



### DEPARTMENT OF MECHANICAL ENGINEERING

#### COURSE OUTCOMES (R-20)

#### 1<sup>ST</sup> YEAR FIRST SEMESTER :

##### MATHEMATICS-I

At the end of the course student should be able to

Sno	Course code	CO Statement
1	BS1101	utilize mean value theorems to real life problems (L3)
2	BS1101	solve the differential equations related to various engineering fields (L3)
3	BS1101	familiarize with functions of several variables which is useful in optimization (L3)
4	BS1101	apply double integration techniques in evaluating areas bounded by region (L3)
5	BS1101	students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

##### ENGINEERING PHYSICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	BSC-2	The need of coherent sources and the conditions for sustained interference (L2) Identify engineering applications of interference (L3) Analyze the differences between interference and diffraction with applications (L4) Illustrate the concept of polarization of light and its applications (L2) Classify ordinary polarized light and extraordinary polarized light (L2)
2	BSC	The basic concepts of LASER light Sources (L2) Apply the concepts to learn the types of lasers (L3) Identifies the Engineering applications of lasers (L2) Explain the working principle of optical fibers (L2) Classify optical fibers based on refractive index profile and mode of propagation (L2)



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		Identify the applications of optical fibers in various fields (L2)
3	BSC	The concept of dielectric constant and polarization in dielectric materials (L2) Summarize various types of polarization of dielectrics (L2) Interpret Lorentz field and Clausius- Mosotti relation in dielectrics(L2) ☐ Classify the magnetic materials based on susceptibility and their temperature dependence(L2) ☐ Explain the applications of dielectric and magnetic materials (L2) ☐ Apply the concept of magnetism to magnetic devices (L3)
4	BSC	How sound is propagated in buildings (L2) Analyze acoustic properties of typically used materials in buildings (L4) Recognize sound level disruptors and their use in architectural acoustics (L2) ☐ Identify the use of ultrasonics in different fields (L3)
5	BSC	Classify various crystal systems (L2) Identify different planes in the crystal structure (L3) Analyze the crystalline structure by Bragg's X-ray diffractometer (L4) Apply powder method to measure the crystallinity of a solid (L4)

### COMMUNICATIVE ENGLISH

At the end of the course student should be able to

Sno	Course code	CO Statement
1	HS1102	understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
2	BS1102	ask and answer general questions on familiar topics and introduce oneself/others
3	BS1102	employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
4	BS1102	recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
5	BS1102	form sentences using proper grammatical structures and correct word forms



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### ENGINEERING PHYSICS LAB :

At the end of the course student should be able to

Sno	Course code	CO Statement
1	BSC-L1	

### PROGRAMMING FOR PROBLEM SOLVING USING C

At the end of the course student should be able to

Sno	Course code	CO Statement
1	ES1101	To write algorithms and to draw flowcharts for solving problems
2	ES1101	To convert flowcharts/algorithms to C Programs, compile and debug programs
3	ES1101	To use different operators, data types and write programs that use two-way/ multi-way selection
4	ES1101	To select the best loop construct for a given problem
5	ES1101	To design and implement programs to analyze the different pointer applications
6	ES1101	To decompose a problem into functions and to develop modular reusable code
7	ES1101	To apply File I/O operations

### Engineering Drawing :

At the end of the course student should be able to

Sno	Course code	CO Statement
1	ES1103	The student will learn how to visualize 2D & 3D objects.

### PROGRAMMING FOR PROBLEM SOLVING USING C LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	ES1102	Gains Knowledge on various concepts of a C language.



