering Fundamentals*, 2nd Edition, Pearson Education, New Delhi,(1989).

Course Outcomes:

Students will be able to:

CO1. Analyze DC electric circuits.
CO2. Apply the knowledge for Solving AC circuits.
CO3. Understand basics of electromagnetism.
CO4. Explain working and applications of transformers.
CO5. Gain knowledge of principle and working of various rotating electrical machines and protection equipment like circuit breaker, fusing unit etc.

Laboratory Experiments:

1. Study of Basic ElectricalElements.
2. Study and Verification of Kirchhoff'slaws.
3. Study and Verification ofSuperposition.
4. Study and Verification of TheveninsTheorem.
5. Study and Verification of Norton'sTheorem.
6. Study and Verification of Maximum power transferTheorem.
7. Measurement of Steady state and transient response on R-L, R-C, R-L-Ccircuits.
8. Study of AC series R-L-Ccircuits.
9. Study of AC parallel R-L-Ccircuits.
10. Study of balanced 3-phase starcircuit.
11. Study of balanced 3-phase deltacircuit.
12. Study of no-load current waveform with harmonics of transformer on an oscilloscope.
13. Determination of voltage regulation and efficiency of a single-phase transformer by direct loading.

14. Study of DC motorstarting.
15. Study of speed control of a DC motor by field current control and by armature voltagecontrol.
16. Study of reversal of direction of rotation of a 3-phase inductionmotor.

Reference: Laboratory Manuals
Note: - Out of total 16 experiments minimum of any 10 should be performed in a semester
Workshop (8 hours / semester)
Electrical and Electronics
Electrical: Basic safety precautions. House Wiring: Introduction to House wiring, Different types of cables. Types of power supply, Types of motors, Starters, Distribution of power supply, Types of bulbs, Parts of tube light, Electrical wiring symbols, Stair case wiring: Demo and Practice (2 switches with one lamp control) and House wiring, Earthing.
Electronics: Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

Engineering Graphics (ESC 106) (Credits 04)

Course Code	ESC 106			
Category	Engineering Sciences			
Course title	Engineering Graphics			
Scheme and Credits	L	T	P	Credits
	2	0	4	4

Course Objectives
1. To introduce students to the conventions, concepts and basic principles of EngineeringDrawing.
2. To enable students to draw projections of geometrical objects and real-lifecomponents.
3. To enable students with the basic knowledge about CADSoftware.

Unit 1: Introduction to Engineering Drawing (04 Hrs.)
Introduction, Use of various drawing instruments, Lettering, Layout of drawing sheet, Sizes of the drawing sheets, Different types of lines used in the drawing practice, Dimensioning–Linear, Angular, Aligned system, Unidirectional system, Parallel dimensioning, Chain dimensioning, Location dimension and Size dimension, Concept ofRF.

Unit 2: Projections of Points and Lines (05 Hrs.)
Projections of points in all possible position w.r.t. reference planes, Projections of lines when it is perpendicular to one of the reference planes, When line is inclined to one and parallel to other reference plane, Line inclined to both reference planes, Applications of projection of lines and concept of traces of lines.

Unit 3: Projections of Planes and Solids (05Hrs.)
Projections of planes when it is parallel to one of the reference planes, lying in reference plane, when it is perpendicular to one and inclined to other reference plane, when it is inclined to both reference planes, Projections on auxiliary planes. Projection of solid when axis is perpendicular to one of the reference planes, when axis is inclined to one and parallel to other reference plane, When axis is inclined to boththe reference planes, Projection of cube, right regular prisms, Right regular pyramids, Right circular cylinder, Right circular cone, Tetrahedron, Frustum ofsolids.

Unit 4: Orthographic Projection (06 Hrs.)
Multi view orthographic projections for parts/ patterns with isometric/ non-isometric surfaces and circular features and sectional views. Reading of orthographic projections.

Unit 5: Isometric Projection (06 Hrs.)
Definition of isometric view, Projection, Isometric scale, Non-isometric lines, Circular features in context of isometric projection. Construction of isometric view/ projection from given orthographic views.

Unit 6: Introduction to Computer Aided Drawing (04 Hrs.)
Computer screen, Layout of the software, standard tool bar/ menus and description of most commonly used tools bars, Navigational tools. Creation of 2D/3D environment. Commands and creation ofco-

ordinate points, lines, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, zoom, pan, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, lettering. Line properties, 3D modelling of basic solids and their intersections.

References:

1. N. D. Bhatt and V. M. Panchal, *Elementary Engineering Drawing*, 49th edition, Charotar Publisher   (2011).
2. M. B. Shah and B. C. Rana, *Engineering Drawing,* Pearson Education(2005).
3. Jolhe Dhananjay, *Engineering Drawing with an introduction to Auto CAD,* 1st edition, Tata McGraw Hill Publishing Co. Ltd(2010).
4. P. J. Shah, *Engineering Graphics,* S. Chand Publication edition, New Delhi(2011-12).

