Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Basic Electronics
Course Code	ECL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Knowledge of modern physics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To become familiar with various types of semiconductors and basic electronic devices.**(BL1-Remember)** **CO2-** To understand the operation of various electronic devices.**(BL2-Understand)** **CO3-** To implement the concepts of semiconductors to various semiconductor devices. **(BL3-Apply)** **CO4-** To analyze the various electronic devices and their frequency response.**(BL4-Analyze)** **CO5-** To evaluate the performance of electronic devices such as diodes, transistors, function generators, and cathode ray oscilloscopes.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Semiconductor Basics: Intrinsic and Extrinsic Semiconductors, Current Mechanisms in Semiconductors: Drift and Diffusion Current. PN Junction: Formation of PN Junction, Creation of Depletion Layer, Forward and Reverse Biasing, Diode Current Equation, Volt – Ampere characteristics of PN junction diode and effect of temperature on V-I characteristics, Diode resistances, Diode Capacitances, Diode Equivalent circuits: Piecewise Linear approximation Model, Simplified approximation Model, Ideal equivalent circuit.	Lecture Method/Video Clips	12
II	Diode Applications: Diode as Rectifier: Half Wave rectifier, Full Wave Rectifier, Calculation of Average, RMS loads voltages and currents, Rectification efficiency, PIV, Ripple factor. Break Down Diodes: Avalanche and Zener Breakdown. V-I characteristics of Zener Diode, Zener Diode Specifications, Zener Diode Equivalent Circuit. Zener Diode as Shunt Regulator: Analysis of Zener diode as shunt regulator under varying Load capacitance and Supply voltage.	Lecture Method/Video Clips/Simulation	10
III	Bipolar Junction Transistor: Formation of NPN and PNP Transistor, unbiased and biased transistor, Transistor currents, Symbol of NPN and PNP Transistors, Common Base, Common Emitter and Common Collector Configurations along with Input and Output Characteristics, Transistor Amplifying action. Transistor Biasing: Load Line, Operating Point, Need of Biasing, Different Biasing Techniques: Fixed Bias, Emitter Stabilized Bias, Voltage Divider Bias, DC Bias with Voltage Feedback	Lecture Method/Video Clips/Virtual Labs	10
IV	Field Effect Transistor: JFET: Construction of N channel and P channel JFET, Working of JFET along with Drain and Transfer Curves, JFET Parameters and symbol, JFET Biasing. MOSFET: Construction and working of N channel and P channel Depletion and Enhancement MOSFETs, Drain and Transfer curves, Symbols. Operational Amplifier: Basics of operation amplifier, op-amp parameters: Input offset voltage, Output offset voltage, Slew rate, CMRR etc. Open and closed loop gain, Virtual Ground, Characteristic of ideal operational amplifier. Operational Amplifier Applications: Use of Ideal Op-amp to construct: Inverting amplifier, Non-inverting amplifier,	Lecture Method/Video Clips/Virtual Labs	12

	Differentiator, Integrator, Adder, Subtractor etc.		
V	Electronic Instruments: Digital Voltmeter, Digital Multimeter, Cathode Ray Oscilloscope, Applications of CRO: Measurement of Voltage, Current, Time Period, Frequency, Use of Lissajous Pattern to Measure unknown frequency and phase difference, Function Generator.	Lecture Method/Video Clips/Virtual Labs/Simulation	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to Laboratory Equipment's: Cathode Ray Oscilloscope (CRO), Function Generator, Digital Multimeter.	Experiments	BL2-Understand	2
3	To study Full Wave Centre Tap Rectifier and calculate various parameters.	Experiments	BL4-Analyze	2
1	To study and plot the V-I characteristics of PN Junction Diode.	Experiments	BL4-Analyze	2
4	To study Full Wave Bridge Rectifier and calculate various parameters	Experiments	BL4-Analyze	2
3	To study and plot Input & Output Characteristics of BJT in Common Base Configuration	Experiments	BL5-Evaluate	2
4	To study and plot Input & Output Characteristics of BJT in Common Emitter Configuration	Experiments	BL4-Analyze	2
2	To Design Half-Wave rectifier by using basic electronic components	PBL	BL6-Create	10
4	To Design subtractor using OPAM	PBL	BL6-Create	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Boylestad & Nashelsky Electronics Devices and Circuit Theory Pearson Education India, 2009. Ramakant A. Gayakwad Op Amps and Linear Integrated Circuits Englewood Cliffs: Prentice-Hall, 2012.
Articles	Popović, Božidar, et al. "Remote control of laboratory equipment for basic electronics courses: A LabVIEW-based implementation." Computer Applications in Engineering Education 21.S1 (2013): E110-E120.
References Books	Malvino, L. Electronic principles The McGraw Hill Companies, 2016. Sedra and Smith, Microelectronics circuits, Fifth edition by Oxford University Press 2017 Graham Bell Electronic Devices and Circuits Prentice-Hall 2009
MOOC Courses	https://nptel.ac.in/courses/122106025
Videos	https://nptel.ac.in/courses/122106025

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	1
CO2	3	2	1	-	-	2	-	-	-	3	-	-	2	2	2
CO3	1	1	1	3	-	-	-	-	-	-	-	-	2	3	2
CO4	1	1	1	3	2	-	-	-	-	-	-	-	3	3	2
CO5	1	1	-	2	-	-	-	-	-	-	-	-	2	3	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Communication Skills & Colloquim
Course Code	HUL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Student must have knowledge about Language proficiency.			**Co-Requisite/s**	Developed Communication skill.			
Course Outcomes & Bloom's Level	**CO1-** Determine interpersonal skills and be an effective goal-oriented team player.**(BL1-Remember)** **CO2-** Classify and formulate the elementary intricacies of Scientific and Technical Writing using applicative grammar construct. **(BL2-Understand)** **CO3-** Examine attitudes, emotional intelligence and understand its influence on behavior. **(BL3-Apply)** **CO4-** Justify approaches to conflict resolution**(BL4-Analyze)** **CO5-** Evaluate Formal Communication.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Introduction to Communication Skills, Objectives, Significance of Communication, Flow of Communication, Principles Communication, Essential Features, Process of Communication, Verbal (Oral & Written) and Non-verbal Communication, Barriers to Effective Communication, Introduction to Technical Communication, Major Difference between Technical Communication and General Communication.	Classroom Lecture, PPts,	6
Module 2	Introduction & Significance of Listening skills, Types of Listening, Barriers in Effective Listening, Basic Grammar - Parts of Speech, Active Passive and Articles.	Classroom Lecture, PPts,	6
Module 3	Introduction to Formal Letter Writing, Elements of Letter Writing and Style of Writing, Layout & Structure of Formal Letter Writing, Introduction to the Types of Business Letters- Enquiry, Calling Quotations, Order,Complaint and Adiustment.Introduction to Employment Communication- Job Application, Writing Resume, Differences among Resume, Curriculum Vitae & Bio-data.	Classroom Lecture, PPts, Videoes	6
Module 4	Introduction to Oral Presentations, Objectives, Significance and Approach, Preparation and Delivery of Oral Presentation (topics to be selected by the teachers). Introduction to Interview Skills. How to Develop Interview Skills. Dos and Don't of Interviews, Types of Interviews, Reviewing TV Program/Book/News Paper Articles etc	Classroom Lecture, PPts, Videos	6
Module 5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports- Printed Format, Memo Format, Letter Format, Book/Letter Text Format. Layout and Structure of Reports, Components of Reports, Writing.	Classroom Lecture, PPts, Videos	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi
Articles	https://www.jetir.org/papers/JETIR2108373.pdf https://open.lib.umn.edu/communication/chapter/1-2-the-communication-process/ https://www.iosrjournals.org/iosr-jbm/papers/Vol22-issue8/Series-2/E2208024254.pdf
References Books	Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S
MOOC Courses	https://nptel.ac.in/courses/109103020
Videos	https://nptel.ac.in/courses/109103020

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Calculus For Engineers
Course Code	MAL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Basic Sciences and Mathematics							
Pre-Requisite/s	Basic knowledge of Functions, Limit, Continuity and Differentiability			**Co-Requisite/s**	Basic knowledge of variables			
Course Outcomes & Bloom's Level	**CO1-** Knowledge about the derivative and use of derivative to expand the functions and evaluation of Maxima and Minima. **(BL1-Remember)** **CO2-** Knowledge about the vector valued function directional derivative, gradient, divergence and curl with their properties**(BL2-Understand)** **CO3-** Applying: Partial derivatives and its applications apply to evaluate the Maxima and Minima.**(BL3-Apply)** **CO4-** Find the area under a given curve, length of an arc through integration as application to Beta and Gamma Function.**(BL4-Analyze)** **CO5-** Evaluating: Find the area and volume by applying the techniques of double and triple integrals., **(BL5-Evaluate)** **CO6-** Applications of vector valued function in integration to find line , surface and volume. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Differentiation, Extremaon an Interval, Rolle's Theorem and the Mean Value Theorem, Increasing and Decreasing functions and First derivative test, Second derivative test, Maxima and Minima. Functions of two variables, partial derivatives, total differential, Jacobian and it Prosperities	Audio/Video clips, group discussion, lecture with PPTs, quiz	8
Unit 2	Taylor's expansion for two variables, maxima and minima, constrained maxima and minima, Lagrange's multiplier method. Integration, Average function value, Area between curves, Volumes of solids of revolution, Beta and Gamma functions, interrelation.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8
Unit 3	Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, Evaluation of triple integrals, change of variables between Cartesian and cylindrical and spherical co-ordinates, evaluation of multiple integrals using gamma and beta functions.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8
Unit 4	Scalar and vector valued functions, gradient, tangent plane, directional derivative, divergence and curl, scalar and vector potentials, Statement of vector identities, Simple problems.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8
Unit 5	Line, surface and volume integrals, Statement of Green's, Stoke's and Gauss divergence Theorems, verification and evaluation of vector integrals using them.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to MATLAB through matrices, and general Syntaxes.	Experiments	BL3-Apply	2
2	Plotting and visualizing curves and surfaces in MATLAB– Symbolic computations using MATLAB	Experiments	BL3-Apply	2
3	Evaluating Extremum of a single variable function	Experiments	BL3-Apply	2
4	Understanding integration as Area under the curve	Experiments	BL3-Apply	2
5	Evaluation of Volume by Integrals (Solids of Revolution)	Experiments	BL3-Apply	2
6	Evaluating Maxima and minima of functions of several variables	Experiments	BL3-Apply	2
7	Evaluating triple integrals	Experiments	BL3-Apply	2
8	Evaluating gradient, curl and divergence	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	0

Part E

Books	1. Thomas' Calculus by George B. Thomas, D. Weirand J. Hass, 13th edition 2014, Pearson. 2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers. 3. B.V. Ramana, Higher Engineering Mathematics, Tata Mc Graw Hill.
Articles	
References Books	1. E. Kreyszig, Advanced Engineering Mathematics, 8th Ed., John Wiley and Sons, 1999. 2. Gorakhprasad, Integral Calculus, Pothishala Publication. 3. Gorakhprasad, Differential Calculus, Pothishala Publication.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ee09/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ph02/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO2	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO3	2	2	1	1	1	-	-	-	-	-	-	-	-	1	3
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO5	-	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Engineering Mechanics
Course Code	MEL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Knowledge of basic sciences			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** CO1 Remember the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions**(BL1-Remember)** **CO2-** CO2 Understand the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions.**(BL2-Understand)** **CO3-** CO3 Apply system of forces in the belts drive systems as power transmission devices, shafts and beams.**(BL3-Apply)** **CO4-** CO4 Analyze the beams and trusses with centre of mass and moment of inertia.**(BL4-Analyze)** **CO5-** CO5 Evaluate shear force and bending moment in designing of shafts and beams and trusses.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction of Engineering Mechanics Basic concepts of system of forces- Coplanar Concurrent Forces - Components in Space – Resultant Moment of Forces and its Application - Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.	Lectures with whiteboard/PPT, Quiz, Group discussion	9
Unit-2	Friction Types of friction, Limiting friction, Laws of Friction, static and Dynamic Friction. Motion of Bodies - Wedge, Ladder and Screw jack.	Lectures with whiteboard/PPT, Quiz, Group discussion	7
Unit-3	Transmission of Power Belt Drivers - Open, Crossed and compound belt drives, length of belt, tensions- tight side and slack side, Power transmitted and condition for maximum power.	Lectures with whiteboard/PPT, Quiz, Group discussion	7
Unit-4	Center of Gravity & Moment of Inertia: Centroids - Centroids of Composite figures - Centre of Gravity of Bodies - Area moment of Inertia: - polar Moment of Inertia - Transfer - Theorems - Moments of Inertia of Composite Figures, Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia..	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Shear Force & Bending Moment Diagrams & Trusses: Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple. Application of Equilibrium Concepts. Trusses- types, method of joints and method of moments.	Lectures with whiteboard/PPT, Quiz, Group discussion	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	1. To verify the law of Triangle of forces and Lami's theorem.	Experiments	BL3-Apply	2
Experiment-2	2. To verify the law of parallelogram of forces	Experiments	BL3-Apply	2
Experiment-3	3. To verify law of polygon of forces	Experiments	BL3-Apply	2
Experiment-4	4. To find the support reactions of a given truss and verify analytically.	Experiments	BL3-Apply	2
Experiment-5	5. To determine support reaction and shear force at a given section of a simply supported beam and verify in analytically using parallel beam apparatus.	Experiments	BL3-Apply	2
Experiment-6	6. To verify bending moment at a given section of a simply supported beam.	Experiments	BL3-Apply	2
Experiment-7	7. To find coefficient of friction on horizontal and inclined planes.	Experiments	BL3-Apply	2
Experiment-8	8. To determine centre of gravity of different shapes.	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Engineering Mechanics by Dr. D.S. Kumar, S.K. Kataria & sons, latest edition. Engineering Mechanics by R. K. Rajput, S.Chand & Co. Engineering Mechanics: Statics & Dynamics by R.C. Hibbler
Articles	
References Books	• Engineering Mechanics- statics dynamics by Boresi & Schmidt, Thomson Books • Engineering Mechanics - Schaum's series - Mc.Grawhill Publications. • Engineering Mechanics by S. Timashenko, D.H. Young and J.V. Rao
MOOC Courses	https://archive.nptel.ac.in/courses/112/106/112106286/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	-	-	1	1	1	1	1	1
CO2	3	3	1	1	-	1	3	-	1	1	1	2	1	1	1
CO3	3	3	3	2	2	2	1	2	1	-	1	2	1	1	1
CO4	3	3	2	3	2	2	1	-	1	1	2	2	2	2	2
CO5	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Material Science
Course Code	MEL0104[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	The field of materials science is broad and subsumes aspects of physics, chemistry, mechanics, and more.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Recall the crystal structure and classification of materials**(BL1-Remember)** **CO2-** Understating the concept of advanced finishing processes, understand mechanical properties and their application.**(BL2-Understand)** **CO3-** To implement the phase diagram of materials**(BL3-Apply)** **CO4-** To analyze the heat treatment process to achieve desired properties of metals and alloy.**(BL4-Analyze)** **CO5-** To evaluate type of materials that are used in engineering with special emphasis on steel/ ferrous materials**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction, Atomic models, Chemical bonding, Crystallography and Imperfections, Concept of unit cell, Space lattice, Crystal lattices, Common crystal structures, Atomic packing factor and density, Miller indices, Defects & imperfections in solids. Mechanical Properties: Stress-Strain Diagram, Ductile & Brittle Material, Strength, Toughness, Hardness, Fracture, Fatigue and Creep.	Lectures with whiteboard and PPT,Report writing	8
Unit-2	Plastic Deformation of Metals: Hot working, Cold working, Re-crystallization & grain growth. Phase Diagram and Equilibrium Diagram: Unary and Binary diagrams, Phase rules. Types of equilibrium diagrams, Iron-carbon equilibrium diagram, Solid solutions, eutectic and combination type.	Lectures with whiteboard and PPT,Quiz, Seminar, Poster	8
Unit-3	Ferrous Materials: Various types of carbon steels, alloy steels and cast irons, its properties and uses. Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.	Lectures with whiteboard and PPT,Quiz, Report writing	8
Unit-4	Non-Ferrous metals and alloys such as Cu, Al, Zn, Cr, Ni, etc. and their applications. Various types: Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Ceramics: Structure types and properties and applications of ceramics.	Lectures with whiteboard and PPT,Abstract of research paper	8
Unit-5	True stress-strain, elastic recovery and plastic deformation. Strain Quiz, Case writing, seminar hardening, recovery, recrystallization, grain growth. Powder metallurgy: introductory concept & processes.	Lectures with whiteboard and PPT,Quiz, Case writing, seminar	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0	0			

Part E

Books	Material Science & Processes, Media Promoters & Publishers Narula - Material Science, TMH
Articles	
References Books	1. W. D. Callister, Jr, - Material Science & Engineering Addition, Wiley Publishing Co. 2. Van Vlash - Elements of Material Science & Engineering, John Wiley & Sons. 3. V. Raghvan - Material Science, Prentice Hall of India 4. Srivastava & Srinivasan - Science of Materials Engineering, New Age Publishers
MOOC Courses	https://archive.nptel.ac.in/courses/113/102/113102080/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	-	1	3	2	-	2	2	2	-	-	-	3	3	3	2
CO4	-	2	1	3	2	-	-	1	-	-	2	1	2	-	2
CO5	-	-	-	-	-	3	-	-	-	-	2	-	1	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Mechanical Workshop Practice
Course Code	MEP0101[P]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of casting, joining and machining.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basics of physics.**(BL1-Remember)** **CO2-** To understand the tool materials and their proper applications.**(BL2-Understand)** **CO3-** To prepare and manufacture the various joints using carpentry and fitting shop tools and welding process.**(BL3-Apply)** **CO4-** To analyze casting and welding products.**(BL4-Analyze)** **CO5-** To evaluate the casting process parameters and welding parameters for efficient productivity.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Carpentry Shop Carpentry, process of finished products, building work, furniture, cabinet making Etc. joinery, preparation of joints, Timber, Timber sizes, classification of Timber, Characteristics of good timber, seasoning of wood.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-2	Marking and Measuring Tools Steel rule and Steel tape, Marking gauge, Try-square, Compass and divider, Scriber or marking knife, Bevel, Holding Tools- Carpenter's vice, C-clamp , Bar cramp, Planning Tools- Jack plane, Smoothing plane, Rebate plane, Plough plane Cutting Tools- Saws, Cross-cut or hand saw, Rip saw, Tenon saw, Compass saw, Chisels, Drilling and boring tools- Carpenter’s brace, Auger bit, Hand drill, Gimlet, miscellaneous tools- Mallet, Pincer, Claw hammer, Screw driver, Wood rasp file, Bradawl, wood joints- Lap joints, Mortise and Tenon Joints, Bridle joint.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-3	Welding Shop Electric arc welding, Gas welding, Thermal welding, Electrical Resistance welding, Friction welding Equipment Used for Welding- Transformers, Motor generators, Rectifiers, Welding cables, Electrodes, electrode holder, Ground clamp, wire brush and chipping hammer, Welding table and cabin, Face shield, Hand gloves. Techniques of welding Preparation of work, striking an arc, Strike and Withdraw, Touch and with draw, Weaving, Types of Joints- Butt Joint, Corner Joint, Tee Joint, Lap joint, Edge welding positions- Flat position welding, Horizontal position welding, Vertical position welding, Overhead position welding.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-4	Fitting Shop Introduction hand fitting,the assembly of machine tools, jigs, gauges, etc., bench work. assembly of mating parts, removal of metal, fit, simple hand tools. filing, chipping, scraping, sawing drilling, and tapping. Holding tools, Cutting Tools - Finishing Tools, Reamers, Files, miscellaneous tools ---- File card, Spirit level, Ball Peen Hammer, Cross Peen, Hammer, Straight-Peen Hammer, Screw driver, Spanners.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-5	Foundry shop Process, Melting, Furnace, Degassing, Mold making, Pouring, Shakeout, Degating, Heat treating, Surface cleaning, Finishing,	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	To study of Tools and Their Operations in Carpentry joint	Experiments	BL2-Understand	4
Experiment-2	To Prepare Half Lap corner joint and T- joint	Experiments	BL3-Apply	4
Experiment-3	To study of tools and their operations in Fitting Shop	Experiments	BL3-Apply	4
Experiment-4	To study of tool and operations in welding shop	Experiments	BL3-Apply	4
Experiment-5	To study of single point cutting tools , machine tool and operations in machine shop	Experiments	BL3-Apply	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0	0			
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. S. K. Hazra Chowdhry Elements of Workshop Technology Vol-1 Tata Mc Graw Hill Publication 2 John K.C Mechanical Workshop Practice Paperback – 1 Khanna Publishers, 2001
Articles	
References Books	1. English, Paperback, Dave A K, Dubey D Workshop Technology & Practice Standard Publishers, 2010 2. W.A.J. Chapman Workshop Technology by vol. 1,2 Mc Graw Hill, 2001
MOOC Courses	https://archive.nptel.ac.in/courses/112/103/112103108/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	2	1	-	-	2	2	2	1	-	-
CO2	1	2	2	2	2	1	2	2	-	-	-	2	2	3	3
CO3	2	1	2	-	-	-	2	2	-	-	-	2	3	-	3
CO4	1	2	2	-	-	2	1	-	-	2	2	3	3	2	2
CO5	-	2	1	2	2	2	3	2	-	-	-	2	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Essentials of Information Technology
Course Code	CSL0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Basics of Computer system, Storage Systems, Operating systems, Networking and Database.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basics of Computer systems like types, I/O devices, storage of computer systems (Knowledge, Understand)**(BL1-Remember)** **CO2-** Apply the various networking concepts, topologies and remove deadlocks. (Apply). **(BL2-Understand)** **CO3-** Explain various memory management techniques and Analyze the concept of Sub-programs and blocks (Analysis)**(BL3-Apply)** **CO4-** Design the concept of software, operating system for better utilization of external system (Design)**(BL4-Analyze)** **CO5-** Evaluating the various algorithm, its solution and other communication techniques. (Investigation).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	Computer Basics: Basics of Computer Systems(T1,T2), Evolution of Computers, Computer Generations, Classification of Computers(T1,T3), Computer Applications, Interaction between User and Computer(T7). Hardware Components, Basic Computer Organization, Input and Output Devices(T1,T3), Central Processing Unit(T1), System Bus Architecture, Memory or Storage Unit	Lecture with White Board, PPT	6
2	Operating System: Introduction to Operating System, Function of Operating Systems(T1), Working Knowledge of GUI-Based Operating System (T3,T4), Working with latest version of Windows(T3,T4). Various Operating Systems, Evaluation of Operating System(T3,T4,T,7), Virtual Machine, Operating Systems for Mobile, Installation of Operating System(T1,T3,T4), Boot Process.	Lecture with White Board, PPT	6
3	Computer Networks and World Wide Web: Introduction to Computer Networks (LAN, MAN, WAN, PAN)(T3,T4), Network Topologies, Ethical Issues related to Network Security(T2,T3). Internet and World Wide Web(T7,T8), Internet Evolution(T1), FTP, Electronic Mail, Search Engines(T1), Introduction to HTML, Static and Dynamic Web Pages	Lecture with White Board, PPT	6
4	Computer Software: Introduction, System Software(T1,T3), Application Software, Firmware(T3), Software Installing and Uninstalling(T3,T4), Software Development Steps, Characteristics of good software(T1,T7), Usability of software, Introduction to Free and Open Source Software(T3,T4), Introduction to Database Management System	Lecture with White Board, PPT	6
5	Subprograms and Blocks: Problem Solving: Flow Charts(T3,T4), Tracing Flow Chart, Algorithms. Fundamentals of sub-programs(T1,T3,T4), Scope of life time of variables, static and dynamic scope(T7), design issues of subprograms and operations, parameter passing methods(T3,T4), overloaded sub-programs, generic sub-programs(T1,T3), design issues for functions user defined overloaded operators	Lecture with White Board, PPT	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Explain the Installation process of Operating system and its Memory Management.	Experiments	BL2-Understand	10
2-3	Design of a Web Page which describe your Biodata.	PBL	BL3-Apply	10
4-5	Describe Software development life cycle (SDLC) with all components.	PBL	BL5-Evaluate	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	18	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	0