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2	ES1102	Able to draw flowcharts and write algorithms.
3	ES1102	Able design and development of C problem solving skill
4	ES1102	Able to design and develop modular programming skills.
5	ES1102	Able to trace and debug a program

### ENGINEERING PHYSICS LAB

At the end of the course student should be able to

Sno	Course code	Co statement
1	BCC-L1	

### ENGINEERING COMMUNICATION SKILLS LABORATORY

At the end of the course student should be able to

Sno	Course code	Co statement
1	HSC-L1	

### ENVIRONMENTAL SCIENCE

At the end of the course student should be able to

Sno	Course code	Co statement
1	MC-1	

### I YEAR II SEMESTER :

#### MATHEMATICS-2

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Sno	Course code	CO Statement
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1	HS1201	develop the use of matrix algebra techniques that is needed by engineers for practical applications(L6)
2	HS1201	solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel(L3)
3	HS1201	evaluate the approximate roots of polynomial and transcendental equations by differential algorithms (L5)
4	HS1201	apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
5	HS1201	apply numerical integral techniques to different Engineering problems (L3)
6	HS1201	apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

### ENGINEERING CHEMISTRY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	BS1210	Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
2	BS1210	Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
3	BS1210	Synthesize nanomaterials for modern advances of engineering technology. Summarize the techniques that detect and measure changes of state of reaction. Illustrate the commonly used industrial materials.
4	BS1210	Differentiate petroleum, petrol, synthetic petrol and have knowledge how they are produced. Study alternate fuels and analyse flue gases.
5	BS1210	Analyze the suitable methods for purification and treatment of hard water and brackish water.

### ENGINEERING MECHANICS

At the end of the course student should be able

Sno	Course code	CO Statement
1	BS1204	The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2	BS1204	He should be able to determine centroid for lines, areas and center of gravity



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		for volumes and their composites.
3	BS1204	He should be able to determine area and mass movement of inertia for composite sections
4	BS1204	He should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.

### BASIC ELECTRICAL & ELECTRONICS ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	ES1206	Analyse various electrical networks.
2	ES1206	Understand operation of DC generators, 3-point starter and DC machine testing by Swinburne's Test and Brake test.
3	ES1206	Analyse performance of single-phase transformer and acquire proper knowledge and working of 3-phase alternator and 3-phase induction motors.
4	ES1206	Analyse operation of half wave, full wave bridge rectifiers and OP-AMPs.
5	ES1206	Understanding operations of CE amplifier and basic concept of feedback amplifier.

### THERMODYNAMICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	ES1207	CO1: Basic concepts of thermodynamics
2	ES1207	CO2: Laws of thermodynamics
3	ES1207	CO3: Concept of entropy
4	ES1207	CO4: Property evaluation of vapors and their depiction in tables and charts
5	ES1207	CO5: Evaluation of properties of perfect gas mixtures.

### WORKSHOP PRACTICE LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	ESC-L2	





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### ENGINEERING CHEMISTRY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	BS1211	The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

### BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	ES1208	Compute the efficiency of DC shunt machine without actual loading of the machine.
2	ES1208	Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.
3	ES1208	Pre-determine the regulation of an alternator by synchronous impedance method.
4	ES1208	Analyse the performance characteristics and to determine efficiency of DC shunt motor & 3-Phase induction motor..
5	ES1208	Control the speed of dc shunt motor using Armature voltage and Field flux control methods.
6	ES1208	Draw the characteristics of PN junction diode & transistor
7	ES1208	Determine the ripple factor of half wave & full wave rectifiers.

### CONSTITUTION OF INDIA

At the end of the course student should be able to



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Sno	Course code	CO Statement
1	PR1201	Understand the local Administration
2	PR1201	Compare and contrast district administration role and importance
3	PR1201	Analyze the role of Myer and elected representatives of Municipalities
4	PR1201	Evaluate Zillapanchayat block level organisation

## II Year I semester

### VECTOR CALCULUS & FOURIER TRANSFORMS and M3

At the end of the course student should be able to

Sno	Course code	CO Statement
1	BSC	<ul style="list-style-type: none"><li>• Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)</li><li>• Estimate the work done against a field, circulation and flux using vector calculus (L5)</li></ul>
2	BSC	<ul style="list-style-type: none"><li>• Apply the Laplace transform for solving differential equations (L3).</li><li>• Find or compute the Fourier series of periodic signals (L3)</li></ul>
3	BSC	<ul style="list-style-type: none"><li>• Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)</li><li>• Identify solution methods for partial differential equations that model physical processes (L3)</li></ul>

### MECHANICS OF SOLIDS

At the end of the course student should be able to

S.No	Course code	CO Statement
1	PCC-ME	Model & Analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium.
2	PCC-ME	Understand the apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment.