Course Outcomes:

At the end of the course the students are able to

CO1. Draw projections of point, line, plane and solid using the fundamental principles.
CO2. Read, interpret and draw orthographic projections.
CO3. Read, interpret and draw isometric projections.
CO4. Draft various Geometrical Elements used in Engineering Practice using CAD software.

Practical Evaluation
At least 4 assignments based on drafting work and at least 4 assignments based on AUTOCAD must be given on different topics.

Engineering Mechanics (ESC 109) (Credits 02)

Course Code	ESC 109			
Category	Engineering Sciences			
Course title	Engineering Mechanics			
Scheme and Credits	L	T	P	Credits
	2	0	0	2

Course Objectives:

1. To develop the ability to understand the use and applications of first principles of science in the field ofengineering.
2. To develop the analytical ability to independently apply mathematics and physics in the field of engineeringmechanics.
3. To develop ability to be understand and investigate problems in engineeringsystems.

Unit 1: Fundamentals of Statics (08 Hrs.)
(a) Definition of force, Force system, Classification of force systems, Law of parallelogram of forces, Triangle law of forces, Polygon of forces, Lami's Theorem, Principle of transmissibility, Resolution of forces.
(b) Moment of a force, Couple, Varignon's theorem, Equivalent force system, Free body diagram, Equilibrium of coplanar, Collinear concurrent and non-concurrent forcesystems.

Unit 2: Centre of Gravity, Moment of Inertia, and Simple Machines (08 Hrs.)
(a) Concept of center of gravity and centroid, Difference between center of gravity and centroid, Determination of centroid for regular geometrical figures and lines, Determination of Centroid for composite figures, Definition of moment of inertia, Radius of gyration, Theorem of perpendicular and parallel axis, Determination of moment of inertia for regular geometrical figures, Determination of moment of inertia of compositefigures.
(b) Simple machines, Concept of simple machines, Mechanical advantages, Velocity ratio, Efficiency and their relationship with each other, Law of lifting machines, Levers, Simple axle and wheel, Worm and worm wheel, Simple screwjack.

Unit 3: Plane Trusses and Friction (08 Hrs.)
(a) Classification of Trusses, Assumptions in analyzing trusses, Nature of forces in member, Method of joints to determine the forces in members of simpletrusses.
(b) Definition of friction, Types of friction, Laws of friction, Angle of repose, Cone of friction, Analysis of rigid bodies and connected rigid bodies on rough inclined surfaces, Analysis of ladder friction and wedgefriction.

Unit 4: Fundamentals of Dynamics (06 Hrs.)
(a) General principles of dynamics, Types of motion, Rectilinear motion, curvilinear motion, Motion under gravity, Motioncurves.
(b) Projectiles, Motion of a body projected horizontally, Laws of motion, D'Alembert's principle, Motion of bodies on incline smooth and roughsurface.

References:

1. Engineering Mechanics (Statics and Dynamics) by A. Nelson, Tata McGraw Hill Pub. Ltd., New Delhi.
2. Engineering Mechanics (Statics and Dynamics) by Irving H Shames, Pearsonpublishers.
3. Mechanics for Engineers by Beer and Johnson (Statics and Dynamics), McGraw Hill Publications.
4. Applied Mechanics by S. B. Junnarkar and H. J. Shah, Charotar Publishing House, Anand,India.
5. Engineering Mechanics (Statics and Dynamics), by Domkundwar and Domkundwar, DhanpatRai & Co. Delhi,India.

Course Outcomes:

Upon successful completion of the course, the student should be able to

CO1. Determine the resultant force and moment for a given system of forces.
CO2. Analyze planar systems to determine the forces in members of trusses, frames and problems related to friction.
CO3. Determine the centroid and second moment of area.
CO4. Understand the laws and use of simple machines.
CO5. Calculate the motion characteristics of a body subjected to a given force system.
CO6. Apply basic knowledge of mathematics and physics to solve simple real-world problems related to force systems on rigid bodies.

Engineering Exploration (LAB 112) (Credits 02)

Course Code	LAB 112			
Category	LAB courses			
Course title	Engineering Exploration			
Scheme and Credits	L	T	P	Credits
	0	0	4	2

Course Objectives: Identify multi-disciplinary approach required in solving an engineering problem. build simple systems using engineering design process.

Unit 1: Introduction to Engineering and Engineering Study (04 Hrs.)
Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21stcentury engineer and graduateattributes.

Unit 2: Engineering Design (12 Hrs.)
Engineering Design Process, Multidisciplinary facet of design, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple solution, Pugh Chart, Motor and battery sizing concepts, Introduction to PCBdesign.

Unit 3: Mechanisms (04 Hrs.)
Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism, Simple Robotic Armbuilding.