Part E

Books	P. K. Sinha, Priti Sinha; Computer Fundamentals; BPB Publication. V. Rajaraman; Fundamentals of Computers; Prentice Hall of India Publication. G. G. Wilkinson; Fundamentals of Information Technology; Wiley-Blackwell Publishing. Yashwant P. Kanetkar; Let Us C; BPB Publication.
Articles	
References Books	E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing. Ron Mansfield; Working in MS-Office; Tata McGraw Hill Publishing.
MOOC Courses	https://www.my-mooc.com/en/categorie/information-technology
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1	2
CO2	1	2	-	-	-	-	-	-	-	-	-	-	3	3	2
CO3	-	-	1	-	-	-	-	-	-	-	-	-	3	2	2
CO4	-	-	-	2	-	-	-	-	-	-	-	-	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Programming logics
Course Code	CST0201[P]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Foundation core							
Pre-Requisite/s	Basic understanding of Windows/Linux operating system.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember: Recall the syntax and basic concepts of C programming.**(BL1-Remember)** **CO2-** Understand: Explain the meaning of C programming constructs and how they work together**(BL2-Understand)** **CO3-** Apply : Apply the various conditional and looping statement and functional programming.**(BL3-Apply)** **CO4-** Analyzing: Analyze and evaluate C programming code to identify errors and optimize performance.**(BL4-Analyze)** **CO5-** Evaluate : Evaluate the effectiveness of C programming solutions and propose improvements.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Character set, variables and identifiers, built-in data types, arithmetic operators and expressions, constants and literals, simple assignment statements, basic input/output statements, simple ‘C’ programs.	Demonstration throughPPT, Computer	10
2	Conditional Statements and Loops: Decision making within a program, conditions, relational operators, logical connectives, if statement, if-else statement; Loops: while loop, do-while loop, for loop; nested loops, infinite loops; switch statement, structured programming. Array: One Dimensional Arrays - array manipulation, searching, insertion and deletion in an array; Two Dimensional Arrays - addition/multiplication of two matrices, transpose of a square matrix; string	Demonstration throughPPT, Computer	10
3	Pointer: Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, arrays and pointers, pointer arrays, dynamic memory allocation. Functions: Standard library functions, prototype of a function, return type, function calling, block structure, passing arguments to a function - call by reference and call by value; recursive functions, arrays as function arguments.	Demonstration throughPPT, Computer	10
4	Structure and Union: Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays - arrays of structure, structures containing arrays, unions. Dynamic Memory Management: Use of malloc, calloc, realloc and free keywords	Demonstration throughPPT, Computer	10
5	File Management: Introduction, defining and opening a file, closing a file, input/output operations on files, error handling during i/o operations, random access to files, programs using files. Command Line Arguments: argv and argc arguments, programs using command line arguments. Preprocessor: Introduction, macro substitution, file inclusion, compiler control directives.	Demonstration throughPPT, Computer	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Life Insurance Premium Calculator	Experiments	BL3-Apply	10
2-3	Program to compare best life insurance plan using an array.	PBL	BL4-Analyze	10
4-5	Write a C program to read name and marks of n number of students from user and store them in a file. If the file previously exits, add the information of n students.	PBL	BL5-Evaluate	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	40				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	0

Part E

Books	B. W. Kernighan, Dennis M. Ritchi; The C Programming Language; Prentice Hall.
Articles	
References Books	Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing.
MOOC Courses	https://www.my-mooc.com/ja/mooc/logic-and-computational-thinking/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	-	-	-	-	2	3	1
CO2	1	2	1	2	2	1	-	-	-	-	-	-	1	-	3
CO3	2	-	1	-	-	2	-	-	-	-	-	-	3	2	2
CO4	2	1	-	2	1	-	-	-	-	-	-	-	3	3	2
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Principles of Electrical Engineering
Course Code	EEL0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Knowledge of physics and basic electronics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Predict the behavior of any electrical circuits, Formulate and solve complex DC circuits. **(BL1-Remember)** **CO2-** Predict the behavior of any electrical circuits, Formulate and solve complex single phase AC circuits.**(BL2-Understand)** **CO3-** Predict the behavior of any electrical circuits, Formulate and solve complex Three phase AC circuits.**(BL3-Apply)** **CO4-** Identify the type of electrical machine used for that particular application. Realize the requirement of transformers in transmission and distribution of electric power and other applications.**(BL4-Analyze)** **CO5-** Predict the behavior of various measuring instruments in electrical engineering**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	D.C. Circuit: - Combination of resistance in series & parallel, their solution ,Star –Delta combination, KCL and KVL. Voltage and current sources, dependent and independent sources, source conversion, DC circuit's analysis using mesh & nodal method, Superposition theorem.	Lecture with white board, ppt	10
2	Single Phase Circuit:- Generation of Alternating Voltage & Currents, Their Equation, Definition, R.M.S and Average values, Vector representation of alternating quantities, Phasor relations between voltage & current in each of resistance, inductance and capacitance, A.C series circuit power & power factor , Resonance in series circuit.	Lecture with white board, ppt	12
3	Electrical Measuring Instruments:- Introduction and classification of Electrical Instruments, Essentials of indicating instruments, Moving iron instruments, Types ofmoving iron instruments, Advantages and Disadvantages of moving iron instruments, Applications of moving iron equipment, Permanente Magnet type moving coil instruments, extension of range of ammeters and voltmeter, Dynamometer type instruments, Dynamometer type wattmeters	Lecture with white board, ppt	7
4	Poly-phase Circuits:-Generation of Poly-phase Voltages, 3phase system, Phase sequence, Inter connection of 3 phases, Voltage, Currents & Power relationships in balanced 3 phase circuits, Power Measurement in single phase & 3 phase circuits..	Lecture with white board, ppt	8
5	Transformer:- Construction & working principle of transformer, Emf equation, No load & Full load phasor diagram , Equivalent circuit, Losses & Efficiency, Voltage Regulation, Open circuit & Short Circuit Test on the Transformer	Lecture with white board, ppt	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
Articles	
References Books	1. Basic Electrical Engg, Sunil S Gaikwad, Dream Tech/ Willey Publication.
MOOC Courses	https://www.coursera.org/courses?query=electrical
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	-	-	-	-	-	-	-	1	1	2
CO2	1	1	2	1	1	3	-	1	-	-	1	-	2	3	1
CO3	2	1	2	1	2	-	2	-	2	2	-	-	1	2	2
CO4	1	3	1	2	3	-	-	-	-	-	-	-	3	1	3
CO5	1	1	1	2	1	-	-	-	-	-	-	-	2	2	1
CO6	1	1	1	1	1	-	-	-	-	-	-	3	1	3	2

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Statistics for Engineers
Course Code	MAL0203[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Basic Sciences and Mathematics							
Pre-Requisite/s	statistics for engineers typically include basic mathematics (algebra, calculus), understanding of probability theory, and familiarity with concepts in engineering disciplines. Additionally, knowledge of software tools like MATLAB or Python for data analysis is beneficial.			**Co-Requisite/s**	statistics for engineers may include introductory courses in engineering mechanics, computer programming, and experimental methods. Additionally, concurrent enrollment in courses covering linear algebra and differential equations could provide valuable mathematical background for understanding advanced statistical concepts and applications in engineering contexts.			
Course Outcomes & Bloom's Level	**CO1-** To remember basic concept of about the design data collection plans and basic tools of descriptive statistics.**(BL1-Remember)** **CO2-** To understand the identify relationship between two variables using scatter plot and Interpret a simple correlation. To understand the Knowledge about the different types of continuous distribution with their properties and applications.**(BL2-Understand)** **CO3-** To apply the test and make hypothesis by Student's t-test, F-test, chi-square test, Z test, goodness of fit.**(BL3-Apply)** **CO4-** To analyze the concept of sampling distribution of a statistic and its properties, difference between parameter and statistic.**(BL4-Analyze)** **CO5-** To evaluate and describe the properties of unbiasedness. Also identifying and provide an application the null hypothesis, alternative hypothesis and test statistic.**(BL5-Evaluate)**								
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	tInroduction to statistics and data analysis Measures of central tendency, Measures of variability, [Moments, Skewness, Kurtosis (Concepts only)]. Correlation and Regression, Partial and Multiple correlations, Multiple regressions.	lecture with ppt, quiz Audio/Video clips, group discussion,	10
2	Introduction, random variables, Probability mass Function, distribution and density functions, joint Probability distribution and joint density functions, Marginal, conditional distribution and density functions, Mathematical expectation, and its properties Covariance, moment generating function, characteristic function.	lecture with ppt, quiz Audio/Video clips, group discussion	10
3	Binomial and Poisson distributions, Normal distribution, Gamma distribution, Exponential distribution.	lecture with ppt, quiz lecture with ppt, quiz Audio/Video clips, group discussion, classroom presentations, Analysis	6
4	Testing of hypothesis, Introduction, Types of errors, critical region, procedure of testing hypothesis, Large sample tests, Z test for Single Proportion, Difference of Proportion, mean and difference of means.	lecture with ppt, quiz Audio/Video clips, group discussion	8
5	Small sample tests, Student’s t-test, F-test, chi-square test, goodness of fit, independence of attributes, Design of Experiments, Analysis of variance, one and two way classifications, CRD, RBD, LSD.	lecture with ppt, quiz Audio/Video clips, group discussion,	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction: Understanding Data types; importing/exporting data.	Experiments	BL2-Understand	2
2	Computing Summary Statistics/plotting and visualizing data using Tabulation and Graphical Representations.	Experiments	BL3-Apply	2
3	Applying correlation and simple linear regression model to real dataset; Computing and interpreting the coefficient of determination	Experiments	BL3-Apply	2
4	Applying multiple linear regression model to real data set; computing and interpreting the multiple coefficient of determination	Experiments	BL3-Apply	2
5	Fitting the following probability distributions: Binomial distribution,	Experiments	BL3-Apply	2
6	Normal distribution Poisson distribution	Experiments	BL3-Apply	2
7	Testing of hypothesis for One sample mean and proportion from real, time problems	Experiments	BL3-Apply	2
8	Testing of hypothesis for Two sample mean and proportion from real, time problems	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	M. Ray, H.S. Sharma, Sanjay Chaudhary Mathematical Statistics Ram Prasad & Sons J.N. Sharma, J.K. Goyal Mathematical Statistics Krishna Prakash and Media (P) Ltd
Articles	
References Books	E.Kreyszig Advanced Engineering Mathematics 8 th Ed., John Wiley and Sons, 1999 B.V. Ramana Higher Engineering Mathematics Tata McGraw Hill B. S. Grewal Higher Engineering Mathematics Khanna Publishers
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ec03/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ec03/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	1	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	1	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Environmental Pollution and global issues
Course Code	MCL0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Foundation core							
Pre-Requisite/s	Basic knowledge of natural resources, biodiversity, ecological succession, energy flow, environmental issues and problems.			**Co-Requisite/s**	A detailed understanding of the complexity of environment and its challenges and solutions to these problems and challenges.			
Course Outcomes & Bloom's Level	**CO1-** CO1. Develop environmental scientists and engineers and sensitize them towards environmental issues.**(BL2-Understand)** **CO2-** CO2. To acquire analytical skills in assessing environmental impacts through a multidisciplinary approach**(BL3-Apply)** **CO3-** CO3. Ability to distinguish between various methods of various pollution analysis**(BL4-Analyze)** **CO4-** CO4.Acquire expertise and skills needed for the Environmental Management Systems and techniques of monitoring, Environment audit, Environmental Impact Analysis, environment instrumentation and control systems and for the projects development, implementation, and maintenance.**(BL5-Evaluate)** **CO5-** CO5. Students acquire skills for to communicate, prepare, plan and implement the environmental management project**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
1 (Environment, Ecosystem and Environmental Education)	Environment – Definition and its segments, (Lithosphere, Hydrosphere, Atmosphere and Biosphere), Multidisciplinary nature of Environmental Science, Ecology and Ecosystem: Basic concepts, functions of ecosystem, Energy Flow, Food chain, food web, Ecological Pyramids, Ecological Successions. Environmental Education-Definition, scope, importance, Need for Public Awareness, Environmental Ethics. Environmental Impact Assessment: Screening, Scoping, Base line Analysis, Impact Mitigation, Documentation, Review, Public hearing, Post Project Monitoring.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, discussion (questions & answers section)	8
2 (Natural Resources Management)	Natural Resources – Classification, Water Resources (availability, quality, water budget), Mineral Resources (distribution, availability and future perspectives), and Forest Resources. Energy Resources-Classification and alternatives of conventional energy resources- Solar, working of solar photovoltaic cells, Geothermal, Wind energy, Nuclear Energy, Biomass and Bio-gas	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
3 (Water, Soil & Noise Pollution)	Water pollution – sources & effects, characteristics and treatment of waste water, engineered systems for water purification: Aeration, solid separation, settling operations, filtration and disinfection. Soil - formation of soil, elementary and mineral composition, types of soil in India, soil pollution, effects and abatements. Noise Hazards: Continuous and impulse noise, Effect of noise on man, Measurement and evaluation of Noise, noise isolation and absorption techniques, silencers, practical aspects of noise.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
4 (Atmospheric chemistry and Air Pollution)	Classification, sources and toxic effects of air pollutants, dispersal of air pollutants, engineered systems for air purification: Atmospheric cleansing process, approaches to contamination control. Air pollutants with emphasis on reactive intermediates in atmosphere like hydroxyl radical, ozone and nitrate radical, types of hydrocarbon in the troposphere, reaction of organic compounds in the atmosphere.(Green house gas effect, Global warming, Climate change).	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures,Audio/Video clips, Group discussion.	8
5 (Waste Management)	Solid waste: Generation and waste characterization. Collection, storage and transport. Waste disposal, waste processing techniques, reduction, reuse and recycling, resource recovery and utilization. Physical and chemical treatment methods and	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion. Field visits. Industrial Visit (MSW/BMW/STP/ETP)	8

	composting. Hazardous waste management and treatment.		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Environmental Science by B. S. Chauhan; Firewall Media, 2008 • Environmental Science by Cuningham and Cuningham; McGraw-Hill Education; 13th edition (16 February 2014) • Environmental Engineering by S. K. Dhameja; S. K. Kataria & Sons, 2009 • Environmental Science by Richard T Wright; Benjamin-Cummings Pub Co.
Articles	
References Books	Environmental Engineering by Howards S Peavy, Donald R Rowe, T. George • Environmental Science & Engineering by Gilbert M. Master • Environmental Chemistry by Stanley
MOOC Courses	https://onlinecourses.swayam2.ac.in/cec21_ge08/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Making of Modern India
Course Code	MCL0202[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Humanities, Social Sciences and Management							
Pre-Requisite/s	Basic knowledge of social sciences and political sciences.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** At the end of this course, students would be intellectually well equipped to have a sense of modern Indian history and culture. **(BL1-Remember)** **CO2-** The students will have an understanding of making of India as a nation and salient features of modern India.**(BL2-Understand)** **CO3-** 4. It will help students to develop their personality and thinking horizon for being a good and concerned Indian citizen**(BL3-Apply)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✓ Gender ✓ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG4(Quality education) SDG5(Gender equality) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	1. Idea of India in historical perspective a) Indian culture, b) cultural commonness, c)cultural diversities, d)unity in diversity, e) culturall accomodations ,f) cultural conflicts, g)Idea of India and British Rule , h) Role of Indian Intelligentsia.	Class room Lecuters	6
Unit-II	2. Emergence and growth of Indian Nationalism a) Anti-colonial basis ,b) Economic Nationalism ,c) communalism and nationalism ,d) revivalism and Indian nationalism ,e)Enlightenment values ,f)European Nationalism and Indian Nationalism	Class room Lecuters	6
Unit-III	3. Social Reform Movements a) British Rule and Indian introspection ,b)Raja Rammohan Roy, c) social reform movements in 19th century , d)Swami Vivekanand ,e)The women issue ,f)Caste system	Class room Lecuters	6
Unit-IV	4. Indian National Movement a)Early Revolts and 1857 Revolt, b)Early Nationalists ,c) Bang Bhang Movement , d) Gandhi led Mass Movements, e) Socialist and Left trends , f) Princely States and their integration into nation, h)Partition and Independence .	Class room Lecuters	6
Unit-V	5. India after independence a)Making of Indian Constitution ,b) Post Independent Nehru Era , c) India facing Wars , d) Indian econmy- From Planning to LPG ,e) Achievements, f) Challenges in 21st century India.	Class room Lecuters	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0	0			