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3	PCC-ME	: Students will learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components. Students are able to analyse beams and draw correct and complete shear and bending moment diagrams for beams.
4	PCC-ME	Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior
5	PCC-ME	Design and analysis of Industrial components like pressure vessels.

### PRODUCTION TECHNOLOGY

At the end of the course student should be able to

S.No	Course code	CO Statement
1	PCC-ME	Able to design the patterns and core boxes for metal casting processes
2	PCC-ME	Able to design the gating system for different metallic components
3	PCC-ME	Know the different types of manufacturing processes
4	PCC-ME	Be able to use forging, extrusion processes
5	PCC-ME	Learn about the different types of welding processes used for special fabrication

### PRODUCTION TECHNOLOGY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	PCC-L3	1. Learn about patterns and casting of metals. 2. Understand the concept of Arc, Spot, TIG welding and brazing process.
2	PCC-L3	3. Understand the Process of simple, compound and progressive press and Hydraulic press 4. Learn the Moulding process of plastic materials
3	PCC-L3	5. Understand the processing of different materials in the lab.

### FLUID MECHANICS & HYDRAULIC MACHINES

At the end of the course student should be able to

Sno	Course	CO Statement
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	code	
1	PCC-2	The basic concepts of fluid properties.
2	PCC-2	The mechanics of fluids in static and dynamic conditions.
3	PCC-2	Boundary layer theory, flow separation and dimensional analysis.
4	PCC-2	Hydrodynamic forces of jet on vanes in different positions
5	PCC-2	Working Principles and performance evaluation of hydraulic pump and turbines

### KINEMATICS OF MACHINERY

At the end of the course the student able to

S.No	Course code	CO Statement
1	PCC-4	Contrive a mechanism for a given plane motion with single degree of freedom
2	PCC-4	Suggest and analyze a mechanism for a given straight line motion and automobile steering motion.
3	PCC-4	Analyze the motion (velocity and acceleration) of a plane mechanism
4	PCC-4	Suggest and analyze mechanisms for a prescribed intermittent motion like opening and closing of IC engine valves etc. CO5: Select a power transmissi
5	PCC-4	Select a power transmission system for a given application and analyze motion of different transmission systems

### COMPUTER AIDED ENGINEERING DRAWING PRACTICE

At the end of the course student should be able to

S.No	Course code	CO Statement
1	PCC-ME	Student get exposed on working of sheet metal with help of development of surfaces.
2	PCC-ME	Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of solids.
3	PCC-ME	Student shall exposed to modelling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis.

### DRAFTING AND MODELING LAB

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S.No	Course code	CO Statement
1	SOC-1	

### ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

At the end of the course student should be able to

S.No	Course code	CO Statement
1	PCC-ME	Understand the concept of Traditional knowledge and its importance
2	PCC-ME	Know the need and importance of protecting traditional knowledge
3	PCC-ME	Know the various enactments related to the protection of traditional knowledge
4	PCC-ME	Understand the concepts of Intellectual property to protect the traditional knowledge

### FLUID MECHANICS & HYDRAULIC MACHINERY LAB

At the end of the course student should be able

S.no	Course code	CO Statement
1	PCC-Lab5	Explain the effect of fluid properties on a flow system. Identify type of fluid flow patterns and describe continuity equation.
2	PCC-Lab5	Analyze a variety of practical fluid flow, measuring devices and utilize fluid mechanics principles in design. CO4 Select and analyze an appropriate turbine with reference to given situation in power plants.
3	PCC-Lab5	Estimate performance parameters of a given centrifugal and reciprocating pump. Able to demonstrate boundary layer concepts.