Unit 4: Platform based development (12 Hrs.)
Introduction to various platform based development (Arduino) programming and its Essentials, Introduction to sensors, Transducers and actuators and its interfacing with Arduino.

Unit 5: Artificial Intelligence and Applications (04 Hrs.)
Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition(Temperature and humidity) using Sensors interfaced with Arduino, Exporting acquired data to Microsoft Excel and analysis using visualrepresentation.

Unit 6: Project Management (04 Hrs.)
Introduction to Agile practices, Significance of team work, Importance of communication in engineering profession, Project management tools: Checklist, Timeline, Gantt chart, Significance of documentation

Unit 7: Engineering Ethics (04 Hrs.)
Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral theories and codes of conduct for resolution of Ethical Dilemmas.

Unit 8: Sustainability in Engineering (04 Hrs.)
Introduction to sustainability, Sustainability leadership, Life cycle assessment, Carbon foot print.

Unit 9: Course Project (12 Hrs.)
  Reviews.

References:

1. Sayyed Khandani, *Engineering Design Process,* August(2005).

2. R. S. Khurmi, *Theory of machines,* 14thEdition, S. Chand and Co. Ltd, New Delhi(2005)

3. Elvira Martinez, *Carlos Romero On the geometry and design of four bar linkage mechanisms,* 4thInternational Conference on Education and New Learning Technogies Barcelona, Spain(2012).

4. Luca P. Carloni, Fernando De Bernardinis, Claudio Pinello, Alberto L. Sangiovanni-Vincentelli, and Marco Sgroi, *Platform-Based Design for Embedded Systems*, *the Embedded Systems Handbook*(2005).

Course Outcomes:

At the end of the course the student should be able to

CO1. Explain the role of an Engineer as a problem solver.
CO2. Analyze engineering solutions from ethical perspectives.
CO3. Analyze engineering solutions from sustainability perspectives.
CO4. Use basics of engineering project management skills in doing projects.
CO5. Understand artificial intelligence and apply to demonstrate data acquisition and analysis skills.

Chemistry (BSC 102) (Credits 4)

Course Code	BSC 102			
Category	Basic Sciences			
Course title	Chemistry			
Scheme and Credits	L	T	P	Credits
	3	0	2	4

Course Objectives: To impart basic Chemistry of Engineering materials to the upcoming engineers.

Unit 1: Analytical Aspects of Water (07 Hrs.)
Impurities and their effects, Chemical analysis- Hardness [EDTA method], Chlorine content, Alkalinity-Numericals, Softening Methods – Lime Soda, Zeolites & ion Exchange, Desalination, need and awareness of conservation ofwater.

Unit 2: Fuels (07 Hrs.)
Classification of Fuels, calorific values, Determination using Bomb calorimeter & Boy's calorimeter, Dulong's formula & numerical, Analysis of coal and significance, numerical. Boiler, troubles in boiler & their prevention.

Unit 3: Petroleum & Lubricants (08 Hrs.)
Refining of petroleum, Knocking, Octane number, Cetane number, Power alcohol, biodiesel, CNG, hydrogen as fuel. Types of Lubricants, Lubrication mechanism properties & their significance.

Unit 4: Corrosion & Spectroscopic Technique (08 Hrs.)
Theories involved and types of corrosion, factors affecting corrosion, Corrosion control methods. Principle of spectroscopy, electronic spectra (UV and Fluorescence), IR,NMR.

Unit 5: Electro-Chemistry & Polymer (07 Hrs.)
Electrochemical and galvanic series, polymers classification and properties, rubber and its modifications, Biodegradable polymers, Conducting polymers and polymer composites.

Unit 6: Advanced Engineering Material (08 Hrs.)
Glass, alloys, ceramics and refractories, cement, Nano-materials, semiconductors, superconductor, optical fibers, fullerenes, organic electronic materials and Twelve Principles of greenchemistry.

Text Books/ References:

1. P. C. Jain and M. Jain, *Engineering Chemistry,* 15th Edition, Dhanpat Rai and sons(2006).
2. S. S. Dara & S. S. Umare, *Engineering Chemistry*, 12th Edition, S. Chand and Company Ltd. (2012).
3. S. K. Sing, *Fundamentals of Engineering Chemistry,* New Age InternationalPublishers.
4. Shashi Chawla, *A Text Book of Engineering Chemistry,* 1st edition, Dhanpat Rai & co(2002).
5. C. N. Banwell, *Fundamentals of molecular Spectroscopy,* Snippet View,(1994).
6. Kuriacose, JC, Rajaram J, *Chemistry of Engineering and Technology, Vol. I and II*, McGraw Hill (1984).

Course Outcomes:

CO1. Students will be able to understand various industrial processes and products.
CO2. Enabling students to know about the relevant engineering materials, their chemistry and recent technology.
CO3. Outer world will be benefited with current scientific knowledge.
CO4. Students will be able to understand various analytical methods used for material analysis.
CO5. To strengthen the student's understanding to the related core subjects in their respective discipline.