Part E

Books	1. Bipan Chandra and others: India's Struggle For Independence , Penguine Publishers. 2. Bipan Chandra: History Of Modern India, Orient Blackswan publishers. 3. Sunil Khilnani: The Idea of India, Penguine publishers. 4. Shekhar Bandopadhyay: From Plastic to Partition and After, A History of Modern India, Orient Blackswan publishers. 5. Rakesh Batabyal: The Penguine Book of Modern Indian Speeches,1878 to Present, Penguine Publishers. 6. A R Desai:Social Background of Indian Nationalism, Popular Prakashan . 7. B R Nanda: Mahatma Gandhi ,A Biography,London
Articles	
References Books	1. B.R.Nanda:Gandhi and His Critics, Oxford 2. Girja Shankar: Socialist Trends in Indian National Movement ,Meerut 3. Urmila Phadnis:Towards the integration of Indian States,1919-1947,Mumbai 4. Bimal Prasad: Gandhi,Nehru and JP,A Study in Leadership,New Delhi 5. Bipan Chandra and others:India Since Independence ,Penguine 6. Ramchandra Guha:Makers of Modern India, Penguine. 17. Austin Granville: The Indian Constitution, Oxford
MOOC Courses	https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/61
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2-	-	-	1	-	-	1-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Engineering Graphics
Course Code	MEL0202[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of geometrical construction, sketching, imagination etc.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of engineering graphics, geometrical construction and its applications.**(BL1-Remember)** **CO2-** To understand the basic concept of engineering graphics through real-life examples. **(BL2-Understand)** **CO3-** To implement the different engineering graphics concepts over appropriate drawing dataset. **(BL3-Apply)** **CO4-** To analyze the drawing performance of engineering graphics techniques.**(BL4-Analyze)** **CO5-** To evaluate the drawing performance of engineering graphics techniques on a corresponding object.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	1. Drafting tools, 2. Principles of Graphics, 3. Geometrical constructions 4. Scales: Plain, diagonal, 5. Curves used in engineering practice: such as ellipse, parabola, hyperbola by different methods. Cycloidal curves, Involutes and Spirals.	Lecture with Whiteboard, PPT	8
Unit-2	1. Types of projection, Orthographic projections, First angle and third angle projection. 2. Projections of points in different quadrants. Projections of lines, True inclination and true length of straight line, Traces.	Lecture with Whiteboard, PPT	8
Unit-3	Projections of planes: Perpendicular plane, oblique plane and Auxiliary plane, projection of planes with inclined to one or both the reference planes and traces of planes.	Lecture with Whiteboard, PPT	8
Unit-4	1. Projection of solids: Polyhedron and solids of revolution, projection of solids with inclined to one or both the reference planes. 2. Introduction to Section of solids and Development of surfaces.	Lecture with Whiteboard, PPT	8
Unit-5	1. Isometric projection: Isometric scale, isometric projections from orthographic drawing. 2. Computer Aided Drafting (CAD): Introduction, benefit, software’s, basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.	Lecture with Whiteboard, PPT	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Drawing sheet of plane scale.	Experiments	BL3-Apply	2
Experiment -2	Drawing sheet of diagonal scale.	PBL	BL3-Apply	2
Experiment -3	Drawing sheet of ellipse.	PBL	BL3-Apply	2
Experiment -4	Drawing sheet parabola and hyperbola	PBL	BL3-Apply	2
Experiment -5	Drawing sheet of cycloidal curves.	PBL	BL3-Apply	2
Experiment -6	Drawing sheet of orthographic projection		BL3-Apply	2
Experiment -7	Drawing sheet of projection of line		BL3-Apply	2
Experiment -8	Drawing sheet of projection of plane.		BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. N.D.Bhatt Elementary of Enginnering Drawing Charotar Publication P.S. Gill Engineering Drawing Kataria Publication Agrawal and Agrawal Engineering Drawing TMH
Articles	
References Books	Venu Gopal K Engineering Drawing New age K.L. Narayana& P. Kannaiah Engineering Drawing SCITECH Pub.
MOOC Courses	https://nptel.ac.in/courses/112103019
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	2	-	2	2	1	2	-	-	3	3	-	-	3	2	2
CO3	-	-	2	1	1	-	-	-	2	1	-	-	3	2	2
CO4	-	1	2	3	1	-	-	-	-	-	-	-	3	-	2
CO5	-	1	1	2	1	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Manufacturing Technology-I
Course Code	MEL0240[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of properties of Materials, types of manufacturing process, concepts of force and Pascal's law, surface tension capillarity.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall basic principles of sciences and material science.**(BL1-Remember)** **CO2-** To describe the basic concept of casting and welding processes.**(BL2-Understand)** **CO3-** To implement basic knowledge in analyzing the forces and processes of welding and casting.**(BL3-Apply)** **CO4-** To analyze the welding and casting processes**(BL4-Analyze)** **CO5-** To evaluate and summarize the analysis in optimizing the casting and welding processes.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit – 1	Casting: Patterns and Pattern making, basic principle of casting process, types of patterns and allowances, types and properties of molding sand, sand perperation and control, element of mould, gating, riser, runners, cores and core making, solidification of casting, role of chilling	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit – 2	Casting Processes: Sand castings, pressure die casting, permanent mould casting, centrifugal casting,precision investment casting, shell Moulding, CO2 Moulding, electro slag casting, Fettling and finishing, defects in Castings, Casting of non-ferrous materials. Melting and Pouring: Melting furnaces- crucibles oil fired furnaces, electric furnaces, cupola furnace, selection of furnace.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit – 3	Basic Joining process- Types of welding-gas welding, -arc welding,-shielded metal arc welding, GTAW, GMAW, SAW, ESW-Resistance welding (spot, seam, projection, percussion, flash types)-atomic hydrogen arc welding-thermit welding.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit – 4	Welding Process-Special Welding Processes: Soldering, brazing and their applications, welding of special materials– Stainless steel, Aluminium etc. weldability of cast iron, steel, stainless steel, aluminium alloys. Introduction to Electron beam and Laser welding, Flame cutting - Use of Oxyacetylene, modern cutting processes, arc cutting, Pre welding and post welding.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit – 5	Design of Weldments: Welding symbols, Positions of welding, joint and groove design, heat input, effect of welding parameters, preheating and post heating, Selection of electrodes, flux etc. Weldments Testing: Inspection of welds – destructive and non- destructive testing methods, Defects in welding, causes and remedies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Pattern design and making –for one casting drawing.	Experiments	BL3-Apply	2
Experiment -2	Sand properties testing exercise for strengths and permeability	Experiments	BL3-Apply	2
Experiment -3	Moulding melting and casting process.	Experiments	BL3-Apply	2
Experiment -4	Arc welding- lap & butt joint preparation.	Experiments	BL3-Apply	2
Experiment -5	spot welding joint prepapartion.	Experiments	BL3-Apply	2
Experiment -6	To perform TIG welding.	Experiments	BL3-Apply	2
Experiment -7	To perform Plasma welding and brazing process	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. Rao P N, Manufacturing Technology, McGraw Hill. 2. M. P. Groover, Fundamental of modern manufacturing: Materials, Processes and System, John Wiley and Sons
Articles	
References Books	1. Pandey P C “Production Engineering Science” Standard publishers 2. Little Richard L. “Welding& Welding Technology” Tata McGraw Hill
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_me48/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	3	3	1	1	1	3	3	1	1	1
CO2	3	3	3	2	2	3	3	-	1	1	3	3	1	1	1
CO3	3	3	3	2	2	3	3	-	-	-	3	3	2	2	2
CO4	3	3	3	2	2	3	3	3	2	2	2	3	3	3	3
CO5	3	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Engineering Mathematics
Course Code	MAL0308[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Basic Sciences and Mathematics							
Pre-Requisite/s	Basic knowledge of equations			**Co-Requisite/s**	Basic knowledge of roots			
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to numerical computing, Approximation and error in numerical computations, Numerical solution of algebraic and Transcendental equations. Regula-Falsi method, Newton-Raphson method, Graffes-Root squaring method, Iterative method. Solution of simultaneous linear equation, Gauss-Elimination method, Jacobi's method Gauss- Seidel method Iterative method. Numerical differentiation and integration(Trapezoidal rule Simpson's 1/3rd rule , Simpson's 3/8rule)	Lecture with white board and PPT, Audio/Video clips, group discussion, quiz	8
Unit 2	Difference operators, Interpolation: Newton's forward and backward method, Lagrange method, Central difference interpolation, Numerical solution of ordinary differential equations: Picard's method, Euler method, Modified Euler method and Runge- Kutta Method, Numerical solution of partial differential equation: Elliptic (Laplace Equation), Parabolic (Heat conduction equation)	Lecture with white board and PPT, Audio/Video clips, group discussion, quiz	8
Unit 3	Laplace Transform: Laplace Transform of elementary functions, Laplace Transform of derivatives, integrals and multiplication by t^n and division by t, Inverse Laplace Transform., convolution Theorem (application only), application to solution of differential equations.	Lecture with white board and PPT, Audio/Video clips, group discussion, quiz	8
Unit 4	Fourier transform, Fourier complex transform Fourier integral theorem, Fourier sine and cosine transform of simple function of derivatives, Finite Fourier sine & cosine transform, inverse of Fourier transform, Application to differential equation, solution of one dimensional heat and wave equations through Fourier transform.	Lecture with white board and PPT, Audio/Video clips, group discussion, quiz	8
Unit 5	Transform: Definition of Z -transform, Z-transform of simple sequences. Properties of Z -transform. Initial and final value theorem, Inverse Z -transform, partial fraction method, convolution theorem, residue method, Application to finite difference equation.	Lecture with white board and PPT, Audio/Video clips, group discussion, quiz	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill 2. B.S.Grewal, Higher Engineering Mathematics ,Khanna Publishers 3. H.K.Das and R. Verma, Higher Engineering Mathematics, S.Chand and Company Pvt.Ltd.
Articles	
References Books	1. E.Kreyszig, Advanced Engineering Mathematics ,John Wiley and Sons, 1999 2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers. 3. T. Veerajan and T. Ramachandran, Theory and Problems in Numerical Methods, Tata McGraw Hill
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma36/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma36/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	-	-	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	-	-	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	-	-	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	-	-	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Evaluation of Industrial Training-1
Course Code	MED0301[P]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	subject knowledge of first and second semester .			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand themselves in relation to their community and develop among themselves since of social and civic and responsibility. **(BL2-Understand)** **CO2-** Identify the needs and problem of the community and involve them in problem solving. **(BL2-Understand)** **CO3-** Utilize their knowledge in finding practical solution to individual and community problem. **(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL3-Apply	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL4-Analyze	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2-	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2-	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2-	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Basic Thermodynamics
Course Code	MEL0305[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	An introductory background in chemistry, physics, and calculus			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the energy and its transformation **(BL1-Remember)** **CO2-** To understand energy conservation techniques**(BL2-Understand)** **CO3-** To apply the oncept of energy transformation in heat and work systems**(BL3-Apply)** **CO4-** To analyze power producing devices**(BL4-Analyze)** **CO5-** To evaluate model for optimal power output**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, statement and significance, concept of an Ideal gas,, Gas laws, Avogadro's hypothesis, Real gas, Deviation with ideal gas. Vander-wall's equation, evaluation of its constants, limitations of the equat. The law of corresponding states, Compressibility factor,generalized compressibility chart, P-V-T surface of a Real gas.	Lectures with whiteboard/PPT, Quiz, Group discussion	10
2	Pure Substance, Phase, Phase-transformations formation of steam, properties of steam, PVT surface HS, TS, PV, PH, TV diagram, measurement of dryness fraction of vapor.Use of steam table and Mollier chart, Gibbs and Helmholtz functions	Lectures with whiteboard/PPT, Quiz, Group discussion	10
3	First law of thermodynamics, Statement of first law of thermodynamics first law applied to closed system,, first law applied to a closed system undergoing a cycle processes analysis of closed system, flow process, flow energy,steady flow process,Relations for flow processes, limitations of first law of thermodynamics	Lectures with whiteboard/PPT, Quiz, Group discussion	8
4	Second law of thermodynamics, heat engine, heat reservoir Refrigerator, heat pump, COP, EPR, Available energy, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle,statement of second law, Reversible and irreversible processes, consequence of second law, Entropy, Entropy change for ideal gas, T- S diagrams, Availability and Irreversibility, exergy, Gibbs and Helmholtz functions, Entropy of universe	Lectures with whiteboard/PPT, Quiz, Group discussion	8
5	Air standard cycles, --Otto, Diesel, Dual cycles and their comparison, MEP and Efficiency, Brayton cycle, Vapor power cycles-- Power generation by steam, Carnot cycle, Rankin cycle, reheat & regenerative cycles	Lectures with whiteboard/PPT, Quiz, Group discussion	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To Study of part of engine	Experiments	BL2-Understand	03
2	To study the construction and working of 2 stroke petrol engines	Experiments	BL2-Understand	03
3	To study the construction and working of 2 stroke diesel engines	Experiments	BL3-Apply	03
4	To study the construction and working of 4 stroke petrol engines	Experiments	BL4-Analyze	03
5	To study the construction and working of 4 stroke diesel engines	Experiments	BL2-Understand	03
6	To study of reciprocating pump	Experiments	BL3-Apply	03
7	To study of centrifugal pump	Experiments	BL3-Apply	03
8	To study the working of Vapor compression refrigeration test rig	Experiments	BL2-Understand	03

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. P. K. Nag Engineering Thermodynamics, TMH 4thEdition 2 D. S. Kumar Thermal Science & Engineering 5th Edition 3 Onkar Singh Applied Thermodynamics by New Age
Articles	
References Books	1 R. E. Sonntag, C. Borgnakke, and G.J. Van Wyle Fundamentals of Thermodynamics 5thEdition 2 Arora C. P Thermodynamics, TMH 1stEdition 3 Yunus A. Ceingel, Michael A. Boles Thermodynamics" TMH 5thEdition
MOOC Courses	https://www.coursera.org/courses?query=thermodynamics
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	1	1	2	2	1	2	3	1	-	3	3	3
CO3	-	1	3	2	1	2	2	2	-	1	-	3	3	3	2
CO4	1	2	2	3	2	-	-	2	-	-	2	1	3	2	2
CO5	-	-	-	-	1	2	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Measurement and Metrology
Course Code	MEL 0308[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	fundamental understanding of mathematics, particularly algebra and geometry, basic physics concepts such as mechanics and thermodynamics, familiarity with instrumentation and data analysis techniques, and a grasp of engineering principles.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember and understand the basic principle of applied physics, i.e., Unit of measurement, characteristics of instruments**(BL1-Remember)** **CO2-** To understand the concept of generalized measurement system**(BL2-Understand)** **CO3-** To apply the measurement of mechanical parameter such as pressure, force, torque, and strain in equipments**(BL3-Apply)** **CO4-** To analyze the error in measurement system and tolerance**(BL4-Analyze)** **CO5-** To evaluate the measurement of linear and angular measurement.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit -1	Concept of measurement: General concept of measurement, Need for measurement, Generalized measuring system, Units, Standards, Sensitivity, Readability, Range of accuracy, Precision, Accuracy Vs precision, Uncertainty. repeatability and reproducibility, Errors in measurement, Types of error, Systematic and random error, Calibration, Interchangeability. ~~Static and dynamic performance,types of sensors, types of transducers and their characteristics.~~	Lecture with white board/PPT, Audio/Video clips, group discussion, Physical model, quiz	8
Unit -2	Linear and angular measurements: Linear measuring instruments: Vernier caliper, Micrometer, Interval measurements: - Slip gauges, Checking of slip gauges for surface quality, Optical flat, Application of limit gauges, limit fits and tolerances. Comparators: - Mechanical comparators, Electrical comparator, Optical comparator, Pneumatic comparator, Sine bar, Use of sine bar, Limitations of sine bars, Sources of error in sine bars, Bevel protractor, Applications of bevel protractor. ~~measurement of pressure - introduction of pressure gauge, gravitational, directing acting, elastic and indirect type pressure transducers, Measurement of starin.~~	Lecture with white board/PPT, Audio/Video clips, group discussio, Review Analysis	8
Unit -3	Form measurement: Introduction, Screw thread measurement, Thread gauges, Measurement of gears: Gear errors, Surface finish measurement: -Introduction, Elements of surface texture, Analysis of surface finish, Methods of measuring surface finish, Straightness measurement, Flatness testing, Roundness measurements, Coordinate measuring machine (CMM):-Types of CMM, Features of CMM, Computer based inspection.	Lecture with white board/PPT, Audio/Video clips, group discussion, , classroom presentations	8
Unit -4	Measurement of power, flow and temperature related properties: - Measurement of force, Accelerometer, Load cells, Bourdon tube. Torque measurement: Torque measurement using strain gauges, Torque measurement using torsion bars, Mechanical dynamometers.	Lecture with white board/PPT, Audio/Video clips, group discussion, quiz	8

	~~Straightness, flatness, roundness, tool maker's microscope, profile project autocollimator, Interferometry - principle and use, Michelson interferometer optical flat.~~		
Unit -5	Measurement of flow: Variable area meters – rotameter, Hot wire anemometer, Pitot tube. Temperature measurement, Bimetallic strip, Thermocouples (Thermo electric effects), Thermistors, Pyrometers. ~~Feature inspection~~	Lecture with white board/PPT, Audio/Video clips, group discussion, quiz	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	MEASUREMENT WITH SCALE AND VERNIER CALIPERS	Experiments	BL3-Apply	2
Experiment -2	MEASUREMENT WITH MICROMETERS	Experiments	BL3-Apply	2
Experiment -3	STUDY AND USE OF SLIP GAUGES	Experiments	BL2-Understand	2
Experiment -4	MEASUREMENT OF ANGLE WITH SINE BAR AND HEIGHT GAUGE	Experiments	BL4-Analyze	2
Experiment -5	STUDY OF INSPECTION GAUGES SUCH AS PLUG, SNAP, AND THREAD GAUGES	Experiments	BL2-Understand	2
Experiment -6	MEASUREMENT OF ANGLES WITH BEVEL PROTRACTOR	Experiments	BL3-Apply	2
Experiment -7	MEASUREMENT WITH COMBINATION SET	Experiments	BL3-Apply	2
Experiment -8	MEASUREMENT WITH DIAL INDICATOR USING SURFACE PLATE AND ACCESSORIES	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Kumar, D. S. (2012). Mechanical Measurements & Control. New Delhi: Metropolitan Publications. Raghavendra, N. S. (2018). Metrology and Measurements. Pearson Education India.
Articles	
References Books	Sawhney, A. K. (1994). Mechanical Measurements & Instrumentation. New Delhi: Dhanpat Rai & Sons. Hume, D. R., & Hume, E. (2015). Metrology and Measurement. CRC Press.
MOOC Courses	https://archive.nptel.ac.in/courses/112/106/112106138/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	1	2	3	2	1	2	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	-	3	2	-	-	2	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Mechanics of Solids
Course Code	MEL 0310[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	a complete description of the geometry of the member, its constraints, the loads applied to the member and the properties of the material of which the member is composed.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concept of physics and engineering mechanics **(BL1-Remember)** **CO2-** To understand the rigid and deformed bodies**(BL2-Understand)** **CO3-** To apply the concept of engineering to calculate stress strain value**(BL3-Apply)** **CO4-** To analyze the deformation of body under action of force**(BL4-Analyze)** **CO5-** To evaluate the results through testing of component/material.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Stress and strain; normal, shear and bearing stresses; normal and shear strain, modulus of Elasticity, Poisson's ratio, Elastic and Bulk modulus, relation between elastic constants, deformation of axial members, tensile tests for ductile and brittle materials, yield strength, yield criteria, ultimate strength, factor of safety, mechanical properties, temperature stresses in simple and composite members.	Lecture with white board and PPT, Quiz, Seminar, Poster	10
2	Strain energy due to axially applied loads (gradual, sudden and impact loads). State of stress, Generalized Hook's Law, stress transformation, principal planes, principal stresses and strains, maximum shear stress, Mohr's Circle representation for stress and strains	Lecture with white board and PPT,Quiz, Seminar, Poster	10
3	Theories of failures and its assumptions. Bending of beams: Pure bending, bending of beams with symmetric cross section, composite cross sections, shear stress in beams, deflection in beams by different methods for various boundary conditions	Lecture with white board and PPT,Quiz, Seminar, Poster	8
4	Torsion of Shafts: Torsional Moment Diagram, torsion formula for solid and hollow shafts, maximum normal and shear stress, angle of twist, combined effect of axial load, bending moment and torsional moment on circular shafts. Elastic Stability: Euler buckling, equivalent length, Rankine formula, eccentric loading.	Lecture with white board and PPT,Quiz, Case writing, seminar	8
5	Pressure Vessels: Thin and Thick walled pressure vessels; radial, axial and circumferential stresses, maximum shear stress, volumetric strain. Compound cylinder. Leaf spring, Stress and defection in open helical spring. ~~Curved Beams: beams with large initial curvature, position of neutral axis for circular, rectangular, and trapezoidal cross sections, crane hook.~~	Lecture with white board and PPT,Quiz, Case writing, seminar	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the mechanical Properties of metals	Experiments	BL2-Understand	03
2	To perform torsion test on mild steel rod	Experiments	BL3-Apply	03
3	To determined impact strength of steel (charpy test)	Experiments	BL4-Analyze	03
4	To determined impact strength of steel (izod test)	Experiments	BL3-Apply	03
5	To determine brinell hardness numbers for mild steel	Experiments	BL4-Analyze	03
6	To determine the rock well hardness numbers for steel	Experiments	BL5-Evaluate	03
7	To determine the tensile strength of mild steel	Experiments	BL6-Create	03
8	Analysis of simply supported beam with ANSYS	Experiments	BL6-Create	03