### II BTECH II SEMESTER

### COMPLEX VARIABLES AND STATISTICAL METHODS

At the end of the course student should be able to

S.No	Course code	CO Statement
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1	BSC-6	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)
2	BSC-6	Find the differentiation and integration of complex functions used in engineering problems (L5) make use of the Cauchy residue theorem to evaluate certain integrals (L3)
3	BSC-6	Apply discrete and continuous probability distributions (L3) Design the components of a classical hypothesis test (L6)
4	BSC-6	Infer the statistical inferential methods based on small and large sampling tests (L4)

### MACHINE DRAWING

At the end of the course student should be able to

S.No	Course code	CO Statement
1	PCC-ME	Draw and represent standard dimensions of different mechanical fasteners and joints and Couplings.
2	PCC-ME	Draw different types of bearings showing different components.
3	PCC-ME	Assemble components of a machine part and draw the sectional assembly drawing showing the dimensions of all the components of the assembly as per bill of materials
4	PCC-ME	Select and represent fits and geometrical form of different mating parts in assembly drawings
5	PCC-ME	To prepare manufacturing drawings indicating fits, tolerances, surface finish and surface treatment requirements.

### METALLURGY & MECHANICS OF SOLIDS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	PCC-Lab1	Summarize the crystal structure for SC, BCC, FCC and HCP. Outline the microstructure for pure metals and alloys. Observe the micro structure of heat treated steels. Observe the hardness of alloys metals by using jominey quenching test. Describe how and why defects (point, line and interfacial) in materials greatly affect engineering properties and limit their use in service.
2	PCC-Lab1	Analyze the behaviour of the solid bodies subjected to various types of loading. Apply knowledge of materials and structural elements to the analysis of simple structures. Undertake problem identification, formulation and solution using a range of analytical methods. Analyze and



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		interpret laboratory data relating to behaviour of structures and the materials they are made of, and undertake associated laboratory work individually and in teams Expectation and capacity to undertake lifelong learning.
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### DYNAMICS OF MACHINERY

At the end of the course student should be able

S.No	Course code	CO Statement
1	PCC-ME	To compute the frictional losses and transmission in clutches, brakes and dynamometers.
2	PCC-ME	To determine the effect of gyroscopic couple in motor vehicles, ships and aeroplanes
3	PCC-ME	To analyze the forces in four bar and slider crank mechanisms and design a flywheel
4	PCC-ME	To determine the rotary unbalanced mass in reciprocating equipment
5	PCC-ME	To determine the unbalanced forces and couples in reciprocating and radial engines

### MATERIALS SCIENCE & METALLURGY

S.No	Course code	CO Statement
1	PCC-ME	1. Understand the crystalline structure of different metals and study the stability of phases in different alloy systems. 2. Study the behaviour of ferrous and non ferrous metals and alloys and their application in different domains
2	PCC-ME	3. Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals. 4. Grasp the methods of making of metal powders and applications of powder metallurgy
3	PCC-ME	5. Comprehend the properties and applications of ceramic, composites and other advanced methods.

### THERMAL ENGINEERING-1



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Sno	Course code	CO Statement
1	PCC-6	1. Derive the actual cycle from fuel-air cycle and air-standard cycle for all practical applications. 2. Explain working principle and various components of IC engine
2	PCC-6	3. Explain combustion phenomenon of CI and SI engines and their impact on engine variables. 4. Analyze the performance of an IC engine based on the performance parameters.
3	PCC-6	5. Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine. 6. Explain the applications and working principle of rockets and jet propulsion.

### INDUSTRIAL ENGINEERING AND MANAGEMENT

At the end of the course student should be able to

Sno	Course code	CO Statement
1	HSC-2	Design and conduct experiments, analyse, interpret data and synthesize valid conclusions Design a system, component, or process, and synthesize solutions to achieve desired needs
2	HSC-2	Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
3	HSC-2	Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management

### THEORY OF MACHINES LAB

At the end of the course student should be able to





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Sno	Course code	CO Statement
1	PCC-Lab	1. Identify various links in popular mechanisms. 2. Select suitable mechanism for various applications
2	PCC-Lab	3. Analyze the motion of cams and followers. 4. Select relevant belts, chains and drives for different applications.
3	PCC-Lab	5. Select relevant brakes and clutches for various applications 6. Select suitable flywheel and governor for various applications.

### PYTHON PROGRAMMING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	SOC-2	Solve the different methods for linear, non-linear and differential equations
2	SOC-2	Learn the PYTHON Programming language
3	SOC-2	Familiar with the strings and matrices in PYTHON
4	SOC-2	Write the Program scripts and functions in PYTHON to solve the methods

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PRINCIPAL