List of Experiments

1. Determination of total hardness ofwater.

2. Determination of PH using PH-meter.

3. Proximate analysis of Coal (Ashdetermination).

4. Estimation of Chloride content inwater.

5. Determination of dissolved Oxygen inwater.

6. Determination of alkalinity inwater.

7. Preparation of Urea – formaldehyderesin.

8. To determine coefficient of Viscosity of given solvent by Ostwald'sViscometer.

9. Determination of Acid value of lubricatingOil.

10. Determination of Chlorine inwater.

11. Determination of Saponification value ofoil.

12. Estimation of Iron in given Iron alloysample.

13. Determination of aniline point of lubricatingoil.

Mathematics– II (BSC 104) (Credits 04)

Course Code	BSC 104			
Category	Basic Science Course			
Course title	Multivariable Calculus and Differential Equations			
Scheme and Credits	L	T	P	Credits
	3	1	0	4

Course Objectives:

1. To familiarize the prospective engineers with techniques in multivariate differentiation, integration and ordinary differentialequations.
2. To equip the students to deal with advanced level of mathematics and applications that would be essential for theirdisciplines.

Unit 1: Differentiation (07 Hrs.)
Curves in plane and space, functions of several variables, graphs and level curves, limit, continuity and partial derivatives, differentiability, the derivative matrix, and tangent planes, the chain rule, gradient and directional derivatives, implicit differentiation.

Unit 2: Higher Derivatives and Extrema (07 Hrs.)
Higher order partial derivatives, Taylor's theorem, maxima and minima, second derivative test, constrained extrema and Lagrange'smultipliers.

Unit 3: Double Integrals (07 Hrs.)
Volume and Cavalieri's principle, the double integral over a rectangle, the double integral over regions, change of order of integration in double integrals, change of variables (cartesian to polar), applications to areas and volumes, center of mass and gravity (constant and variable densities).

Unit 4: Triple Integrals (12 Hrs.)
Triple integrals in rectangular coordinates, triple integrals in cylindrical and spherical coordinates, substitution in multiple integrals, orthogonal curvilinear coordinates, simple applications involving cubes, Sphere and rectangular parallelepipeds; scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, theorems of Green, Gauss and Stokes.

Unit 5: First Order Ordinary Differential Equations (06Hrs.)
Basic concepts, exact ODE's, integrating factors, linear ODE's, Bernoulli's equation, population dynamics, orthogonal trajectories, applications to electriccircuits.

Unit 6: Ordinary Differential Equations of Higher Orders (06 Hrs.)
Second order linear differential equations with constant coefficients, Method of variation of parameters, Method of undetermined coefficients, Cauchy-Euler equation, applications to electric circuits and mass spring systems.

Text books/ References:

1. J. E. Marsden, A. J. Tromba and A. Weinstein, *Basic Multivariable Calculus,* 3rdEdition, Springer(1993).
2. Hughes-Hallett et al., *Calculus - Single and Multivariable,* 3rd Edition, John-Wiley and Sons(2003).
3. G. B. Thomas and R. L. Finney, *Calculus and Analytic geometry*, 9thEdition, Pearson, Reprint(2002).
4. M. D. Weir, J. Hass, *Thomas' Calculus,* 12thEdition, Pearson India Education Services Pvt. Ltd., New Delhi (2016).
5. Erwin Kreyszig, *Advanced Engineering Mathematics,* 9thEdition, John Wiley & Sons (2006).
6. W. E. Boyce and R. C. DiPrima, *Elementary Differential Equations and Boundary Value Problems,* 9thEdition, Wiley India(2009).

Course Outcomes:

At the end of the course the student will be able to:

CO1. Understand the functions of several variables and their geometry in plane and space.

CO2. Determine the limit, continuity, partial derivatives, and apply them in finding extrema and study tangent planes.

CO3. Evaluate multiple integrals and their usage.

CO4. Understand the basic concepts of first order and higher order ordinary differential equations and model physical processes and solve.

Programming for Problem Solving (ESC 107) (Credits 04)

Course Code	ESC 107			
Category	Engineering Sciences			
Course title	Programming for Problem Solving			
Scheme and Credits	L	T	P	Credits
	3	0	2	4

Course Objectives:

1. To learn the problem-solving techniques writing algorithm andflowchart.
2. To learn the fundamentals of computer organization, syntax and semantics for C programming language.
3. To learn to write, compile and debug programs (in Clanguage).
4. To introduce the constructs of structuredprogramming.

Unit 1: Introduction to Programming (08 Hrs.)
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, syntax and logical errors in compilation, object and executable code.

Unit 2: Arithmetic expressions and precedence (08 Hrs.)
Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Unit 3: Arrays (08 Hrs.)
Arrays (1-D, 2-D), Character arrays and Strings. Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

Unit 4: Function (08 Hrs.)
Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 5: Structure (05 Hrs.)
Structures, Defining structures and Array of Structures.