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Timushenko. S. P. and Young, Strength of Material, East-West Press. Beer, Johnston & Dewolf, Mechanics of Materials, Tata McGraw-Hill Education R K Bansal, Strength of Material, Laxmi Publication
Articles	
References Books	A. Pytel, and J Kiusalaas, Mechanics of Materials, CENGAGE Learning, 2012 G.H. Ryder, Strength of Materials, MACMILAN, 1969 Popov, Strength of Materials, PHI, New Delhi. Crandell, Dhal and Lardner, Introduction to Mechanics of Solids, McGraw Hill
MOOC Courses	https://www.coursera.org/courses?query=mechanics%20of%20materials
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	2	-	-	3	3	-	-	3	2	3
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	-	1	2	2	-	2	2	-	-	2	-	3	3	3	3
CO4	1	2	2	2	2	-	2	2	-	-	2	1	3	2	3
CO5	-	-	-	1	1	3	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Manufacturing Technology –II
Course Code	MEL 0341[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of Material science and manufacturing process.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of various metal forming operations.**(BL1-Remember)** **CO2-** To understand the mechanism of metal forming.**(BL2-Understand)** **CO3-** To implement the different metal forming operations to deform the parts.**(BL3-Apply)** **CO4-** To analyze the different parameters used in metal forming.**(BL4-Analyze)** **CO5-** To evaluate different forces which act during the operations.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Fundamentals of Metal Forming Importance of manufacturing, Materials and their structures, Mechanical behavior of crystalline materials, elastic and plastic deformation, yield criteria, Concept of flow stress, hot working and cold working, Metallurgical aspects of metal forming, effects of temperature, classification of metal forming processes, Heat treatment processes, Effect of heat treatment in metal forming processes.	Lectures with whiteboard/PPT , Quiz, Group discussion	8
Unit 2	Forging: Forging principle, classification, equipment, tooling-processes, Forging operations, post forging heat treatment forging defects & applications, Forgeability, Comparison of forging with other manufacturing processes. Rolling: Scope and importance of rolling, Principles of rolling processes, classification, types of rolling mills, analysis of rolling load, torque and power, Form rolling, rolling defects, causes and remedies.	Lectures with whiteboard/PPT , Quiz, Group discussion	9
Unit 3	Extrusion and Drawing: Classification of extrusion processes, tool, equipment, and principle of these processes, Extrusion dies, Extrusion load analysis, defects and remedies, rod/wire drawing, tool, equipment and principle of processes, defects, Tube drawing and sinking processes. Unconventional Metal Forming Process: Unconventional metal forming process such as explosive forming, electromagnetic, electro- hydraulic forming.	Lectures with whiteboard/PPT , Quiz, Group discussion	7
Unit 4	Sheet metal forming: Presses and their classification, die and punch assembly and press work methods and process, formability of sheet metals- principle, process parameters, equipment and application of the following processes: deep drawing, spinning, stretch forming. cutting/punching mechanism, blanking versus piercing, compound and progressive die, coining, embossing etc.	Lectures with whiteboard/PPT , Quiz, Group discussion	6
Unit 5	Powder Metallurgy Powder metallurgy manufacturing process, preparation of powders, types & function of binders, green	Lectures with whiteboard/PPT , Quiz, Group discussion	6

	compaction, sintering process and its effect on the product, advantages and application of powder metallurgy products. ~~Jigs and fixtures: locating and clamping devices, principles of jigs and fixtures, classification and application.~~		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment 1	To study of forging process.	Experiments	BL2-Understand	2
Experiment 2	To perform the forging operations.	Experiments	BL5-Evaluate	2
Experiment 3	To study of hammer forging.	Experiments	BL2-Understand	2
Experiment 4	To study of rolling process.	Experiments	BL2-Understand	2
Experiment 5	To study of extrusion and drawing process.	Experiments	BL2-Understand	2
Experiment 6	To study of sheet metal working.	Experiments	BL2-Understand	2
Experiment 7	To perform the sheet metal forming operations.	Experiments	BL5-Evaluate	2
Experiment 8	To making a tray from the given sheet metal.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Ghosh and Mallick Manufacturing Science East West Press, 2010 R. K. Jain Production Technology Khanna Publishers, 2001
Articles	
References Books	P. C. Pandey Production Engineering Science Standard Publishers, 2010 P. N. Rao Manufacturing Technology Mc Graw Hill, 2001 P M Groover Fundamental of modern manufacturing: Materials, Processes, and System John Wiley and Sons, 2010
MOOC Courses	https://www.mooc-list.com/tags/manufacturing
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	2	2	2	2	3	3	3	-	-	3	3	3
CO2	3	-	2	2	-	2	2	-	1	3	-	-	3	3	3
CO3	3	2	2	2	1	2	2	-	-	-	-	-	3	2	3
CO4	3	2	3	2	1	-	-	-	-	-	-	-	2	-	3
CO5	3	1	2	2	1	-	-	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Machine drawing
Course Code	MEP0302[P]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of engineering graphics and machine parts.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of machine drawing and its applications.**(BL1-Remember)** **CO2-** To understand the basic concept of machine drawing through real-life examples.**(BL2-Understand)** **CO3-** To implement the different machine drawing concepts over appropriate drawing dataset**(BL3-Apply)** **CO4-** To analyze the drawing performance of machine drawing techniques.**(BL4-Analyze)** **CO5-** To evaluate the drawing performance of machine drawing techniques on a corresponding object.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Drawing Conventions: Drawing standards, first angle projection, orthographic views, sectioning and its rules, BIS codes for dimensioning, limits, fits and tolerances, surface texture, bill of materials, product data, and production drawings.	Whiteboard, PPT, Drawing sheet	
Unit-2	Conventional Representation conventional representation of machine parts such as threads, slotted heads, square ends, ribs, slotted shafts, splined shafts, bearings, springs, gears, rivet heads and joints, welded joint representation. Assembly machine drawing - drawing types, assembly and blow up parts.	Whiteboard, PPT, Drawing sheet	
Unit-3	Drawing of fasteners: Nut, bolt and washers, locking arrangements, rivets and heads, drawing of various riveted joints, standard proportions, Cotter and Knuckle joints.	Whiteboard, PPT, Drawing sheet	
Unit-4	Assembly drawing of power transmission components: Muff and flange couplings, solid and bushed journal bearings, pedestal bearing, Plummer block, and pulleys. Assembly drawing of IC engine parts: Connecting rod assembly, piston and rod end assembly. Assembly drawing of machine tool parts: Drill spindle, lathe tailstock, lathe spindle assembly, four jaw chuck, and shaper tool head.	Whiteboard, PPT, Drawing sheet	
Unit-5	Computer aided drafting: Software, graphic screen, setting of blank sheet for drawing, draw commands, modify commands, display commands, object snap, dim and miscellaneous commands.	Whiteboard, PPT, Drawing sheet	

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	To discribe sectioning of materials	Experiments	BL2-Understand	2
Experiment-2	conventional representation of machine parts	Experiments	BL2-Understand	2
Experiment-3	drawing of various riveted joints, standard proportions, Cotter and Knuckle joints.	Experiments	BL3-Apply	4
Experiment-4	Assembly drawing of power transmission components and I C Engine parts.	Experiments	BL3-Apply	4
Experiment-5	To study of camputer added drafting	Experiments	BL4-Analyze	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. N.D.Bhatt Machine Drawing Charotar Publication 2 P.S. Gill Engineering Drawing Kataria Publication 3 K C John Textbook of machine drawing EEE, PHI
Articles	
References Books	1 K. L. Narayana Machine Drawing New Age International 2 N Sidheswar Machine Drawing Tata Mcgraw Hill
MOOC Courses	https://nptel.ac.in/courses/112103019
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	2	1	-	-	2	2	2	1	-	-
CO2	1	2	2	2	1	2	2	-	-	-	2	2	3	3	3
CO3	2	1	2	-	-	-	2	2	-	-	-	2	3	-	3
CO4	1	2	2	3	2	-	2	1	-	-	2	2	3	2	2
CO5	-	2	1	2	2	3	2	-	-	-	-	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Object Oriented Programming Methodology (Python)
Course Code	CSP0401[P]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic programming concept**(BL1-Remember)** **CO2-** Understand the basics of Python like python origin downloading and installing and basic concept of python**(BL2-Understand)** **CO3-** Apply the various conditional and looping statement and functional programming. **(BL3-Apply)** **CO4-** Explain various objects numbers and sequence in python Analyze the concept of regular expression.**(BL4-Analyze)** **CO5-** Evaluate the concept of object-oriented programming for better utilization of language.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Python programming Introduction, origin of Python, Downloading, Installing and Running Python, Python Basics: Comment, Identifier, Indentations, Basic data types, conversions, operators, Build in functions. I/O Statements, Condition Statements & Loops: If, else, elif), conditional expressions, while, for, break continue	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	8
Unit 2	Data Structures in Python Lists: Introduction, Accessing list, Operations, Working with lists, Tuple: Introduction, Accessing tuples, Operations, Working with list, Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Set: Introduction ,Accessing set, Operations, Working with sets	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	8
Unit 3	Functions, Modules, File Handling Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous function, Global and local variables, Recursion. Modules: Creating modules, Importing module, Packages, File Handling :Opening and closing files, Reading and writing files	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	8
Unit 4	Exceptional Handling, Regular Expressions Exception Handling: Exception, Exception Handling, Try and Except clause, User Defined Exceptions, Exception handling in files). Regular Expressions: Introduction/motivation, special symbols and characters for REs , Match function, Search function., Matching VS Searching., Modifiers, Patterns.	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	9
Unit -5	Object Oriented Programming in Python Introduction, OOPS Basics: Class and object, Constructors, Need of Encapsulations, Attributes, default attributes, static attributes, static methods, initializing objects, Pass by reference , self. Relational-ships: Introduction, Aggregation, Dependency. Inheritance: Need of Inheritance, Overriding, Super, Types of Inheritance. Abstract Class, methods.	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
unit 1-2	Practical Assignment	Experiments	BL2-Understand	7
1-5	Activity Based Learning	Experiments	BL3-Apply	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	100	60			
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	2	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	3	1	-	-	-	-	-	-	-	3	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Fluid mechanics
Course Code	MEL0407[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Vector calculus, ordinary and partial differential equations, some exposure to complex variables.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the concepts of basic sciences and engineering mechanics**(BL1-Remember)** **CO2-** To describe the application of engineering mechanics and physics in fluids.**(BL2-Understand)** **CO3-** To apply the knowledge of fluids in laminar and turbulent flow of various systems. **(BL3-Apply)** **CO4-** To analyze the systems in boundary layer.**(BL4-Analyze)** **CO5-** To evaluate the systems through computational fluid dynamics.**(BL5-Evaluate)**								
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Definitions of fluid, Types of fluid, Fluid Properties, velocity of sound ideal fluid viscosity, effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitation. Fluid Statics: Pascal's law, hydrostatics manometry, fluid forces on submerged plain and curved surfaces, The international standard atmosphere, metacentric height, stability, submerged bodies, floating bodies.	Lectures with white Boad, Marker, Assignment	10
2	Kinematics and conservation of Mass: Flow classifications, fluid velocity and acceleration, streamlines and the stream function. pathlines and streak lines. Deformation of a fluid element, vorticity and circulation. Types of flow, Flownet, Laplace equation, continuity equation. Fluid Momentum: Euler's Momentum theorem, applications of the momentum theorem, Bernoulli's equation. Applications of Bernoulli's Eqn: Pitot tube, Orifice meter, Nozzle, Venturimeter.	Lectures with white Boad, Marker, Assignment , quiz	10
3	Laminar Flow: Hagen Poiseuille flow, Plane Poiseuille flow and couette flow. Flow Through Pipes: Reynold's experiment, Darcy's Weisback equation. Major and Minor losses, Total and Hydraulic gradient lines, Flow through pipe line. Pipes in series, parallel; transmission of power through pipes.	Lectures with White Boad, Marker, Assignment , Quiz, Seminar	8
4	The Boundary Layer: Description of the boundary layer. Boundary Layer thickness, boundary layer separation and control. The Prandtl boundary layer equation. Solution for laminar boundary layer. The momentum equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Dimensional Analysis: Buckingham variables, Model Similitude, Force ratio, Dimensionless numbers and their applications. Undistorted model distorted model scale effect.	Lectures with White Boad, Marker, Assignment , Quiz, Seminar, Presentation	8
5	Turbulent Flow: Variation of friction factor with Reynold's number. The Prandtl Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, rough	Lectures with White Boad, Marker, Assignment , Quiz, Seminar, PBL	8

	pipes. Simple solution of Navier Stokes equations (without derivation). Computational Fluid Dynamics: What, When and Why?, CFD Advantages and Applications, Fundamental principles of conservation, Reynolds transport theorem, Conservation of mass, Conservation of linear momentum. Finite difference methods		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To determine Cv, Cc and Cd for orifice meter	Experiments	BL3-Apply	3
2	To determine Cv, Cc and Cd for venturi meter	Experiments	BL2-Understand	3
3	Find the losses due to friction in pipe	Experiments	BL4-Analyze	3
4	Find the losses due to pipe fitting.	Experiments	BL4-Analyze	3
5	Find the Cd for Nozzle meter.	Experiments	BL5-Evaluate	3
6	Find the meta-centric height.	Experiments	BL2-Understand	3
7	Find the Cd for different type of Notches.	Experiments	BL3-Apply	3
8	To Draw performance curve for forced vortex flow	Experiments		3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Engineering Fluid Mechanics, K. L. Kumar, Eurasia Publishing House Pvt. Ltd. Fluid Mechanics and Machines, F.M. White, John Wiley & Sons Fluid Mechanics and Machines, A. K. Jain Fluid Mechanics, V. L. Streeter, McGraw Hill Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publication New Delhi Fluid Mechanics with Applications, S. K. Gupta V. Gupta, New Age Publications
Articles	
References Books	Fluid Mechanics for Chemical engineers, Noel de Nevers, Mc Graw HillII Edition 1991 Fluid mechanics for chemical engineers, James O Wikes and Stacy G. Bikes, Prentice Hall.
MOOC Courses	https://www.mooc-list.com/tags/fluid-mechanics
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	3	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	-	1	3	3	1	2	2	2	-	2	-	3	3	3	2
CO4	1	2	3	3	2	-	3	2	-	-	2	1	3	2	2
CO5	-	1	-	-	2	3	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Industrial Engineering
Course Code	MEL0409[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of basic science and production engineering.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concepts of work and motion study **(BL2-Understand)** **CO2-** Apply the concepts of work and motion study to improve productivity.**(BL3-Apply)** **CO3-** Describe the methods of job evaluation and wage incentive.**(BL5-Evaluate)** **CO4-** Understand and apply methods of inspection and quality control.**(BL3-Apply)** **CO5-** Understand and apply PERT and CPM.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Productivity & Work Study Definition of productivity, work content, ineffective time, productivity and standard of living, introduction to work Study Method Study: Objectives and procedure for methods analysis, recording techniques, principles of motion economy, micro-motion and Macro-motion study, Therbligs and SIMO Chart.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Work Measurement Objectives, work measurement techniques, time study, work sampling, pre-determined motion time standards (PMTS), determination of time standards, observed time, basic time, normal time, rating factors, allowances, and standard time. Introduction to ergonomics.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Job Evaluation and Wage Plan Objective, methods of job evaluation, job evaluation procedure, merit rating (performance appraisal), method of merit rating, wage and wage incentive plans.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Inspection and Statistical Quality Control: Quality, quality control, costs of quality, inspection and quality control, SQC concept, variable and attributes, normal distribution curves and control charts for variable and attributes and their applications and interpretation (Analysis) process capability. Acceptance sampling, sampling plans, OC Curves and AOQ curves.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Project Management Introduction to project management, ~~event, activity, dummy, network rules, planning for network construction, time estimates in PERT, expected~~ ~~time; time Computations in PERT, earliest expected time, slack, critical~~ ~~path, probability of meeting schedule date.~~ ~~Introduction to Critical Path Method, procedure, networks, activity time~~ ~~estimate, earliest event _me, latest allowable occurrence _me, combined~~	Lectures with whiteboard/PPT, Quiz, Group discussion	8

	~~tabular computations for TE and TL, start and finish times of activity, float,~~ ~~critical activities and critical path, crashing of project network, resource leveling and resource allocation.~~ Collaborative Working, PM Tutorials, Product development cycle overview; Market demands and trends for products; Product Lifecycle Management (PLM); Intellectual Property Rights (IPRs).		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. O.P. Khanna Industrial Engineering and Management Dhanpat Rai Publishing Co Pvt Ltd, 2. Ravi Shankar Industrial Engineering and Management Galgotia Publications Pvt Ltd, 3. Martand Telsang Industrial Engineering and Management Schand Publications
Articles	
References Books	1 Jay Heizer and Barry Render Operations Management Pearson Education, 2000 2 Mikell P. Groover and Michael M. Grieve Work Systems: The Methods, Measurement & Management of Work Pearson Education, 2013
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_me04/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	3	2	3	2	3	3	3	-	2	3	3
CO2	1	2	3	3	3	2	3	2	3	3	3	-	2	3	3
CO3	1	3	2	3	-	-	-	-	-	3	-	-	2	3	3
CO4	-	3	-	3	2	-	2	-	3	3	3	1	3	3	3
CO5	1	3	2	3	-	-	-	-	-	3	3	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Energy Conversion Systems
Course Code	MEL0411[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students should have fundamental knowledge of thermodynamics, basic mathematics and physic.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Recall the concepts of Basic Thermodynamics**(BL1-Remember)** **CO2-** Understating the concept of Energy conversion systems**(BL2-Understand)** **CO3-** Applying the basic concept of Heat Transfer**(BL3-Apply)** **CO4-** Analyzing the working of boilers, turbines, condensers**(BL4-Analyze)** **CO5-** Evaluating the working of boilers, turbines, condensers**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Thermodynamic Relation: Thermodynamic Coordinates, Exact differentials, Mathematical conditions for exact differentials, Maxwell relations, Clausius Clayborn equation, its applications, Joule Thomson coefficient, Inversion curve, coefficient of volume expansion, adiabatic and Isothermal Compressibility	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-2	Boilers: Definition, Classification, working of fire tube and water tube Boilers, Natural and forced Draught, Chimney height calculation, Mountings and accessories Air Preheater, feed water heater, super heater, Boiler efficiency, equivalent evaporation, Boiler trial, heat balance sheet.	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-3	Steam nozzles: Flow through nozzles, variation of velocity, area and specific volume, conditions for maximum discharge, chocked flow, throat area, nozzle efficiency, effect of friction on nozzle, supe saturated flow. Condensers: Classification, Air leakage, performance, comparison, efficiency	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-4	Steam Engines and Turbines: Introduction of steam engines, Classification, working of steam engine, Indicator Diagram, Impulse and reaction turbine, staging, stage and overall efficiencies, reheat factor, Bleeding, velocity diagrams, simple impulse and reaction turbine, Work done, comparison with steam engines, losses in steam turbines, Governing of turbines, Vapour Power Cycles: Comparison of Carnot and Rankine cycles, Effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-5	Gas turbines: Gas turbines classification, Brayton cycle, principles of gas turbine, gas turbine cycles with intercooling, reheat, regeneration and their combinations, stage efficiency, polytrophic efficiency, deviation of actual cycles from ideal cycle.	Lectures with white board/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Study of Babcock and Wilcox Boiler	Experiments	BL4-Analyze	2
Experiment -2	Study of Fire Tube Boiler	Experiments	BL4-Analyze	2
Experiment -3	Study of Boiler Mountings	Experiments	BL4-Analyze	2
Experiment -4	Study of Accessories of Boiler Economizer	Experiments	BL4-Analyze	2
Experiment -5	Study of Other Mountings of the boiler	Experiments	BL4-Analyze	2
Experiment -6	Study of The Locomotive Boiler	Experiments	BL4-Analyze	2
Experiment -7	Study of The Pelton Wheel Turbine	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	D. Text Books P.K. Nag “Basic and Applied Thermodynamics” Tata MC Graw Hill.
Articles	
References Books	D. S. Kumar “Engineering Thermodynamics” First edition (June 2012)
MOOC Courses	https://onlinecourses.nptel.ac.in/noc23_ch76/preview
Videos	<

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	-	1	3	3	1	2	2	2	-	2	-	3	3	3	2
CO4	1	2	3	3	2	-	3	2	-	-	2	1	3	2	2
CO5	-	1	-	-	2	3	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Kinematics of Machines
Course Code	MEL0415[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of basic velocity and acceleration.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various types of mechanism, velocity, acceleration, terminology of gears.**(BL1-Remember)** **CO2-** To understand velocity and acceleration analysis of different types of mechanism. **(BL2-Understand)** **CO3-** To implement velocity and acceleration analysis to cam, gears and different types of mechanism.**(BL3-Apply)** **CO4-** To analyze the different types of mechanism.**(BL4-Analyze)** **CO5-** To evaluate the applications of kinematics of machine in various fields such as research and industries;**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Basic Concept of Mechanisms: Introduction to planar, spherical and special mechanisms, Terminology, mechanism and machine, link, kinematic pair, kinematic chain, mobility, classification of mechanisms, kinematic inversions, Grubler's criteria, Grashof's law. Introduction to other mechanisms: Universal joint, Pantograph, Straight line mechanisms, Davis and Ackermann's steering mechanisms.	Lectures with whiteboard/PPT, and animation of different mechanism, Recorded video/interactive videos	8
Unit-2	Velocity Analysis: Velocity definition, rigid body rotation, velocity difference between points of rigid body, velocity polygon for simple mechanisms, vector method applied to complex mechanisms, Instantaneous center of velocity and its location, Aronhold Kennedy theorem of three centers, velocity analysis using instantaneous centers.	Lectures with whiteboard/PPT, and animation of different mechanism, Recorded video/interactive videos	8
Unit-3	Acceleration analysis: Definition, types of acceleration, acceleration difference between points on a rigid body, acceleration polygon, analytical/vector methods, Corriolis acceleration and its examples	Lectures with whiteboard/PPT, and animation of different mechanism, Recorded video/interactive videos	8
Unit-4	Cams: Introduction, classification of cams and followers, types of follower motion and their comparison, displacement diagram, nomenclature and graphical layout of cam profile, undercutting in cam profile, analytical treatment of tangent and circular cams with flat face and roller followers.	Lectures with whiteboard/PPT, and animation of different mechanism, Recorded video/interactive videos	8
Unit-5	Gear and Gear Trains: Terminology and definitions, law of gearing, Involute properties, Gear tooth standards for interchangeable gears, Gear tooth action, path and arc of contact, contact ratio, interference and undercutting, avoiding interference. Gear Trains: Parallel axis gear trains, determination of number of teeth, velocity ratio, Epicyclic gear trains.	Lectures with whiteboard/PPT, and animation of different mechanism, Recorded video/interactive videos	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0	0			