Unit 6: Pointers (08 Hrs.)
Idea of pointers, defining pointers, use of pointers in self-referential structures, notion of linked list (no implementation), File handling (only if time is available, otherwise should be done as part of the lab)

Text Books:
1. Byron Gottfried, *Schaum's Outline of Programming with C,*McGraw-Hill.
2. E. Balaguruswamy, *Programming in ANSI C*, TataMcGraw-Hill.
3. G. Dromey, *How to solve it by computer*, Prentice Hall Inc., Upper saddle river, NJ(1982).
4. K. R. Venugopal and S R Prasad, *Mastering C*, Tata McGrath Hill(2007).
5. R. S. Bichkar, Programming with C, Universities Press (India)(2012).
6. Ashok N. Kamthane, *Programming in C 3e*, Pearson Education India(2015).

References:
1. Herbert Schidt, *C: The complete reference*, 4th edition, McGraw Hillpublication.
2. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall ofIndia.

CourseOutcomes:

The student willlearn

CO1. To formulate simple algorithms for arithmetic and logical problems.
CO2. To translate the algorithms to programs (in C language).
CO3. To test and execute the programs and correct syntax and logical errors.
CO4. To implement conditional branching, iteration and recursion.
CO5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

[Teacher's guidelines: The laboratory should be preceded a tutorial to explain the approach or algorithm to be implemented for the problem given.]

List of Practical
Practical 1: Problem solving using computers. Study of following Concepts: • Computerarchitecture. • Algorithm withexamples. • Flowchart withexamples
Practical 2: Simple computational problems using arithmeticexpressions. Study of Operators inC. Write C programsusing: a) Arithmeticoperators. b) Assignmentoperator. c) Relationaloperators. d) Logicaloperators. e) Bitwiseoperators. f) Conditionaloperators. g) Increment/decrementoperators. h) sizeof () operator (to find size of int, float, double,char).

Practical 3: Problems involving if-then-else structures. Study of Decision making statements and Write C programs using a. if statement b. if…elsestatement c. else if ladder.

Practical 4: Loops, while and for loops.
Study of loop control statements.
    ➢ forloop
    ➢ while
    ➢ do-while
• Write a C program to find sum of natural number up to nterms.
• Write a C program to find factorial of an enterednumber.
• Write a C program to find sum of digits of anumber.
• Write a C program to check whether a number is palindrome ornot.
• Write a C program to check whether input number is Armstrong number ornot.

Practical 5: 1D Array manipulation. Study of single dimensional array in C and declaration using simple example. • Write a C program to find largest element of anarray. • Write a C program to input elements in array and sort array elements in ascending or descendingorder. • Write a C program for Bubble, Insertion and Selection sort.
Practical 6: Matrix problems. Study of two-dimensional array in C and declaration using simple example. • Write a C Program to add two matrix using two-dimensionalarrays. • Write a C Program to multiply to matrix using two-dimensionalarrays. • Write a C Program to find transpose ofmatrix. • Write a C Program to trace ofmatrix.
Practical 7: String operations. Study of string and functions of string.h in C. • C Program to Find the Length of aString. • C Program to Find the Frequency of Characters in aString. • C Program to Find the Number of Vowels, Consonants, Digits and White space in aString.

Practical 8: Simple functions.
Study of function in C. Write a C program to find square of number using function.
Write a C program for swapping of two numbers using
    ➢ Call byvalue.
    ➢ Call byreference.

Practical 9: Programming for solving Numerical methods problems. • C Program to Solve any Linear Equation in OneVariable. • C Program to find all Roots of a QuadraticEquation.
Practical 10: Recursive functions. • Write a C program to find factorial of an entered number usingrecursion. • Write a C program to check whether entered number is Prime or not usingrecursion. • Write a C program to generate n terms of Fibonacci series usingrecursion.

Practical 11: Pointers and structures.
- Study of pointer in C and a simple C program forpointer.
- Write a C program to access element of an array usingpointer.
- Study of structure in C and a simple C program to print id, name and percentage of on student usingstructure.
- Write a C Program save and print student's information (Student name, Id, Percentage) using structure.

Practical 12: File operations: Basics of File Handling in C (C Program for basic file operations).
- Creation of a new file (fopen with attributes as "a" or "a+" or "w" or"w++")
- Opening an existing file(fopen)
- Reading from file (fscanf orfgetc)
- Writing to a file (fprintf orfputs)
- Moving to a specific location in a file (fseek,rewind)
- Closing a file(fclose)

Laboratory Outcomes:
- To formulate the algorithms for simpleproblems.
- To translate given algorithms to a working and correctprogram.
- To be able to correct syntax errors as reported by thecompilers.
- To be able to identify and correct logical errors encountered at runtime.
- To be able to write iterative as well as recursiveprograms.

Micro Project

After successful completion of tutorial and lab students will complete following micro project (Optional) in groups, minimum of two and maximum of three students can form a group to complete micro project.

Sample Problem Statements

1. Distance Between Two Cities:
Write a program to calculate the distance between two cities and to allow the user to specify a unit of distance. This program takes coordinates for the cities like (x, y) from user and gives the distance.
Input: City 1: 10, 20
City 2: 30, 55
Specific Unit: 1. (km) 2. (M) 3. (Cm)
Output: Distance according to specific unit

2. Income Tax Calculator:
Write a program which asks the user to enter his income and depending upon the income it selects the percentage of tax. It should return the total income with calculated tax.
Input: User's income
Output: Income plus calculated tax
Note: Tax range
Percentage   Income
0%   Less than2,50,000
5%   2,50,001 -500,000
20%   500,001 -10,00,000
30%   Above10,00,000

3. Find Total Cost of Tile to Cover L X B Floor:
Write a program to calculate the total cost of tile, it would require covering a floor plan of length and breadth, using a cost entered by the user.
Input: Length and breadth of tile and floor, cost of a tile
Output: total cost of tiles

4. Unit Converter (temp, currency, volume, mass and more):
Write a program to converts various units from one to another. The user enters the type of unit and the value being converted, and then the type of unit they want to convert to. The program will then make the conversion.
Input: Chose option: 1. Temp 2. Currency – 1
Input unit: 1. Celsius 2. Fahrenheit – 1
Output unit: 1. Celsius 2. Fahrenheit – 2
Value: 10
Output: 46 Fahrenheit

5. Calculator:
Write a program to generate a scientific calculator to do mathematical operations.

6. Number Converter:
Write a program to convert a number from decimal/hex/binary/octal to its equivalent binary/octal/decimal/hex number and vice-versa.
Input: Chose input type: 1. Decimal 2. Hex -1
Chose output type: 1. Binary 2. Hex -1
Input value – 12
Output: 1100

7. CalendarApplication:
Write a program to generate calendar which has following features.
1. It displays a formatted calendar of desiredmonth.
2. You can find the day by entering the date. For example, if you enter dd:mm:yy = 10:03:1991, it gives you the day'Sunday'.
3. You can add the note for aday.
4. If the given month has a note in it, it will display || in thatday.

8. Student information system project:
Where you can do following things:
1. Addrecords
2. Displayrecords
3. Modifyrecords
4. Deleterecords
5. Exitprogram
Note: Use files to store data.

9. Telecom Billing Management System:
The tasks to be performed are:
1. A: for adding newrecords.
2. L: for displayingrecords.
3. M: for modifyingrecords.
4. P: forpayment.
5. S: for searchingrecords.
6. D: for deletingrecords.
Users are provided with the above tasks.

10. Password Creator:
Write a program which takes password from user and checks if it is strong or not (depending upon alphabets, numbers and special charters)
Input: password: Helloyou
Output: Weak Password
Input: password: He12o@you
Output: Strong Password

Workshop/Manufacturing Practices (ESC 108) (Credits 3)

Course code	ESC 108			
Category	Engineering Science Courses			
Course title	Workshop/Manufacturing Practices			
Scheme and Credits	L	T	P	Credits
	1	0	4	3

Course Objectives:

1. To acquaint the students with basic manufacturing processes commonly employed in theindustry.
2. To familiarize the students with new technologies used in manufacturingindustry.
3. To demonstrate the students with very basic engineering applications in humanlife.

Unit 1: Manufacturing Methods: (04 Hrs.)
Introduction to manufacturing methods, classification of manufacturing processes and principals of casting, forging, extrusion, rolling, sheet metal forming, machining, joining, advanced manufacturing methods (LASER and EDM).

Unit 2: Fitting Operations & Power Tools (01 Hrs.)
Introduction to fitting, matching of parts, marking, Centre punching, Chipping, Cutting, Drilling, Tapping.

Unit 3: Carpentry (01 Hrs.)
Introduction to wood working, Kind of woods, machines, Power tools, Use of hand tools like hacksaws, Jackplanes, Chisels and gauges for construction of various joints.

Unit 4: Metal Casting (01 Hrs.)
Basic principle of metal casting, Introduction to types of casting methods and classification.

Unit 5: Welding (Arc Welding & Gas Welding), Brazing (01 Hrs.)
Introduction of metal joining processes, Classification, Introduction to arc welding and principle of working.

Unit 6: Plastic Moulding, Glass Cutting (02 Hrs.)
Types of plastics, Introduction to moulding processes (compression moulding, transfer moulding, Injection moulding and extrusion), Introduction to glass cutting techniques.

Unit 7: CNC Machining and Additive Manufacturing (02 Hrs.)
Introduction to NC and CNC. Working principle of CNC machine, CNC elements (MCU,, NC tooling etc.). Introduction to rapid prototyping.