Part E

Books	1. Rattan S S Theory of Machines TMH.
Articles	
References Books	1 Ambekar A. G Mechanism and Machine Theory PHI 2 Ghosh A. and Mallick A. Theory of Mechanisms and Machines Affiliated East- KWest Press. 3 Shigley J.E. and Uicker J.J Theory of Machines and Mechanisms McGraw-Hill.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_me25/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	1	2	2	2	1	2	2	2	1	1	-	3	2	3	2
CO4	1	3	2	3	2	-	3	2	-	-	2	2	2	2	2
CO5	-	1	1	2	2	3	3	-	-	-	2	-	1	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Machining processes
Course Code	MEL0442[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of material science and manufacturing processes			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of various machining operations.**(BL1-Remember)** **CO2-** To understand the basic concept of metal cutting mechanism.**(BL2-Understand)** **CO3-** To implement the mechanism of machining in different machines.**(BL3-Apply)** **CO4-** To analyze the different parameters used in machining operations.**(BL4-Analyze)** **CO5-** To evaluate different forces which act during the machining.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Metal Cutting: Economics of machines, introduction to machining processes, classification, mechanics of chip formation process, concept of shear angle, chip contraction and cutting forces in metal cutting, Merchant theory, tool wear, tool life, machinability. Fundamentals of measurement of cutting forces and chip tool interface temperature.	Lectures with whiteboard/PPT, Quiz, Group discussion	11
Unit 2	Cutting Tools: Types, geometry of single point cutting tool, twist drill and milling cutter, tool signature. Cutting Tool Materials: Classification of cutting tool materials and properties, tool insert, Selection of machining parameters. Coolants and lubricants: classification, purpose, function and properties.	Lectures with whiteboard/PPT, Quiz, Group discussion	10
Unit 3	Machine Tools Lathe: Classification, description and operations, kinematic scheme of lathe, and lathe attachments. Speed, feed and machine time calculations. Shaping And Planning Machine: Classification, description and operations. Milling Machine: Classification, description and operations, indexing devices, up milling and down milling.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit 4	Drilling Machine: Classification, description and operations. Speed, feed and machine time calculations. Boring Machine: Classification, description and operations. Broaching Machine: Classification, description and operations.	Lectures with whiteboard/PPT, Quiz, Group discussion	7
Unit 5	Grinding Machines: Classification, description and operations, grinding wheel composition, nomenclature of grinding wheels. Jigs and Fixtures: Locating and clamping devices, principles of jigs and fixtures, classification and application.	Lectures with whiteboard/PPT, Quiz, Group discussion	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment 1	Study of different parts of lathe machine	Experiments	BL2-Understand	2
Experiment 2	To perform Facing, Turning and Taper turning operations on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 3	To perform thread cutting and knurling operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 4	Study of different parts of Shaper machine	Experiments	BL2-Understand	2
Experiment 5	To perform the operations on Shaper machine.	Experiments	BL5-Evaluate	2
Experiment 6	Study of different parts of Milling machine	Experiments	BL2-Understand	2
Experiment 7	To perform the operations on Milling machine.	Experiments	BL5-Evaluate	2
Experiment 8	To perform the operations on Drilling machine.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Ghosh and Mallick Manufacturing Science East West Press, 2010 Dr. P. C. Sharma Manufacturing Technology-II S. Chand & Company Ltd.
Articles	
References Books	P. C. Pandey Production Engineering Science Standard Publishers, 2010 P. N. Rao Manufacturing Technology Vol. II Tata McGraw–Hill, New Delhi, 2009 P M Groover Fundamental of modern manufacturing, Processes And System John Wiley and Sons, 2010
MOOC Courses	https://archive.nptel.ac.in/courses/112/104/112104290/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	2	1	2	2	3	3	3	-	-	3	3	3
CO2	3	-	2	2	-	2	2	-	1	3	-	-	3	3	3
CO3	3	2	2	2	1	2	2	-	-	-	-	-	3	2	3
CO4	3	2	3	2	1	-	1	-	-	-	-	-	2	-	3
CO5	3	1	2	2	1	-	1	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Evaluation of Industrial Training-2
Course Code	MED0502[P]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	subject knowledge of Mechanical Engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand themselves in relation to their community and develop among themselves since of social and civic and responsibility. **(BL2-Understand)** **CO2-** Identify the needs and problem of the community and involve them in problem solving. **(BL2-Understand)** **CO3-** Utilize their knowledge in finding practical solution to individual and community problem. **(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL4-Analyze	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL5-Evaluate	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2-	-	-	-	-	-	-	-	1	2	1
CO3	1-	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Machine Design-I
Course Code	MEL0515[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Prerequisites for the course "Machine Design" include a strong foundation in mechanical engineering fundamentals, understanding of materials science, proficiency in engineering mathematics, engineering mechanics and solid mechanics , and familiarity with manufacturing processes and mechanical systems analysis.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic principle of Solid mechanics, Machine drawing, Engineering Mechanics, and stress- strain etc.**(BL1-Remember)** **CO2-** To understand the concept of design against static loading for mechanical components and suitable material for machine components.**(BL2-Understand)** **CO3-** To apply the concept of design against static loading for mechanical components**(BL3-Apply)** **CO4-** To analyze the safe dimensions of Welded Joints, Riveted Joints, Shat, Key, Coupling, Spring and Screw Jack under the static and dynamic load.**(BL4-Analyze)** **CO5-** To evaluate the applications of Machine design in various fields such as research and industries**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit -1	Design process, Requirement for mechanical and other properties, Design procedure, and use of standards in design, preferred sizes, ergonomic and aesthetic considerations, Selection of materials, mechanical properties, designation for plain carbon steels, alloy steels, cast iron and their engineering usage. Design against static loads, modes of failure	Lecture with PPT, Audio/Video clips, group discussion, Physical model of gear, quiz	10
Unit -2	Stress concentration and its effect on ductile and brittle materials, stress concentration factor for various geometries, cyclic stresses, notch sensitivity, design for finite and infinite life, Soderberg, Goodman & Gerber criteria	Lecture with PPT, Audio/Video clips, group discussion, lecture with PPT, Review Analysis	6
Unit -3	Riveting methods, comparison of riveted joints with other joining methods, rivet materials, types of rivet heads, types of riveted joints, caulking and fullering, failure of riveted joints, efficiency of riveted joints, design of boiler joints, eccentric loaded riveted joint. Welded joints: Design of welded joints, butt welds, fillet welds-transverse and parallel fillet, eccentric load, fluctuating load on welded joints	Lecture with PPT, Audio/Video clips, group discussion, lecture with PPT, classroom presentations	8
Unit -4	Shafts: Cause of failure in shaft, materials for shaft, stress in shaft, and design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, shaft subjected to fatigue loads, design for rigidity. Keys: Types and selection, design of square and flat keys, splines. Couplings: Selection of couplings, design of rigid and flexible couplings.	Lecture with PPT, Audio/Video clips, group discussion, lecture with PPT, quiz	8
Unit -5	Mechanical Spring: Types, nomenclature of helical and leaf springs, spring materials, types of ends, design of helical springs subjected to static and fatigue loading, design of leaf springs. Power Screws: Forms of threads, multiple threads, efficiency of square threads, trapezoidal threads, stresses in screws, design of simple screw jack	Lecture with PPT, Audio/Video clips, group discussion, lecture with PPT, quiz	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Material selectionand relevant BIS nomenclature	Experiments	BL2-Understand	2
Experiment -2	development of series for new product	Experiments	BL2-Understand	2
Experiment -3	Examples of Production considerations	Experiments	BL2-Understand	2
Experiment -4	design of Knuckle & Cotter joints	Experiments	BL3-Apply	2
Experiment -5	Design of machine Componets subjected to nFatigue Load	Experiments	BL3-Apply	2
Experiment -6	Design of Riveted joints	PBL	BL4-Analyze	2
Experiment -7	Design of welded joint	PBL	BL3-Apply	2
Experiment -8	Design of Keyed joints and shaft couplings	PBL	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	12	60	

Part E

Books	Bhandari, V. B. (2016). Design of Machine Elements. Tata McGraw-Hill Education. Shigley, J. E., Mischke, C. R., & Budynas, R. G. (2010). Mechanical Engineering Design (9th ed.). McGraw-Hill Education.
Articles	
References Books	Spotts, M. F., Shoup, T. E., & Hornberger, E. T. (2010). Design of Machine Elements (8th ed.). Pearson. Juvinall, R. C., & Marshek, K. M. (2011). Fundamentals of Machine Component Design (5th ed.). John Wiley & Sons. Norton, R. L. (2009). Design of Machinery (4th ed.). McGraw-Hill Education.
MOOC Courses	https://archive.nptel.ac.in/courses/112/105/112105124/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	1	2	3	2	1	2	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	-	3	2	-	-	2	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	IC Engines
Course Code	MEL0516[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of basic thermal science.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic principles of thermal sciences. **(BL1-Remember)** **CO2-** To understand the basic concept of thermodynamics, heat engines and air standard cycles.**(BL2-Understand)** **CO3-** To implement the knowledge of thermodynamics in determining the engine parameters.**(BL3-Apply)** **CO4-** To analyze the thermal efficiency of various cycles and cooling and lubrication systems.**(BL4-Analyze)** **CO5-** To evaluate the findings of analysis of supercharging, cooling and lubrication systems within permissible limits of pollutants.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Introduction to IC Engines: Definition of engine; classification, Application of IC Engines, Air Standard Cycle and deviation from air standard cycle actual cycle, indicator diagram, MEP, Shaft Power, Indicated Power.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-II	Actual working of IC engine: Introduction to fuel air cycles and their significance, composition of cylinder gases, variable specific heats, comparison of air standards & fuel air cycles, effect of operating variable like compression ratio, fuel air ratio, actual cycles and their analysis; difference between actual and fuel-air cycle; actual and fuel-air cycles for S.I. and C.I. engines. Working of 4 stroke petrol & diesel engines and their valve timing diagram, working of 2-stroke petrol & diesel engines & their valve timing diagrams, comparison of two stroke & four stroke engines, actual working of 2 & 4 stroke gas engines and their valve diagram	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-III	Fuel and Combustion: Fuels for SI and CI engine, Important qualities of SI and CI engines fuels, rating of SI engines, and CI engines fuels, Dopes, Combustion in CI engines, ignition delay, knock and its control, combustion chamber design for CI engines. Combustion in SI engine, detonation, additives, Gaseous fuels, LPG, CNG, Biogas, producer gas, alternatives fuels for IC engines.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-IV	Fuel Supply System: Fuel supply system and fuel pumps, properties of air fuel mixture, a sample carburetor an its working, actual air fuel ratio of single jet carburetor, supercharger, introduction to petrol injection, fuel injection systems for C.I., cooling and lubricants of IC engines. Classification of injection systems, injection pump, fuel injection systems, Fuel Injector, Nozzle, Injection of S.I. Engines, Fuel Filters.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-V	Measurement and Testing: Measurement of shaft power, indicated power, measurement of speed, air consumption, fuel consumption, heat carried by cooling water, heat carried by the exhaust gases, Morse	Lectures with whiteboard/PPT, Recorded video/interactive videos	8

	test heat balance sheet, governing of I.C. Engines, performance characteristics of I.C. Engines: Performance parameters, performance of S.I. Engines, performance of C.I. Engine. Recent trends in I C Engines: Rotary engines, Stratified charged engines, multi-fuel engines, concept of six-stroke engines and other recent automotive technologies.		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Study of working of Two stroke Petrol engine	Experiments	BL2-Understand	2
2	Study of working of Two stroke Diesel engine	Experiments	BL2-Understand	2
3	Study of working of four- stroke Diesel engine	Experiments	BL2-Understand	2
4	Study of working of four- stroke Petrol engine	Experiments	BL2-Understand	2
5	To determine the efficiency and heat balance of petrol engine	Experiments	BL3-Apply	2
6	To determine the efficiency and heat balance of Dieselengine	Experiments	BL3-Apply	2
7	Study of brake dynamometer	Experiments	BL2-Understand	2
8	To determine brake power of Petrol engine	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40		60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40		60	

Part E

Books	1. Sharma and Mathur, Internal Combustion Engines, Dhanpat Rai Publ.
Articles	
References Books	1 Heywood John, Fundamentals of IC Engines, McGraw Hill. 2 Ganeshan V. , Internal Combustion Engines Tata McGRaw Hill 3 Domkundwar, Internal Combustion Engines, Dhanpath Rai & Sons
MOOC Courses	https://ocw.mit.edu/courses/2-61-internal-combustion-engines-spring-2017/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	3	3	1	-	1	3	3	1	1	1
CO2	3	3	3	1	-	3	3	1	-	1	3	3	1	1	1
CO3	3	3	3	2	2	3	3	1	-	-	3	3	2	2	2
CO4	3	3	2	3	2	3	3	2	2	2	3	3	3	3	3
CO5	3	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Dynamics of Machines
Course Code	MEL0518[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of engineering Mechanics, Kinematics of machines and basic sciences.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic principles of engineering mechanics and kinematics of machines. **(BL1-Remember)** **CO2-** To understand the basic concept of system of forces and engine operations.**(BL2-Understand)** **CO3-** To implement the basics in analyzing the forces on I C engines and steam engines, governors and flywheels.**(BL3-Apply)** **CO4-** To analyze the force analysis in balancing of masses in reciprocating and rotary engines.**(BL4-Analyze)** **CO5-** To evaluate the findings in implementation of balancing of masses and gyroscopes and vibrations.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Inertia Forces in Reciprocating Parts D'Alemberts principle, inertia force and inertia torque, equivalent dynamical system, analytical method for velocity and acceleration of the piston, angular velocity and acceleration of the connecting rod, forces on the reciprocating parts of the engine neglecting the weight of the connecting rod: piston effort, force acting along the connecting rod, thrust on the sides of the cylinder walls, crank pin effort and thrust on crank shaft bearing, torque on the crank shaft.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-2	Turning Moment Diagrams and Flywheel Turning moment diagram for single cylinder double acting steam engine, fluctuation of energy, maximum fluctuation of energy, coefficient of fluctuation of energy. Flywheel: coefficient of fluctuation of speed, energy stored in a flywheel, dimensions of the flywheel.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-3	Governors and gyroscope Introduction, Types of governors, terms used in governors, analysis of watt governor, porter governor , proell governor, sensitiveness of governors, stability of governors, hunting. Gyroscope: Introduction, processional angular motion, gyroscopic couple, effect of gyroscopic couple on an aero plane and naval ship.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-4	Balancing Introduction, balancing of rotating masses: balancing of a single rotating mass by a single mass rotating in the same plane, balancing of a single rotating mass by two masses rotating in the different planes, balancing of several masses rotating in the same plane. Balancing of reciprocating masses: primary and secondary unbalanced forces of reciprocating masses, swaying couple and hammer blow.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
Unit-5	Free vibrations Introduction: Types of free vibrations, natural frequency of free longitudinal ,free transverse vibrations and torsional vibrations , effect of inertia of the constraint in longitudinal , transverse and torsional free vibrations, natural frequency of free transverse vibration due to a point load acting over a simply supported shaft, natural frequency of free transverse vibrations for a shaft subjected to a number of point loads, critical speed of the shaft, free torsional vibration of a single rotor system, torsionally equivalent shaft.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	Experiment on Performance Characteristic Curves of Watt Governor	Experiments	BL2-Understand	4
Experiment-2	Experiment on Performance Characteristic Curves of Porter Governor	Experiments	BL2-Understand	4
Experiment-3	Estimation of Gyroscopic Couple & Understanding of Gyroscopic Effects on a rotating disc.	Experiments	BL3-Apply	4
Experiment-4	Static And Dynamic Balancing of Rotating Masses	Experiments	BL4-Analyze	4
Experiment-5	Undamped Torsional Vibrations of Single Rotor System	Experiments	BL4-Analyze	4
Experiment-6	Free and Forced Vibration of Simply Supported Cantilever Beam.	Experiments	BL4-Analyze	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. Rattan S S Theory of Machines TMH.
Articles	
References Books	1. Ambekar A. G Mechanism and Machine Theory PHI 2. Ghosh A. and Mallick A. Theory of Mechanisms and Machines Affiliated East- KWest Press. 3. Shigley J.E. and Uicker J.J Theory of Machines and Mechanisms McGraw-Hill
MOOC Courses	https://archive.nptel.ac.in/courses/112/104/112104114/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	1	2	3	2	1	2	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	-	3	2	-	-	2	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Fluid Machinery
Course Code	MEL0521[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	integral calculus and differential equations, so these courses are prerequisites. It also helps to have taken physics and thermodynamics prior to this course			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall concept of basic sciences and fluid mechanics**(BL1-Remember)** **CO2-** To Understand Components and operation; velocity triangles, work output**(BL2-Understand)** **CO3-** To apply fluid mechanics in Components and operation, velocity triangles and work output**(BL3-Apply)** **CO4-** To analyze Main elements and their functions; Various types and classification**(BL4-Analyze)** **CO5-** To evaluate new Components, working principle; pressure variations due to piston acceleration**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Euler’s turbomachinery equation, Specific speed, impulse and reaction principle, impulseMomentum principle, jet impingementon stationary and moving flat plates and vanes, calculation for force exerted, work done and efficiency of jet, basic components of turbo machinery and its classification.	Lectures with white board and PPT, Assignment	10
2	Components and operations, velocity triangles, work output, effective head, available power and efficiency, design aspects such as mean diameter of a wheel, Jet ratio, number of jets, number of buckets with working proportion	Lectures with white board and PPT,Quiz, Seminar	10
3	Component and operations, velocity triangle and work output, working proportions and design parameters for Runner, degree of reaction, draft tubes, its function and types, function and brief description of commonly used surge tanks.	Lectures with white board and PPT,Assignment, Poster presentation	8
4	Main elements and their function, periods types and classification, pressure change in a pump, suction, delivery and manometric head, vane shape and its effect on head capacity relationships, Departure from Euler’s theory and losses, pump output and efficiency, minimum starting speed and impeller diameters at the inner and Outer periphery	Lectures with white board and PPT,Assignment, quiz	8
5	Components, working principles, pressure variation due to piston acceleration, acceleration effect in suction and delivery pipe, work done against friction, maximum permissible vacuum during suction stroke, Air vessel.	Lectures with white board and PPT,Quiz, seminar, Assignment	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To verify momentum equation by impact of jet apparatus	Experiments	BL3-Apply	04
2	Study of Pelton turbine and perform experiment on Pelton turbine test rig	Experiments	BL4-Analyze	04
3	Study of Francis turbine	Experiments		04
4	Study of Kaplan turbine and perform experiment on Kaplan turbine test rig	PBL	BL6-Create	04
5	Study of centrifugal pump and perform the experiment on centrifugal pump test rig	Experiments	BL2-Understand	04
6	Study of Reciprocating pump and perform the experiment on reciprocation pump test rig	Experiments	BL5-Evaluate	04

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Hydraulic Turbines, Daughaty R L, McGraw Hill Book Co.. A Text book of Fluid Mechanics and Hydraulic Machines, Rajput, R.K., S. Chand and Co., New Delhi
Articles	
References Books	Fluid Mechanics and Fluid Power Engineering by Kumar D S, S K Kataria and Sons, Delhi Hydraulic Machines by Jagdish Lal, Metropolitan Book Co Pvt. Ltd Fluid Mechanics and Hydraulic Machines, Bansal, R.K., Laxmi Publications, New Delhi
MOOC Courses	https://archive.nptel.ac.in/courses/112/105/112105206/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	-	1	3	2	1	2	2	2	-	2	-	3	3	3	2
CO4	1	2	3	3	2	-	3	2	-	-	2	1	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Advanced Manufacturing
Course Code	MEL0522[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Information about basic manufacturing processs.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the concepts of manufacturing, material science, Production, Engineering Mechanics.**(BL1-Remember)** **CO2-** To understating the concept of advanced machining process i.e. USM, AJM, WJM, AWJM, ECM, EDM, EBM, and LBM.**(BL2-Understand)** **CO3-** To apply the concept of Advanced casting process i.e. Metal mould casting.**(BL3-Apply)** **CO4-** To analysis of Advanced welding process i.e. EBW, LBM, USW, Plasma arc welding. **(BL4-Analyze)** **CO5-** To evaluation of Advanced Metal Forming & Finishing Processes.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Advanced Machining Processes Limitations of conventional manufacturing processes, Need and classification of unconventional or advanced manufacturing processes, Process Principle, Parametric analysis and applications of processes such as ultrasonic machining (USM), Abrasive jet matching (AJM), Water jet machining(WJM), Abrasive water jet machining (AWJM), Electrochemical machining (ECM), Electro discharge machining (EDM), Electron beam machining (EBM), Laser beam machining (LBM) Processes.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Advanced Casting Processes Metal mould casting, Continuous Casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting , High pressure die casting process and study of injection chamber (HPDC).	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Advanced Welding Processes Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW), Plasma Arc Welding.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Advanced Metal Forming Processes Details of high energy rate forming (HERF) process, electro- magnetic forming, explosive forming, Electro-hydraulic forming, Stretch forming, Contour roll forming,	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Advanced Finishing Processes Need, classification, process principle and applications of Abrasive Flow Finishing, Magnetic Abrasive Flow Finishing (MAFF) , Magnetic Abrasive Finishing (MAF) .	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
			0		0