References:

1. Hajra Choudhury S. K, Hajra Choudhury A.K. and Nirjhar Roy S. K, *Elements of Workshop Technology*, Vol. I (2008) and Vol. II (2010), Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, *Manufacturing Engineering and Technology*, 4th edition, Pearson Education India Edition(2002).
3. Gowri P. Hariharan and A. Suresh Babu, *Manufacturing Technology – I*, Pearson Education (2008).
4. Roy A. Lindberg, *Processes and Materials of Manufacture*, 4th edition, Prentice Hall India (1998).
5. Rao P. N, *Manufacturing Technology*, Vol. I and Vol. II, Tata McGraw-Hill House(2017).
6. Amitabh Ghosh & Malik, *"Manufacturing Science"*, East-West Press PvtLimited.

Course Outcomes:

CO1. Student demonstrates basic knowledge of workshop operations.
CO2. Students will be aware of fitting, carpentry, joining operations through the acquired skill sets.
CO3. Students will show ability to work with basic manufacturing techniques.

Practical / Demonstration:
1. Machine shop (10Hrs.)
　　　Includes a job on lathe machine including facing, taper turning, knurling operations and demonstration of other machine tools.
2. Fitting shop (08Hrs.)
　　　A job including operation like Filing, Marking and measuring, Sawing,Plumbingon 　　Pipe.
3. Plumbing: (06Hrs.)
　　　A job including various plumbing operations.
4. Carpentry (06Hrs.)
　　　Includes a job involving a cutting, shaping, fastening of wood components.
5. Welding shop (08 Hrs. -Arc welding 04 Hrs. + gas welding 04Hrs.)
　　　Includes joining of two plates by lap welding/butt welding using arc welding or gas welding.
6. Casting (08Hrs.)
　　　Demonstration or making actual model on sand casting, preparation of sand, mould, pattern.
7. Smithy (06Hrs.)
　　　Making a simple model /demonstration with operations including, drawing, fullering, edging, cutting, bending, upsetting etc.
8. Plastic moulding & Glass Cutting (06Hrs.)
　　　Demonstration of plastic moulding processes or glass cutting techniques.

Term Work: It shall include the submission of the well documented journals on above topics and any 6 job based on above practical**.**

Professional Communication (HMC 110) (Credits 3)

Course code	HMC 110			
Category	Humanities and Social Sciences, including Management courses			
Course title	Professional Communication			
Scheme and Credits	L	T	P	Credits
	2	0	2	3

Objectives:

1. To enable students to learn the structure and style of effectivesentences.
2. To enable students to express in English effectively.
3. To enhance students' Listening, Speaking, Reading & writing (LSRW)Skills.
4. To help students to understand nuances of technicalwriting.

Unite 1: Grammar & Vocabulary Building (10 Hrs.)

Sentence Structures
Parts ofSpeech
Tenses
Voice
Positive & NegativeSentences
FramingQuestions
ReportedSpeech
The concept of Word Formation &Types
Root words from Foreign Languages and their use inEnglish
      Acquaintance with Prefixes and suffixes from Foreign Languages in English to form Derivatives.
      Synonyms, Antonyms, One Word Substitute and StandardAbbreviations.

Unit 2: Identifying Common Errors in Writing (06 Hrs.)

Tense
Concord
Conjunction
Articles
      Prepositions
      Gerund
      MisplacedModifiers
      Redundancies
      Clichés

Unit 3: Basic Writing Skills (08 Hrs.)

Paragraph (Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writingprecisely).

Business Correspondence(Elements of Business Letters, Formats-Semi-block, Complete block, Modified block, Types of Letters-Enquiry, Reply to Enquiry, Order, Complaint,Adjustment).

Report Writing-Types of Reports, Formats –Memo &Letter.

PrécisWriting.

Unit 4: Technical Writing (06 Hrs.)

4.1 Framing Definitions, Writing Instructions, Description & Explanation

References:

1. Michael Swan, *Practical English Usage,* OUP(1995).
2. F.T. Wood, *Remedial English Grammar,* Macmillan(2007).
3. William Zinsser, *On Writing Well,* Harper Resource Book(2001).
4. Liz Hamp-Lyons and Ben Heasly, *Study Writing,* Cambridge University Press(2006).
5. Sanjay Kumar and PushpLata, *Communication Skills,* Oxford University Press(2011).
6. CIEFL, Hyderabad, *Exercises in Spoken English. Parts. I-III,* Oxford UniversityPress.
7. Raymond Murphy, *Essential English Grammar,* CUP(2016).
8. Raymond Murphy, *Intermediate English Grammar,* CUP(2016).
9. R.C. Sharma & Krishnamohan, *Business Correspondence & Report Writing,* Tata McGraw Hill Education.
10. J. Sethi and. V. Dhamija, *A Course in Phonetics and Spoken English,* Prentice Hall of India Private Limited(2006).