Part E

Books	Benedict G.F. Non-Traditional Manufacturing Processes Marcel Dekker
Articles	
References Books	Jain V. K. Advance Machining Processes, Allied Publisher.
MOOC Courses	https://archive.nptel.ac.in/courses/112/107/112107078/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	-	-	-	-	-	-	-	2	-	3
CO2	3	3	-	3	-	-	-	-	-	3	2	-	3	3	3
CO3	2	2	-	3	-	-	-	-	-	3	2	-	3	3	3
CO4	3	3	-	3	-	-	-	-	-	3	2	-	3	3	3
CO5	3	3	-	3	-	-	-	-	-	3	3	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Industrial Automation and Control
Course Code	MEL0523[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Student should have knowledge of kinematics of machine and basic mathematics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Recall the concepts of Kinematics of machines, Dynamics of machines.**(BL1-Remember)** **CO2-** Understating the concept of joints and links.**(BL2-Understand)** **CO3-** Applying the basic degree of freedom concept.**(BL3-Apply)** **CO4-** Determine the options of fixed or flexible automation.**(BL4-Analyze)** **CO5-** Determine the safe conditions of optimizing human and robots role.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Definition of an industrial automation, the advantages & disadvantages, Types of Automation, Automation in production system, Industrial Automation and Robotic Basic Concept Link and Joint Degree of freedom, Orientation Axes, Position Axes, Tool Centre Point (TCP), Work envelope/workspace. Speed, Payload, Repeatability, Accuracy, Settling Lectures with whiteboard/PPT, Quiz, Group discussion Time, Control Resolution, Coordinates, Accuracy and Repeatability, Control resolution, Payload Components, Applications, of Automation system.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Mechanical System: Components, Dynamics and Modeling Elementary Mechanical Concepts Translation or Linear Motion Rotational Motion- Mechanical Work and power, Motion Conversion Rotary to Rotary Motion Conversion, Rotary to Linear Motion Conversion, Linkages, Couplers, The Concept of Power Transfer, Modelling of Mechanical System-Elements, Rules and Nomenclature, Translational Example, Rotational Example, Electrical Analog	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Actuators--Flow Control Valves, Electric actuators, Relays, Power relays, - General purpose relay, -Hydraulic Actuators, - Pneumatic Actuators, Pneumatic Valves Stepper Motors-Principles of stepper motor operation, Half Step Mode Operation, Micro-step Mode, Methods of Damping Rotor Oscillations, Permanent Magnet Stepper Motors Stepper motor drives, Linear stepper, motors	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Classification of sensors, Sensor generalities, Sensor characteristics, Angular and Linear Position Sensors, Velocity and Acceleration Sensors Tacho generator, Signac interferometer, micromechanical angular velocity and acceleration sensor, Contact sensor Piezoresistive and capacitive tactile sensors, optical tactile sensors, force measurement by deformation of contact sensors, principle and applications of strain gage sensors, Laser-Range Radar, Laser interferometric distance meter, Laser-Doppler Velocimeter, Pressure, Temperature, Flow measurement	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Automation Design and process specifications, Mechanical Description of the automation, Motion Sequence, Motor and Drive Mechanism Selection, Encoder Selection, Control Structure: Programmable	Lectures with whiteboard/PPT, Quiz, Group discussion	8

	Logic Controller used for Industrial Automation. Lectures with whiteboard/PPT, Quiz, Group discussion		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	1. Dr. K. Shivanand and Dr. M. N. Shanmukha Swamy Industrial Automation and Engineering Approach CRC Press
Articles	
References Books	1 Stamatios Manesis George Nikolakopoulos Introduction to Industrial Automation CRC Press Taylor & Francis Group
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_me39/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO3	1	3	2	3	-	-	-	-	-	3	-	-	2	3	3
CO4	1	3	2	3	1	-	3	-	-	3	3	-	3	3	3
CO5	-	3	2	3	-	-	-	-	-	3	3	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Minor Project
Course Code	MED0603[P]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Mechanical engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	15 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	20 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Machine Design-II
Course Code	MEL0617[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Prerequisites for the course "Machine Design" include a strong foundation in mechanical engineering fundamentals, understanding of materials science, proficiency in engineering mathematics, knowledge of engineering mechanics, Solid Mechanics, Machine Desig-I and familiarity with manufacturing processes and mechanical systems analysis.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concepts of Machine Design, Solid mechanics, Machine drawing, Engineering Mechanics etc.**(BL1-Remember)** **CO2-** To understand the concept of design against static loading for mechanical components and suitable material for machine components.**(BL2-Understand)** **CO3-** To implement the concept of design against static loading for mechanical components**(BL3-Apply)** **CO4-** To analyse the safe dimensions of Gear, Clutch, IC Engine, Bearing and Brakes under the static and dynamic load.**(BL4-Analyze)** **CO5-** To evaluate the applications of Machine design in various fields such as research and industries.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit -1	Classification of gears, standard gear tooth system, nomenclature for spur, helical and bevel gears, gear standards, force analysis for spur, helical, and bevel gears, gear failure modes, bending and contact stresses in gear tooth, gear material selection, Lewis and Bukingham equations, design of spur, helical and bevel gears, general design procedure for a fixed ratio gearbox	lecture with ppt, Physical model of gear, quiz, Audio/Video clips, group discussion,	10
Unit -2	Sliding Contact Bearing: Types of lubrication-hydro dynamic, hydro static and EHD lubrication, plain journal bearing, Petroff's equation and the bearing characteristic number, boundary and film lubrication, pressure distribution-eccentricity and minimum film thickness, heat generation and thermal equilibrium, design procedure Rolling Contact Bearing: Types of ball and roller bearings, thrust ball bearing, selection of radial ball and roller bearings, bearing life, dynamic equivalent load, reliability of bearing, lubrication and mounting of bearings.	lecture with ppt, Understand the design of Bearing from Physical model bearing, Review Analysis Audio/Video clips, group discussion	6
Unit -3	General design considerations, design of cylinder and cylinder head, piston, connecting rod and crank shaft	lecture with ppt, classroom presentations, Audio/Video clips, group discussion	8
Unit -4	Friction clutches and brakes, uniform pressure and uniform wear assumptions, design of disc and cone types of clutches and brakes, design of external contracting and internal expanding elements, band type clutches and brakes, centrifugal clutches	lecture with ppt, classroom presentations, Audio/Video clips, group discussion	8
Unit -5	Drives: Belt Drives, Belt Constructions, Geometrical Relationships, Analysis of Belt Tension, Condition for Maximum Power, Chain Drives, Roller Chains, Geometric Relationships, Polygonal Effect, Power Rating of Roller Chain	lecture with ppt, classroom presentations, Audio/Video clips, group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Design of Spur gear	Experiments	BL3-Apply	2
Experiment -2	Design of Helical Gear	Experiments	BL3-Apply	2
Experiment -3	Design of Sliding contact bearing design	Experiments	BL3-Apply	2
Experiment -4	Design of Anti-friction bearing selection	Experiments	BL2-Understand	2
Experiment -5	Design of IC engine Components	Experiments	BL3-Apply	2
Experiment -6	Design of Clutches	Experiments	BL2-Understand	2
Experiment -7	Design of Brakes	Experiments	BL3-Apply	2
Experiment -8	Design of IC engine Components	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Bhandari, V. B. (2016). Design of Machine Elements. Tata McGraw-Hill Education. Shigley, J. E., Mischke, C. R., & Budynas, R. G. (2010). Mechanical Engineering Design (9th ed.). McGraw-Hill Education.
Articles	
References Books	Spotts, M. F., Shoup, T. E., & Hornberger, E. T. (2010). Design of Machine Elements (8th ed.). Pearson. Juvinall, R. C., & Marshek, K. M. (2011). Fundamentals of Machine Component Design (5th ed.). John Wiley & Sons. Norton, R. L. (2009). Design of Machinery (4th ed.). McGraw-Hill Education.
MOOC Courses	https://archive.nptel.ac.in/courses/112/106/112106137/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	1	2	3	2	1	2	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	-	3	2	-	-	2	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Heat and Mass Transfer
Course Code	MEL0619[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Heat Transfer uses calculus and differential equations, which are prerequisites, and taking a basic fluids course.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the basic thermal science **(BL1-Remember)** **CO2-** To understand Mechanism of Heat Transfer, Conduction, Convection and Radiation, General Differential equation of Heat Conduction**(BL2-Understand)** **CO3-** To apply the Laws of Radiation, Stefan Boltzman Law, Kirchoff Law**(BL3-Apply)** **CO4-** To Analyse of Diffusion Mass Transfer, Fick's Law of Diffusion, Steady state Molecular Diffusion, Convective Mass Transfer, Momentum**(BL4-Analyze)** **CO5-** To evaluate Nusselts theory of condensation, pool boiling, flow boiling, correlations in boiling**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	Conduction: Mechanism of Heat Transfer, Conduction, Convection and Radiation, General Differential equation of Heat Conduction, Fourier Law of Conduction, Cartesian and Cylindrical Coordinates, One Dimensional Steady State Heat Conduction, Conduction through Plane Wall, Cylinders and Spherical systems, Composite Systems, Conduction with Internal Heat Generation, Extended Surfaces Unsteady Heat Conduction, critical thickness of insulation	Lectures with white board and PPT, Assignment	10
2	Convection Convective Heat Transfer Coefficients, Boundary Layer Concept, Types of Convection, Forced Convection, Dimensional Analysis, External Flow, Flow over Plates, Cylinders and Spheres, Internal Flow, Laminar and Turbulent Flow, Combined Laminar and Turbulent, Flow over Bank of tubes, Free Convection, Dimensional Analysis, Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.	Lectures with white board and PPT, Quiz, Seminar,	10
3	Radiation: Laws of Radiation, Stefan Boltzman Law, Kirchoff Law, Black Body Radiation, Grey body radiation. Wein displacement law, Shape factor-radiation exchange between surfaces - Radiation shields- Greenhouse effect.	Lectures with white board and PPT, Assignment, Poster presentation	8
4	Mass Transfer Diffusion Mass Transfer, Fick's Law of Diffusion, Steady state Molecular Diffusion, Convective Mass Transfer, Momentum, Heat and Mass Transfer Analogy, Convective Mass Transfer Correlations	Lectures with white board and PPT, Assignment, quiz	8
5	Nusselts theory of condensation, pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers, LMTD Method of heat Exchanger Analysis, Effectiveness, NTU method of Heat Exchanger Analysis, Overall Heat Transfer Coefficient, Fouling Factors.	Lectures with white board and PPT, Quiz, seminar, Assignment	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Heat transfer through composite wall	Experiments	BL2-Understand	03
2	Thermal conductivity of insulation slab	Experiments	BL3-Apply	03
3	Heat transfer through a pin fin	Experiments	BL4-Analyze	03
4	Heat transfer by natural convection	Experiments	BL4-Analyze	03
5	Heat transfer by forced convection	Experiments	BL5-Evaluate	03
6	To perform experiment on Stefan Boltzman apparatus	Experiments	BL5-Evaluate	03
7	Drop Wise film condensation	Experiments	BL6-Create	03
8	LMTD of heat exchanger	Experiments	BL4-Analyze	03

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40		60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40		60	

Part E

Books	Sachdeva R. C., “Fundamentals of Engineering Heat and Mass Transfer” New Age International, 1995. D. S. Kumar, Heat and Mass Transfer, SK Kataria & Sons, 2009
Articles	
References Books	Nag P. K, “Heat Transfer”, Tata McGraw-Hill, New Delhi, 2002 Holman J. P. “Heat and Mass Transfer” Tata McGraw-Hill, 2000. Kothandaraman C. P. “Fundamentals of Heat and Mass Transfer” New Age International, New Delhi Frank P. Incropera and David P. DeWitt, “Fundamentals of Heat and Mass Transfer”, John Wiley Cengel, Yunus A., Heat Transfer- A practical approach, McGraw-Hill Rathore M. M., Comprehensive engineering heat transfer, New Delhi
MOOC Courses	https://www.mooc-list.com/tags/heat-transfer
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	1	2	3	2	1	2	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	-	3	2	-	-	2	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Power Plant Engineering
Course Code	MEL0620[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of basic sciences and thermal engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the concepts of Basic Thermodynamics**(BL1-Remember)** **CO2-** To understating the concept of Energy conversion systems**(BL2-Understand)** **CO3-** To apply the basic concept of Heat Transfer**(BL3-Apply)** **CO4-** To analyze the working of boilers, turbines, condensers**(BL4-Analyze)** **CO5-** To evaluate the safe conditions of emission levels**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Introduction to Power Plants & Boilers Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants Combined Power Cycles, Comparison and Selection, Load Duration Curves., Steam Boilers and Cycles, High Pressure and Super Critical Boilers, Fluidized Bed Boilers	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-II	Steam Power Plant Fuel and Ash Handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulverize, Electrostatic Precipitator, Draught, different types, Surface Condenser, Types of cooling tower	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-IV	Diesel and Gas Turbine Power Plant, Types of Diesel Plants, Components, Selection of Engine Type, Applications Gas Turbine Power Plant, Fuels, Gas Turbine Material, Open and Closed , Cycles, Reheating, Regeneration and Inter-cooling, Combined Cycle.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-V	Other Power Plants Geo thermal, Tidel, Pumped storage, Solar thermal central receiver system. Cost of Electric Energy, Fixed and operating Costs, Energy Rates, Types of Tariffs, Economics of load sharing, comparison of economics of various power plants.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Arora S. C. and Domkundwar S, “A course in Power Plant Engineering”, Dhan Patrai, 2001 2 Nag P. K, “Power Plant Engineering”, Tata McGraw-Hill, 1998. 3 R. K. Rajput, “Power Plant Engineering”, Laxmi Publications, 1995.
Articles	
References Books	1 G. R. Nagpal, “Power Plant Engineering”, Khanna Publishers, 1998. 2 K. K. Ramalingam, “Power Plant Engineering”, Scitech Publications, 2002. 3 T. Morse Frederick, “Power Plant Engineering”, Prentice Hall of India, 1998
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_me10/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	2	-	1	-	3	-	1	2	1	1
CO2	3	3	3	3	2	2	-	1	-	3	-	1	3	1	1
CO3	3	3	2	2	2	2	-	1	-	3	-	1	3	1	1
CO4	3	2	3	2	2	2	-	1	-	3	-	1	3	2	2
CO5	3	3	3	3	2	2	-	1	-	3	-	1	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Operations Research
Course Code	MEL0626[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of linear equation, Engineering mathematics and industrial engineering.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the industrial engineering**(BL1-Remember)** **CO2-** To understand the Performance of queue, line balancing**(BL2-Understand)** **CO3-** To apply the queuing theory and game theory**(BL3-Apply)** **CO4-** To measures how effective production system (supply system)**(BL4-Analyze)** **CO5-** To evaluate the production system (supply system). **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Linear Programming Meaning of Linear Programming, General Mathematical Formulation of LPP, Graphical Analysis, Simplex Method, Two-phase Method, Big M-Method; Duality and Post Optimality Analysis Advantage and Limitations of LPP	Lectures with white board and PPT, Report writing	8
Unit-2	Transportation Model Mathematical Formulation, Initial Basic Feasible Solution, Vogel's Approximation Method, Optimization (Minimization and Maximization) Using Modified Distribution Method and Stepping Stone Method Assignment Problem Quiz, Seminar, Assignment Model as a Particular Case of Transportation Model, Formulation of Assignment Problems, Solution of Assignment Problems Using Hungarian Method (Minimization and Maximization) Route Allocation..	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8
Unit-3	Waiting Line Models Introduction, Scope in Management Decisions, Queuing Models M/M/1 (Infinite and Finite Population), Probability Calculations arid Application of M/M/C (Infinite Population) Replacement Models Introduction Scope in Management, Single Equipment Replacement Model and Group Replacement	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8
Unit-4	Game Theory Introduction to Games, Maximin and Minimax Principles, Pure and Mixed Strategies, Solution of Games Using-Algebraic and Graphical Methods; Linear programming approach for game theory Simulation & Computer Solutions Introduction to simulation, Monte Carlo Technique and Its Applications	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8
Unit-5	Inventory Models: Economic Order Quantity, Economic Production Order, Models with Price Breaks, Lead Times, Stockouts. Fixed time Period Models with Specified Probability of stock-outs & Service levels. Dynamic Programming Nature of Dynamic Programming Problem, Dynamic Programming Solutions for Knap Sack, Traveling Salesman (Stage Coach), Assignment of Salesmen to Sales Area and Capital Budgeting	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Gupta & Hira, Operations Research S. Chand & Company
Articles	
References Books	[1] Gupta & Hira, Operations Research, S. Chand & Company [2] Taha Operations Research, Pearson Education [3] Kedar Nath and Ram Nath, Operations Research, Publishers [4] Philips Ravindran, Operations Research, Solberg Wiley India Pvt. Limited.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_ma48/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	-	-	-	3	3	1	-	3	3	3
CO3	1	2	2	2	1	-	-	-	-	1	-	3	2	3	2
CO4	1	3	2	3	2	-	3	2	-	-	2	2	2	2	2
CO5	-	1	1	2	2	-	-	-	-	-	2	-	1	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Additive Manufacturing
Course Code	MEL 0627[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Understanding of the concept of design knowledge of CAD. Understanding of the concept of material and manufacturingg.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the fundamental principles of additive manufacturing.**(BL1-Remember)** **CO2-** To understand the fundamental principles of additive manufacturing.**(BL2-Understand)** **CO3-** To apply appropriate material selection criteria for different additive manufacturing applications.**(BL3-Apply)** **CO4-** To compare and contrast different additive manufacturing processes based on their strengths and weaknesses**(BL4-Analyze)** **CO5-** To evaluate strategies for integrating additive manufacturing into existing manufacturing systems for improved efficiency and productivity.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction and Basic Principles Rapid prototyping and tooling, prototype fundamentals-types of prototypes, History of RP system, development of rapid prototyping, fundamentals of rapid prototyping, Tooling. Three Phases of Development, advantages of rapid prototyping, direct benefits, indirect benefits. Trends in manufacturing, Conventional Machining, Processes- Development of a CAD model, Generation of STL Files, Slicing the STL fileSupport Structures, Manufacturing, Post processing. Fundamentals, need, advantages, disadvantages, benefits, Complexity, Accuracy, Geometry Additive Manufacturing, AM Parts, uses, The Generic AM Process, Layer-Based Manufacturing, 3D Printing, Benefits of AM, Distinction Between AM and CNC Machining, Practical Example AM Parts	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-2	Development of Additive Manufacturing Technology Introduction, Computers, Computer-Aided Design Technology, Other Associated Technologies, The Use of Layers, Classification of AM Processes, Metal Systems, Hybrid Systems, Milestones in AM Development,, AM Around the World, Rapid Prototyping ,Direct Digital Manufacturing	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-3	Liquid-Based Systems 3D Systems Stereolithography Apparatus (SLA), Models and Specifications, Advantages and Disadvantages, Process, Principle, Photopolymers, Photopolymerization, Layering Technology, Solid Ground Curing (SGC), Introduction, Highlights Process Machine Details Applications.	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-4	Solid-Based Rapid Prototyping Systems Fused Deposition Modelling. Modelling System Hardware, Software, Build Materials, The Extrusion Head, Drive Blocks, The Heating Chamber Tips Build Substrate Fused Deposition Modelling Operation Orientation/Positioning Slicing, Build Parameters Uses of Fused Deposition Modelling Parts Advantages and Disadvantages Key Terms Laminated Object Manufacturing, System Hardware, Laminated Object Manufacturing Operation, Software, Part Orientation Crosshatching System Parameters Laminated Object Manufacturing Build Technique, Finishing a Laminated Object Manufacturing Part, Uses of Laminated Object Manufacturing	Lectures with white board/PPT, Quiz, Group discussion	8

	Advantages and Disadvantages Materials Properties		
Unit-5	Powder-Based Rapid Prototyping Systems Selective Laser Sintering, Selective Laser Sintering Technology, Purpose, Current State, Advantages, High Throughput Capability, Self- Supporting Build Envelope, Purpose, applications, advantages, Disadvantages, Powder Bed Fusion Processes, Materials Various other Techniques	Lectures with white board/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Study of Rapid Prototyping and Tooling.	Experiments	BL4-Analyze	2
Experiment -2	Study of Layered Manufacturing (LM).	PBL	BL4-Analyze	2
Experiment -3	Study of Laminated Object Manufacturing (LOM).Laminated Object Manufacturing	Experiments	BL4-Analyze	2
Experiment -4	To study about selective laser sintering	Experiments	BL4-Analyze	2
Experiment -5	Study of Shape Deposition Manufacturing Process Description	Experiments	BL4-Analyze	2
Experiment -6	Study and demonstration of 3D	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Chua C.K., Leong K.F., and Lim C.S Rapid prototyping: Principles and applications, Third edition, World Scientific Publishers, Gebhardt A Rapid prototyping Hanser Gardener Publications,
Articles	
References Books	Kamrani A.K. and Nasr E. A Rapid Prototyping: Theory and practice Springer Liou L.W. and Liou F.W Rapid Prototyping and Engineering applications: A tool box for prototype development CRC Press
MOOC Courses	https://www.coursera.org/courses?query=additive%20manufacturing
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	-	2	-	-	-	-	-	-	2	3	3	3
CO2	3	3	3	3	3	2	-	-	-	1	3	1	3	3	3
CO3	-	1	-	3	2	2	-	1	-	1	3	3	2	3	3
CO4	3	3	3	3	3	-	-	1	-	2	2	-	3	-	3
CO5	-	3	3	3	3	-	-	-	-	3	3	2	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Training Report
Course Code	MEC0701[P}

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	subject knowledge of Mechanical Engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand themselves in relation to their community and develop among themselves since of social and civic and responsibility. **(BL2-Understand)** **CO2-** Identify the needs and problem of the community and involve them in problem solving. **(BL2-Understand)** **CO3-** Utilize their knowledge in finding practical solution to individual and community problem. **(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL4-Analyze	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL5-Evaluate	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2-	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2-	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Major Project
Course Code	MED0702[P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Mechanical engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts.**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Module-I			

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	48 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Product Design and Development
Course Code	MEE0703

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of CAD/ CAM			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concepts of product development process. **(BL1-Remember)** **CO2-** Apply the concepts of design principles. **(BL3-Apply)** **CO3-** Describe the methods of conducting market research and analysis.**(BL2-Understand)** **CO4-** Analyze methods of Prototyping and testing. **(BL4-Analyze)** **CO5-** Evaluate product development methods**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction to product design, product definition, design definition, the role and nature of design, old and new design methods with suitable examples and illustrations, the challenges of product development.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Product Planning and Marketing The product planning process, opportunity identification, project evaluation and prioritization, resource allocation and timing, pre-project planning, reflect on results and the process, marketing strategies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Product Design Process Customer needs identification, product specifications,	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	An approach to industrial design, general approach to man-machine relationship-workstation design –working positions. Design of controls, displays and its compatibility, ergonomic aspects-anthropometric data and its importance in design. Role of CAD/CAM/CAE software's in product design.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Quality and Reliability aspects in PDD and Product Appraisal Definition of quality and Reliability, parameters and characteristics, difference between quality and reliability, Quantifying reliability, bathtub curve MTTF and MTBF, system reliability, requisiteness for reliability of product. Existing techniques such as W	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Karl.T.Ulrich, Steven D Eppinger-Irwin Product Design and Development McGrawhill-2000
Articles	
References Books	Srinath LS Concepts in Reliability Engineering- East -West Press, NewDelhi
MOOC Courses	https://onlinecourses.nptel.ac.in/noc21_me83/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	-	2	1	-	2	2	-	3	-	3
CO2	1	2	2	-	-	2	3	1	3	3	3	-	3	3	3
CO3	2	2	2	-	-	2	3	1	3	3	3	-	3	3	3
CO4	1	3	2	-	2	2	3	1	3	3	3	-	3	3	3
CO5	1	2	2	-	2	2	3	1	3	3	3	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Non-Conventional Energy resources
Course Code	MEE0705

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of energy and souses of energy.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the energy conversion systems.**(BL1-Remember)** **CO2-** To understanding the solar thermal plate.**(BL2-Understand)** **CO3-** To apply the concept related to non conventional energy.**(BL3-Apply)** **CO4-** To analyze the energy conversion in non-conventional energy conversion in various fields.**(BL4-Analyze)** **CO5-** To evaluate the performance and efficiency of energy aspects on the basis of different parameters.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	General Introduction Various non-conventional energy resources–Introduction availability classification relative merits and demerits. Solar Cells Theory of solar cells. Solar cell materials. Solar cell array. Solar cell power plant imitation.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-2	Solar Thermal Energy Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, application and performance. Solar thermal power plants. Thermal energy storage for solar heating and cooling limitations	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-3	Geothermal Energy Resources of geothermal energy thermodynamics of geo-thermal energy conversion- electrical conversion non- electrical conversion environmental Magneto hydrodynamics (MHD) Principle of working of MHD power plant, Performance and limitations. Fuel Cells Principle of working of various types of fuel cells and their working, Performance and limitations.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-4	Thermo-electrical and thermionic conversions Principle of working, performance and limitations. Wind Energy; Wind power and its source, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-5	Bio mass Ocean thermal energy conversion (OTEC) Availability, theory and working principle performance and limitations Wave and Tidal wave principle of working, performance and limitations. Water recycling plant.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Raja etal, Introduction Non-Conventional energy resources" SciTech Publications. 2. Johan Twiden and Tony weir "Renewal energy resources "BSP Publications 2006. 3. D.S Chauhan " Non-Conventional energy resources" New Age International. 4. C.S Solanki" Renewal Energy Technology" A Practical Guide for Beginners" PHI.
Articles	
References Books	1. Ghosh and Mallick "Manufacturing Science" East West Press, 2010. 2. Jain R. K. "Production Technology" Khanna Publishers, 2001.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_ge14/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	2	2	3	-	3	3	-	1	3	-	3
CO2	3	-	2	2	1	2	2	-	3	3	2	-	3	3	3
CO3	2	-	2	1	3	-	3	1	2	1	-	2	3	3	3
CO4	1	2	2	3	2	2	2	1	-	-	1	2	3	-	3
CO5	1	2	1	3	2	-	2	-	-	-	-	1	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Optimization Methods
Course Code	MEE0706

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Prerequisite requirements for this course include a strong foundation in calculus, linear algebra, and numerical methods. Proficiency in mathematical modeling and problem-solving is essential. Prior knowledge of optimization concepts, algorithms, and their applications would be beneficial. Basic programming skills may also be advantageous for implementing numerical methods and algorithms.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Recall the fundamental concepts and principles of optimization.**(BL1-Remember)** **CO2-** Understand the principles behind optimization techniques such as direct search methods, Lagrange multipliers, and Kuhn-Tucker conditions.**(BL2-Understand)** **CO3-** Apply optimization techniques to single-variable and multi-variable functions, considering both unconstrained and constrained scenarios.**(BL3-Apply)** **CO4-** Evaluate the effectiveness of different optimization techniques in various scenarios. **(BL3-Apply)** **CO5-** Critically evaluate the performance of optimization algorithms in solving real-world problems.**(BL5-Evaluate)** **CO6-** Design novel optimization algorithms or modify existing ones to address specific optimization challenges**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
Unit -1	Unconstrained Optimization: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions.	Audio/Video clips, group discussion, lecture with PPT, quiz	8
Unit -2	Constrained Optimization: Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn –Tucker Sufficient Conditions.	Audio/Video clips, group discussion, lecture with PPT, Review Analysis	8
Unit -3	Optimization: Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg- Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Liner Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation, Multi-Objective Optimization, Branch and Bound Approaches, Genetic Algorithms and Genetic Programming, Singular Based Optimization, On-Line Real-Time Optimization, Optimization in Econometrics Approaches – Blue.	Audio/Video clips, group discussion, lecture with PPT, Review Analysis	8
Unit -4	Optimization and Functions of a Complex Variable and Numerical Analysis: The Finite Difference Method for Poisson's Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runga-Kutta Method for Ordinary Differential Equations, Gaussian Quardative Tranzoidal Rule and Simpson's 1/3 and 3/8 Rules, the Newton Raphson in one and two Dimensions, Jacobi's Iteration Method.	Audio/Video clips, group discussion, lecture with PPT, quiz	8
Unit -5	Optimization in Operation Research: Dynamic Programming, Transportation – Linear Optimization Simplex and Hitchcock Algorithms, Algorithms, Minimax and Maximum Algorithm, Discrete Simulation, Integer Programming – Cutting Plane Methods, Separable Programming, Stochastic Programming, Goal Programming, Integer Linear Programming, Pure and Mixed Strategy in theory of Games, Transshipment Problems, Heuristic Methods.	Audio/Video clips, group discussion, lecture with PPT, quiz	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Rao, S. S. (2009). Optimization: Theory and applications. John Wiley & Sons. Boyd, S., & Vandenberghe, L. (2004). Convex optimization. Cambridge University Press.
Articles	
References Books	Bazaraa, M. S., Sherali, H. D., & Shetty, C. M. (2006). Nonlinear programming: Theory and algorithms. John Wiley & Sons. Nocedal, J., & Wright, S. J. (2006). Numerical optimization. Springer Science & Business Media. Bertsekas, D. P., & Tsitsiklis, J. N. (1996). Linear and nonlinear programming (2nd ed.). Athena Scientific.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc21_me10/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	3	-	2	1	1	3	-	-	3	3	-	-	2	2	2
CO3	2	-2	2	-	2	2	2	-	2	1	1	2	2	2	1
CO4	2	2	2	2	2	-	-	-	-	1	2	3	-	2	2
CO5	1	2	1	1	1	2	-	-	1	-	2	1	2	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Introduction to Computational Fluid Dynamics
Course Code	MEE0707

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Prerequisite requirements for this course include a solid understanding of calculus, differential equations, and basic programming skills. Additionally, familiarity with numerical methods and computational techniques would be beneficial. A background in physics or engineering, particularly in fluid mechanics and heat transfer, is also recommended.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Recall the classifications of partial differential equations (PDEs) including elliptic, parabolic, and hyperbolic equations. Memorize the fundamental conservation laws governing fluid motion.**(BL1-Remember)** **CO2-** Understand the difference between initial value and boundary value problems.**(BL2-Understand)** **CO3-** Apply solution algorithms like Jacobi iterative and Gauss-Seidel methods to solve elliptic equations.**(BL3-Apply)** **CO4-** Analyze the computational challenges associated with solving Navier-Stokes equations for incompressible fluid flow**(BL4-Analyze)** **CO5-** Synthesize theoretical concepts with computational methods to devise strategies for enhancing stability and accuracy in numerical simulations.**(BL5-Evaluate)** **CO6-** Evaluate the practical applicability and effectiveness of computational simulations in addressing engineering challenges related to fluid mechanics and heat transfer accurately. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit -1	Evaluate the practical applicability and effectiveness of computational simulations in addressing engineering challenges related to fluid mechanics and heat transfer accurately.	Audio/Video clips, group discussion, lecture with PPT, quiz	8
Unit -2	Parabolic PDE`s and Stability Analysis Parabolic PDE, Explicit and Implicit Methods, Consistency, Stability Analysis, Error Analysis, Modified Equation, Artificial Viscosity	Audio/Video clips, group discussion, lecture with PPT, Review Analysis	8
Unit -3	Elliptic and Hyperbolic Equation Elliptic Equation, Solution algorithms, Jacobi Iterative, Point Gauss-Seidel and Line Gauss-Seidel Methods, Hyperbolic equations, FTFS, FTCS and BTCS methods	Audio/Video clips, group discussion, lecture with PPT, Review Analysis	8
Unit -4	Numerical Methods for Conduction Heat Transfer Steady and Unsteady Heat Conduction equation, One-dimensional and Two-dimensional Steady State Problems, Three-Dimensional Problem, Transient One-dimensional Problem, False Transient Approach	Audio/Video clips, group discussion, lecture with PPT, quiz	8
Unit -5	Numerical Methods for Incompressible Fluid Flow Governing Equation of Incompressible Fluid Flow, Difficulties in Solving Navier-Stokes equations, Stream-Vorticity Formulation, Primitive Variable Approach, Poisson Equation	Audio/Video clips, group discussion, lecture with PPT, quiz	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Smith, J. D., & Johnson, A. B. (2020). Numerical Methods for Partial Differential Equations: Theory and Applications. Publisher Anderson, Jr, J. D. (1995). Computational Fluid Dynamics. McGraw Hill Education. Pletcher, R. H., Tannehill, J. C., & Anderson, D. (2012). Computational Fluid Mechanics and Heat Transfer. CRC Press.
Articles	
References Books	Ferziger, J. H., & Peric, M. (2002). Computational Methods for Fluid Dynamics. Springer. LeVeque, R. J. (2007). Finite Difference Methods for Ordinary and Partial Differential Equations: Steady-State and Time-Dependent Problems. Society for Industrial and Applied Mathematics. Ferziger, J. H., & Peric, M. (2002). Computational Methods for Fluid Dynamics. Springer.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc21_me126/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	2	2	1	-	2	2
CO3	1	2	2	2	1	2	2	2	1	1	-	2	2	2	2
CO4	1	2	2	2	-	2	2	-	-	2	2	2	2	2	2
CO5	-	1	1	2	2	2	2	-	-	-	-	2	1	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Industrial Robotics
Course Code	MEE0709

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Engineering mechanics, Machine design			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. Comprehend, classify and analyze the fundamentals of robotics.**(BL1-Remember)** **CO2-** 2. Analyze the inverse manipulator kinematics and dynamics.**(BL2-Understand)** **CO3-** 3. Gain the knowledge about the manipulator design and mechanism.**(BL3-Apply)** **CO4-** 4. Elucidate the role of actuators, drive systems and sensors in robotics.**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit:1	Introduction: Fundamentals and robot - components, joints, degrees of freedom, coordinates. The mechanics & control of mechanical manipulators. Spatial Descriptions and Transformations: Descriptions – Positions, Orientations, and Frames, Mappings, Operators – Translations, Rotations, and Transformations, Transformation arithmetic and transform equations, transformation of free vectors, Representation & Orientation.		
Unit:2	Manipulator Kinematics: Links & Connections. Actuator Space, Joint Space and Cartesian Space. Tools & Computational considerations.		
Unit:3	Solvability, Algebraic and Geometric. Standard Frames, Repeatability and Accuracy. Jacobians: Velocities and Static Forces: Time varying position and orientation.		
Unit:4	Linear and rotational velocity of rigid bodies. Jacobians & Singularities. Cartesian transformation of velocities and static forces. Kinematic Configuration. Workspace measures and attributes. Redundant and closed chain structures. Actuation Schemes, Stiffness & Deflections. Position Sensing & Force Sensing.		
Unit:5	Mass Distribution. Newton’s and Euler’s Equations. Iterative and Closed Form. Lagrangian formulation of manipulator dynamics. Manipulator Dynamics in Cartesian Space. Non-rigid body effects. Basic components & terminology. System Dynamics. Laplace transform and inverse Laplace transform. First and second order transfer functions. Proportional and proportional plus controllers. State space control methodology. Digital control and non-linear control systems.		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	John J. Craig, “Introduction to Robotics Mechanics and Control”, Pearson Education Limited 2022 Saeed B. Niku, “Introduction to Robotics Analysis, Control, Applications”, John Wiley & Sons Ltd 2020.
Articles	
References Books	Nicholas Odrey, Mitchell Weiss, Mikell Groover, Roger Nagel and Ashish Dutta. “Industrial Robotics-Technology, Programming and Applications”, McGraw Hill Education; 2nd edition, 2017.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	-	2	3	1	-	3	3	3
CO3	1	2	3	2	1	-	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	-	2	2	-	-	2	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Alternative fuels and emission control
Course Code	MEE0710

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of applied chemistry, thermodynamics and IC engines			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** recall the basics of chemistry and thermodynamics**(BL1-Remember)** **CO2-** Describe the significance of alternative fuels over conventional fuels**(BL2-Understand)** **CO3-** Test the fuels in various engines**(BL3-Apply)** **CO4-** Analyze the performance of an engine under standard conditions with a specific alternative fuel**(BL4-Analyze)** **CO5-** Evaluate the various alternative fuels and their suitability with a specific engine and environment**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Introduction Alternate fuels and renewable sources of energy in automobile field - availabilities, Storage, Handling and Safety aspects- Costs and other factors.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-III	Renewable sources of energies Introduction about the solar energy collectors- Concentrating, Flat plate collectors- application wind energy-Bio energy, Geo thermal energy- Chemical energy: Fuel cells, Batteries; Hydrogen energies- Energy conservations in sterling and heat pumps.	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-IV	Pollutants: Sources from SI and CI Engines, Two Stroke (SI and CI) engine pollution formation; Indian Emission Standards for SI and CI engines; European Emission Standards Comparison with alternate fuel emissions.	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-V	Pollution control Techniques and Test procedures: Optimization of operating factor-EGR Fumigation- Air injection-PCV system (opens Closed) Catalytic Converters-Catalyst use of unleaded petrol. Gas Analyzers-Different Smoke meters-Different test methods; Electric Vehicles-Simple layout-Traction batteries-Re charging methods-rating pollution factors, Fuel Cells.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. Ganesan V., Internal Combustion Engines. 2. Held P.M., High speed Combustion Engines 3. Rai,GD Non Conventional sources of Energy
Articles	
References Books	1. Obert E.F., Internal Combustion Engines. 2. SAE Transaction-Vehicle emission. 3. John. H. Jhonson, Diesel Particulate Emissions Landmark Research
MOOC Courses	https://www.mooc-list.com/tags/renewable-energy
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	3	1	3	3	2	1	1	1	1	3	2	2
CO2	2	2	1	2	2	3	3	2	1	2	1	2	3	2	2
CO3	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO4	3	3	3	3	2	2	3	2	1	2	2	2	3	3	3
CO5	3	3	3	3	2	3	3	2	2	3	2	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Sensors, Actuators and Signal Conditioning
Course Code	MEE0711

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of measurement and metrology and basic electrical/ electronics engineering.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the measurement and metrology**(BL1-Remember)** **CO2-** To comprehend and classify the behavior of different types of sensors**(BL2-Understand)** **CO3-** To implement the data acquisition systems with different sensors for real-time applications.**(BL3-Apply)** **CO4-** To conduct experiments and measurements in laboratory and realize hands-on experience on real components, sensors and actuators.**(BL4-Analyze)** **CO5-** To evaluate and realize the trends in sensor technology, industrial network and automation.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Basics of Energy Transformation - Introduction to sensors and transducers, Principle of sensing and transduction, Classification of sensors.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-II	Performance Characteristics of Sensors - Static characteristics: accuracy, precision, resolution, sensitivity, linearity, span and range - Dynamic characteristics, Mathematical model of transducer: zero, first and second, Response to impulse, step, ramp and sinusoidal inputs, Selection criteria of sensor.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-III	Actuator Performance and Selection-Sensor Technology -Electrical actuating systems: solid-state switches, solenoids and electric motors: DC motor, stepper motor, and Inertial measurement unit, Mechanical actuating systems: types of motion, kinematic chains, cams and gears, Pneumatic and hydraulic actuating systems: diaphragms, bellows and control valves. Process of developing sensors, Trends in sensor technology and IC sensors, Sensor array's and multi-sensor systems, Smart sensors, Industrial network and automation.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-IV	Measurement of Industrial Parameters - Measurement of temperature: thermistor and LM35, Measurement of pressure: strain gauge and piezoelectric type, Measurement of distance: ultrasonic, linear variable differential transformer and capacitance type, proximity sensor, Infrared sensor, Pulse oximeter and Tachometer.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-V	Data Acquisition System andSignal Conditioning -Data Acquisition: single channel and multi-channel data acquisition, Data logging, Interfacing of sensors using DAQ cards, Applications: automobile and biological systems.Amplification, Filtering, Multiplexing, Conversion techniques, Sensor interface design: Wheatstone bridge and operational amplifier circuits for various applications.	Lectures with whiteboard/PPT, Quiz, Group discussion	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	D. Patranabis, “Sensors and Actuators”, 2nd Edition, PHI Learning, New Delhi, India, 2013. Ramon Pallas-Areny, John G. Webster, “Sensors and Signal Conditioning”, 2nd Edition, Wiley India Pvt. Ltd., India, 2012.
Articles	
References Books	D. Patranabis, “Sensors and Transducers”, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, India, 2011. Jon S. Wilson, “Sensor Technology Hand Book”, Newnes Publishing Company, Boston, USA, 2005. A.K. Sawhney, Puneet Sawhney, “A Course in Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai and Co. Pvt. Ltd., New Delhi, India, 2014.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc19_ee41/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	2	2	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	1	2	3	-	1	2	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	2	2	2	2	1	2	2	3	2	2
CO5	2	2	2	2	2	3	3	2	3	1	2	2	3	1	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Theory of Production process
Course Code	MEE0717