Course Outcomes:

At the end of the course the students will be able to:

CO1. Acquire basic proficiency in English.
CO2. Listen, speak, read and write effectively.
CO3. Express in English effectively.
CO4. Frame definitions, write instructions, and describe objects.

Practicals (Oral Communication):

(This unit involves interactive practice sessions in Language Lab)

1. ListeningComprehension
2. Pronunciation, Intonation, Stress andRhythm
3. Common Everyday Situations: Conversations andDialogues
4. Communication at Workplace: Interviews, Formal Presentations.

Environmental Sciences (MAC 111) (Audit)

Course code	MAC 111			
Category	Mandatory Courses			
Course title	Environmental Sciences			
Scheme and Credits	L	T	P	Credits
	0	0	2	Audit

Course Objectives:

1. Creating awareness about environmental problems among futurecitizens.
2. Imparting basic knowledge about the environment and its alliedproblems.
3. Developing an attitude of concern for the Environment
4. Motivating public to participate in environment protection and environment improvement.
5. Acquiring skills to help the concerned individual in identifying and solving environmentalproblems.
6. Striving to attain the harmony withnature.

Activity 1: Each student should plant a tree as symbol for induction/ getting admitted into institute and throughout the semester the student should water the plant and the growth of the plant is monitored at the end of the semester. This activity is to promote environmental attitude and develop bonding with nature with the help of planted tree.

Activity 2: Any of the following activity can be chosen by a student.

1. To calculate individual (per capita) use of water for a day and find ways to reduce thatuse
2. To check leakages of water taps in the institute campus, calculate the water wastages and making efforts for repairs of leakedtaps.
3. To visit at least 5 household for checking their water taps and pursue them for repairs of leaked taps, making them aware of water scarcity andconservation.
4. To make presentations for awareness regarding water resources among students, Villagers and local people (at least 10 households).
5. Any otheractivity.

Activity 3: Any of the following activity can be performed.

1. Promotion of recycle-reuse-reduce through various activities (largescale).
2. Visiting dumping ground or waste disposalsite.
3. Preparing compost site in the institute campus, the plant waste material and other biodegradable material from campus can be used for making of compost which can be used for plants within theinstitute.
4. Any otheractivity.

Activity 4: Case study on E-waste and space pollution (Assignment). Enlisting Various E-waste generated byindividual.

Activity 5: Shutting down the fans and ACs of the campus for an hour.
Any other activity.

Activity 6: No car and bike day' in institute.
Any other activity.

Activity 7: Avoiding use of plastics.

1. Finding out individual activities which causes various types ofpollution.
2. Avoiding use of bikes for aday.
3. Using public vehicles by all local students for aday.
4. Any otheractivity.

Activity 8:

1. Registering varieties of plants in the institute campus (Bio diversity register ofinstitute).
2. Studying any threatened animal(Assignment).
3. Any otheractivity.

Activity 9:

1. To visit solar appliances lab in ourinstitute.
2. To understand the detailed working of any of solar energy/ wind energyapplications.
3. Avoiding electricitywaste.
4. Any otheractivity.

Activity 10:

Case study of any nuclear power plant, nuclear hazard recently in news through newspaper articles (Assignment).

Activity 11:

1. Case study of any natural disaster happened recently(Assignment).
2. Visit to Fire brigade station for flood situationmonitoring.
3. Visit to district disaster responsecell.
4. Any otheractivity.

Activity 12:

1. Detailed study of anymovement.
2. Living any of the environmentalists for a day, reading their thoughts, literature, trying to incorporate in dailylives.
3. Organizing essay competition, poster competition, slogan makingcompetition.
4. Celebrating various environmentaldays.
5. Any otheractivities.

Activity 13:

1. Essay on showing how Indian culture is environment friendly and also finding its odds or inconsistencies.
2. Any otheractivities.

Activity 14:

1. Forming changes in daily life according to environment friendly sustainablelifestyles.
2. Any otheractivities.

Activity 15:

1. Try to identify environmental problem in local area and prepare detailed report on it giving solution (Assignment/ report).

References:

1. Anindita Basak, *Environmental Studies,* Pearson Education(2009).
2. R. Rajgopalan, *Environmental Studies from Crises to Cure,* 3rdEdition, Oxford University Press (2016).
3. Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy, *Environmental Studies*, Wiley India, (2009).
4. John, *Environmental Science*, Tata McGraw Hill publications, NewDelhi.
5. S. K. Dhameja, S .K. Kataria and sons, *Environmental engineering and Management*, 2ndEdition, New Delhi(2004).

Course Outcomes:

CO1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.

CO2. Estimate the population - economic growth, energy requirement and demand.

CO3. Analyze material balance for different environmental systems.

CO4. Realize the importance of ecosystem and biodiversity for maintaining ecological balance.

CO5. Identify the major pollutants and abatement devices for environmental management and sustainable development.