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of materials science, manufacturing and industrial engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various production processes.**(BL1-Remember)** **CO2-** To understand the mechanism of production processes.**(BL2-Understand)** **CO3-** To implement the different metal forming operations to deform the parts.**(BL3-Apply)** **CO4-** To analyze the different parameters used in production processes.**(BL4-Analyze)** **CO5-** To evaluate different forces which act during the operations.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Theory of Casting: Casting process and solidification, types of patterns and allowances, types and properties of molding sand, elements of mould and design consideration, cores, core print, chills, gates, riser, sand casting.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-II	Gating System: Gating system design, riser design, methods of calculating riser volume, feeding distance calculations, die casting, centrifugal casting, investment casting. Theory of Melting and production of ferrous and non-ferrous materials, cupola furnace, defects, remedies and inspection of casting.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	8
Unit-III	Mechanical Fundamentals of metal working: Elastic and plastic deformation, yield criteria for ductile materials, plastic stress strain relationship, hot working and cold working, classification of metal working, forging process and its operations, forgeability, analysis and classification of forging process.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	8
Unit-IV	Metal forming: Mechanism of rolling process, Analysis and classification of rolling, rolling mill arrangement, rolling pass, force calculation in rolling process, rolling defects. Classification of extrusion process, analysis and calculation of Extrusion, analysis of wire drawing, rod and tube drawing process, forming defects.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	8
Unit-V	Welding – Classification of welding process, thermal effect in welding, heat affected zone in welding, Principal of welding processes: gas welding, shielded metal arc welding, GTAW, GMAW, SAW, Resistance welding, soldering, brazing and braze welding and their application, residual stress in welding, welding distortion and its types, weldability.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Ghosh and Mallick Manufacturing Science East West Press, 2010 Jain R. K. Production Technology Khanna Publishers, 2001
Articles	
References Books	Pandey P. C. Production Engineering Science Standard Publishers, 2010 Rao P. N. Manufacturing Technology Mc Graw Hill, 2001 Groover P M Fundamental of modern manufacturing: Materials, Processes, and System John Wiley and Sons, 2010
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_me73/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	2	1	2	2	3	3	3	-	-	3	3	3
CO2	3	-	2	2	-	2	2	-	1	3	-	-	3	3	-
CO3	3	2	2	2	1	-	1	-	-	-	-	-	3	2	3
CO4	3	2	3	2	1	-	1	-	-	-	-	-	2	-	3
CO5	3	1	2	2	1	-	1	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Computer Aided Design
Course Code	MEL0722[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Prerequisites for the course "Computer Aided Design" typically include a foundational knowledge of computer science concepts, proficiency in programming languages such as C++ or Python, ,familiarity with algorithms and data structures, and basic understanding of graphical user interfaces and design principles.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concepts of basic computer, Machine drawing and Numerical Method, and computer graphics.**(BL1-Remember)** **CO2-** To Understating the concept of computer graphics**(BL2-Understand)** **CO3-** To implement the efficient way to drawing geometry in graphics software.**(BL3-Apply)** **CO4-** To analyse the different types of method to draw the 2D and 3D geometry**(BL4-Analyze)** **CO5-** To evaluate the applications of computer graphics in various fields such as research and industries.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit -1	Introduction and elements of CAD, Essential requirements of CAD, Concepts and importance of integrated CAD/CAM, Engineering Applications, CAD/CAM systems, Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random and Raster scan display, Colour CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters	lecture with PPT, quiz, Audio/Video clips, group discussion,	8
Unit -2	Graphics standards and software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm. World/device Coordinate Representation, Windowing and clipping, 2-D Geometric transformations - Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 - D transformations, multiple transformation.	lecture with PPT, quiz, Audio/Video clips, group discussion	8
Unit -3	Curves representation, Properties of curve design and representation, Interpolation v/s approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves- Hermite cubic splines - Blending function formulation and its properties, Bezier curves - Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves	lecture with PPT, quiz, Audio/Video clips, group discussion	8
Unit -4	Polygon mesh representations, Quadric and Super quadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models Application commands for various commercial software	lecture with PPT, quiz, Audio/Video clips, group discussion	8
Unit -5	Numerical Methods: Introduction, Errors in numbers, Binary representation of numbers, Root finding-Bisection method, Newton-Raphson method, Curve fitting-Least square method, Numerical differentiation-Newton's interpolation, Numerical Integration-Trapezoidal and Simpson method	lecture with PPT, quiz, Audio/Video clips, group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	To create a 2D view of the given diagram using Auto CAD.	Experiments	BL2-Understand	2
Experiment-2	To create a 2D view of the given diagram using Auto CAD.	Experiments	BL2-Understand	2
Experiment-3	To create a 2D isometric view of the given diagram using Auto CAD.	Experiments	BL3-Apply	2
Experiment-4	draw the sketch of the model shown in Figure using SolidWorks	Experiments	BL2-Understand	2
Experiment-5	To draw the basic sketch for the revolved solid model shown in Figure using SolidWorks	Experiments	BL3-Apply	2
Experiment-6	INTRODUCTION TO CATIA V5R19	Experiments	BL2-Understand	2
Experiment-7	To draw the sketch of the model shown in Figure using CATIA	Experiments	BL3-Apply	2
Experiment-8	INTRODUCTION TO FEA and ANSYS	PBL	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Kumar, S., Srivastava, S. K., & Srivastava Sr., S. K. (2012). Computer Aided Design: A Basic and Mathematical Approach I.K. International Publishing House Pvt. Limited Zeid, I. (2016). Mastering CAD/CAM. McGraw-Hill Education.
Articles	
References Books	Kularatne, D., & Wijesundara, S. (2017). Computer-Aided Design and Manufacturing. CRC Press. Groover, M. P., & Zimmers, E. W. (2014). CAD/CAM: Computer-Aided Design and Manufacturing. Prentice Hall.
MOOC Courses	https://archive.nptel.ac.in/courses/112/102/112102101/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	3	-	1	2	2	2	-	-	3	3	-	-	3	2	2
CO3	2	-	2	1	2	-	2	-	2	1	-	1	3	3	2
CO4	3	2	2	3	2	-	2	2	-	-	2	2	3	-	2
CO5	2	2	1	2	2	-	-	3	-	-	3	2	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Refrigeration and Air Conditioning
Course Code	MEL0723[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of thermodynamics and fluid mechanics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the concepts of Basic Thermodynamics.**(BL1-Remember)** **CO2-** To understating the concept of Energy conversion systems.**(BL2-Understand)** **CO3-** To applying the basic concept of Heat Transfer.**(BL3-Apply)** **CO4-** To determine the options of Refrigerants**(BL4-Analyze)** **CO5-** To evaluate the safe conditions of emission levels.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect and C.O.P. Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Boot strap refrigeration	Lectures with whiteboard/PPT, Quiz, Group discussion	10
2	Vapor Compression System, Single stage system, Analysis of vapor compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P., Effect of sub cooling of condensate & superheating of refrigerant vapor on C.O.P. of the cycle, Actual vapor compression refrigeration cycle, Multistage vapor compression system requirements, Inter cooling, Different configuration of multistage system, Cascade system.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
3	Principle of vapour absorption refrigeration system, Comparison between absorption and compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature - concentration diagram and Enthalpy – concentration diagram, Adiabatic mixing of two streams, Ammonia – Water vapor absorption system, Lithium- Bromide water vapor absorption system, Comparison. Refrigerants: Classification, nomenclature, properties. Types of refrigerants	Lectures with whiteboard/PPT, Quiz, Group discussion	10
4	Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside and outside design conditions, Heat transfer through walls & roofs, Infiltration and ventilation, Internal heat gain, Sensible heat factor, By pass factor, Grand Sensible heat factor, Apparatus dew point.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
5	Refrigeration and air conditioning equipment e. g. compressors, condensers, evaporators & expansion devices, air washers, cooling towers and humidifying efficiency, Cold storage and food preservation, Freezers, Ice plant, Water coolers, Basic difference between comfort and industrial air conditioning.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Study of VCRC	Experiments	BL2-Understand	03
2	To estimate COP of mechanical heat pump and refrigerator	Experiments	BL3-Apply	03
3	To study VARC	Experiments		03
4	To estimate COP of vapor compression ice plant	Experiments	BL4-Analyze	03
5	Estimate performance of window air conditioning system	Experiments	BL5-Evaluate	03
6	Study of 2 stage reciprocating air compressor	Experiments	BL6-Create	03
7	To study element of air conditioning system	Experiments	BL5-Evaluate	03
8	Study about various refrigerant	PBL	BL3-Apply	03

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Refrigeration and Air Conditioning Technology Modern Refrigeration and Air Conditioning
Articles	
References Books	1 Hooman Gohari Air Conditioning and Refrigeration Repair Made Easy McGraw-Hill Education
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_me135/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	1	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	1	3	3	1	-	3	3	3
CO3	3	2	2	2	1	2	2	2	2	1	-	3	3	3	3
CO4	1	3	3	3	2	-	3	2	-	-	3	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Total Quality Management
Course Code	MEL0727[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of Probability & Statistics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall industrial engineering and operation research**(BL1-Remember)** **CO2-** To understand the history of TQM**(BL2-Understand)** **CO3-** To apply the theories of TQM in real life industrial problems**(BL3-Apply)** **CO4-** To analyze the change in productivity through principles of TQM.**(BL4-Analyze)** **CO5-** To evaluate the different ways and theories of TQM**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Evolution of Quality Historical Perspective, Basic Concepts of Quality, Vision, Mission and Objectives of an Organization, Corporate Structure in an Organization and Role of Quality	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-2	Quality Quality Planning, Quality By Design, Quality Costs and Cost of Failure, Waste Control, How Quality Benefits Business, Quality and Competitiveness in Business, Zero Defects and Continuous Improvement	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-3	Total Quality Concepts and Total Preventive Maintenance CWQC, Product Liability Difference in Western And Japanese Approach of TQM, Basic Philosophy and Fundamental Models of TQM, Total Quality and Ethics, Internal Politics and Total Quality Management, Quality Culture, Education and Training, Implementing Total Quality Management An Integrated System Approach, Total Preventive Maintenance—Self Assessment	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-4	Leadership Leadership Role of Leadership and Commitment in Quality Deployment, Team Building, Motivation, and Rewards, Total Employee Empowerment, Quality Functions Measurement, Inspection, Testing, Calibration and Assurance	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-5	Design Control and Conformity, Tolerance and Variability PDCA Cycle, Juran Trilogy, Crosby's 10 points and Deming's 14 Points Customers Requirements, Customer Supplier and Chain Links, Establishing Customer Focus Customer, Satisfaction, Measurement and Customer Retention	Lectures with whiteboard/PPT, Quiz, Group discussion	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Joel E. Ross Total Quality Management: Text, Cases, and Readings Routledge
Articles	
References Books	R. Panneerselvam Total Quality Management: Key Concepts and Case Studies Prentice Hall India
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_mg34/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	3	-	-	2	1	-	2	2	-	3	-	3
CO2	3	2	2	3	-	2	3	1	3	3	3	-	3	3	3
CO3	3	3	2	3	-	2	3	1	3	3	3	-	3	3	3
CO4	3	3	3	3	2	2	3	1	3	3	3	1	3	3	3
CO5	3	3	3	3	2	2	3	1	3	3	3	1	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Major Project
Course Code	MED0803[P]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Mechanical engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts.**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	15 hrs
Module-II	To have field work and data collection through a chosen methodology	PBL	BL4-Analyze	15 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	20 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	150				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
300	150	120	60	180	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Vibration and Noise- Measurement and Control
Course Code	MEE0809

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Prerequisites for the course "Mechanical Vibration and Noise" include a solid understanding of dynamics, mechanics of materials, and mathematics, particularly differential equations and linear algebra. Familiarity with mechanical systems and their behavior under varying loads is also essential.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic of mechanical vibration and noise.**(BL1-Remember)** **CO2-** To Understand the mathematical model and determine the natural and forced frequency of mechanical system**(BL2-Understand)** **CO3-** To implement measurement of the free, Noise and forced vibration with damping**(BL3-Apply)** **CO4-** To analyze the theoretical concept of vibration in shock absorber**(BL4-Analyze)** **CO5-** To evaluate the applications of mechanical vibration and noise in various fields such as research, structure health monitoring and industries**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit -1	Fundamental Aspects of Vibrations: Vibration, main causes, advantages and disadvantages; engineering applications of vibration and noise; vector method of representing harmonic motion; characteristics of vibration, harmonic analysis and beats phenomenon, work done by harmonic forces on harmonic motion; periodic, non-harmonic functions- Fourier series analysis; evaluation of coefficients of Fourier series; elements of vibratory system; lumped and distributed parameter systems. Undamped Free Vibrations: Undamped free vibration: Single degree of freedom Systems, introduction, undamped free vibration – Natural frequency' of free vibration, Rayleigh's method, stiffness of spring elements, effects of spring mass, Energy method, Newton's method and D' Alembert' s principle- problems	Audio/Video clips, group discussion, lecture with PPT, quiz	8
Unit -2	Damped Free Vibrations: Viscous damping: coefficient of damping; damping ratio; under damped, over damped and critically damped systems; logarithmic decrement; frequency of damped free vibration; Coulomb or dry friction damping; frequency, decay rate and comparison of viscous and Coulomb damping; solid and structural damping; slip or interfacial damping.	Audio/Video clips, group discussion, lecture with PPT, Review Analysis	8
Unit -3	Forced Vibration: Forced vibration: Single degree of freedom systems, steady state solution with viscous damping due to harmonic force solution by complex algebra, concept of response, reciprocating and rotating unbalance, vibration isolation Transmissibility ratio, energy dissipated by damping equivalent, Viscous damping, Structural damping, sharpness or resonance, base excitation. Whirling Motion and Critical Speed: Whirling motion and Critical speed: Definitions and significance .Critical –speed of a vertical , light –flexible shaft with single rotor : with and without damping .Critical speed of a shaft carrying multiple discs (without damping), Secondary critical speed.	Audio/Video clips, group discussion, lecture with PPT, Review Analysis	8
Unit -4	Systems With Two Degrees of Freedom : Un-damped free vibration of Two-D.O.F and Principal modes of vibration; torsion vibrations; Forced, Un-damped vibrations with harmonic excitation; Coordinate coupling; Dynamic vibration absorber; torsion Vibration Absorber; Pendulum type of dynamic vibration.	Audio/Video clips, group discussion, lecture with PPT, quiz	8

Unit -5	Noise Engineering – Subjective response of sound: Frequency and sound dependent human response; the decibel scale; relationship between, sound pressure level (SPL), sound power level and sound intensity scale; relationship between addition, subtraction and averaging, sound spectra and Octave band analysis; loudness; weighting networks; equivalent sound level, auditory effects of noise; hazardous noise, exposure due to machines and equipment's; hearing conservation and damage risk criteria, daily noise doze. Noise: Sources, Isolation and Control: Major sources of noise on road and in industries, noise due to construction equipments and domestic appliances, industrial noise control, strategies- noise control at source (with or without sound enclosures), noise control along the path (with or without partitions and acoustic barriers); noise control at the receiver, ear defenders, earplugs, semi-insert protectors.	Audio/Video clips, group discussion, lecture with PPT, quiz	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Fabrication of Model of Spring Mass System	PBL	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Grover, G. K. (2009). Mechanical Vibrations. Nem Chand & Bros. Rao, S. S. (2011). Mechanical Vibrations. Pearson Education.
Articles	
References Books	Thomson, W. T. (2010). Theory of Vibration with Applications. Cengage Learning. Den Hartog, J. P. (1985). Mechanical Vibrations. Dover Publications.
MOOC Courses	https://archive.nptel.ac.in/courses/112/107/112107212/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	3	-	2	1	1	3	-	-	3	3	-	-	3	2	2
CO3	2	-2	2	-	2	2	2	-	2	1	1	2	3	2	2
CO4	2	2	2	2	2	-	-	-	-	1	3	3	-	2	2
CO5	1	2	1	1	2	2	-	-	-	-	2	1	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Computer Integrated Manufacturing
Course Code	MEE0813

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of properties of Materials types of manufacturing process, Computer application, Production, planning and control.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the production and industrial engineering **(BL1-Remember)** **CO2-** To describe the significance of group technology and cellular manufacturing. **(BL2-Understand)** **CO3-** To apply the basics of CAD and CAM in the methodology of CAPP and FMS.**(BL3-Apply)** **CO4-** To analyze the PPC and Production scheduling. **(BL4-Analyze)** **CO5-** To evaluate the master production scheduling for enhancing productivity and apply the FMS for the best output from the industry.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	General Concepts -Introduction to CIM concepts, scope of CIM, CIM wheel, Evolution of CIM, needs and benefits of CIM, CAD – benefits, Graphics standards, CAD software, Applications of NC, advantages and disadvantages of NC, CNC, advantages and functions of CNC, DNC, advantages and functions of DNC, Integration of CAD/CAM/CIM.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-II	Group Technology and Cellular Manufacturing: Concept of Group Technology and its Application, part families, part classification and coding, benefits of group technology; Clustering Techniques and Cellular Manufacturing.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-III	Group Technology and Cellular Manufacturing: Concept of Group Technology and its Application, part families, part classification and coding, benefits of group technology; Clustering Techniques and Cellular Manufacturing.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-III	Computer Aided Process Planning and Flexible Manufacturing System: Introduction, Methods of CAPP; Process Classifications and Selections, Process Sheet Documentation, CAD based Process Planning, Inventory management,; FMS concept, Scope of FMS, Type of FMS, FMS planning and implementation, FMS Scheduling, sequencing, FMS layout and essentials, application and benefits of FMS.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-IV	Computer Aided Production Management: Introduction, production planning and control (PPC) fundamentals, use of computer in PPC such as Aggregate Production Planning(APP), Master Production Schedule(MPS), Material Requirement Planning(MRP), Manufacturing Resource Planning(MRPII), Enterprise Resource Planning (ERP), basics of JIT.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-V	Automated Material Handling Systems and Monitoring and Quality Control: Industrial Robots, Conveyors, AGVs; Types of production monitoring system, process control and strategies, computer aided quality control, Objectives of CAQC, Integration of CAQC with CIM, basics of rapid prototyping.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	0	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	1. Pandey P. C. , 2010, Production Engineering, Science Standard Publishers, 2. Ghosh and Mallick, Manufacturing Science, East west press
Articles	
References Books	1. Groover M P, Fundamental of modern manufacturing: Materials, Processes, and System, John Wiley and Sons 2. Rao P. N., Manufacturing Technology, McGraw Hills
MOOC Courses	https://www.mooc-list.com/tags/computer-aided-manufacturing
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	1	1	-	2	1	3	3	1	1	1
CO2	3	3	1	1	-	1	3	-	1	1	2	1	1	1	1
CO3	3	3	3	2	2	2	1	2	1	-	1	2	2	2	2
CO4	3	3	2	3	2	2	1	-	1	1	2	2	3	3	3
CO5	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Non Destructive testing
Course Code	MEE0814

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of properties of material types and science.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember the basics principle of sciences and material science..**(BL1-Remember)** **CO2-** Understand the basics fests of design of Non destructive testing**(BL2-Understand)** **CO3-** Apply system of testing.**(BL3-Apply)** **CO4-** Analyze the system of testing defect.**(BL4-Analyze)** **CO5-** Evaluate the various testing and forgings for strengthening the products**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction Scope and advantages of NDT. Comparison of NDT with DT. Some common NDT methods used since ages, Terminology. Flaws and Defects, Visual inspection,Equipment used for visual inspection. Ringing test chalk test (oil whitening test).Attractive uses of above tests in detecting surface cracks, bonds trength & amp; surface defects.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Common NDT methods Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment &techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test Magnetic particle Inspection – Scope , principle, Ferro Magnetic and Non-ferro magnetic materials, equipment & testing. Advantages, limitations Interpretation of results. DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, application.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Radiographic methods X-ray radiography principle, equipment & methodology. Applicability, types of radiations, limitations. Interpretation of Radiographs, limitations of γ-ray radiography – principle,equipment. Attenuation of electro magnetic radiations, source of radioactive materials &technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering). Pair production, Beam geometry, Scattering factor.Advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - X-ray of human body.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Ultrasonic testing methods Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques,advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Eddy Current Inspection Principle, Methods, Advantages, Scope and limitations. Types of Probes. Case Studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	(1) ASM Handbook Vol. 11, 8 71th Edition – Non-destructive Testing & Evaluation
Articles	
References Books	(1) Research Techniques in NDT Vol.3, R.S. Shah, Academic (2) Industrial Quality Control, Webstar (3) Bray, Don E. and Stanley, Roderic K., Nondestructive Evaluation: A Tool in Design, Manufacturing, and Service. Revised Edition 1997, CRC Press New
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_mm07/preview1
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	1	2	1	1	1	-1	2	1
CO2	3	1	1	1	2	2	-	-	-	-	2	2	1	1	1
CO3	3	3	2	-	-	2	2	-	-	-	-	2	2	1	4
CO4	3	3	2	-	-	2	-	-	-	1	2	1	2	1	1
CO5	1	2	-	3	3	-	-	-	2	3	-	2	2	3	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Finite Element Method
Course Code	MEE0816

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Knowledge of basic sciences and machine design			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concepts behind formulation methods in FEM**(BL1-Remember)** **CO2-** Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements. **(BL2-Understand)** **CO3-** Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced.**(BL3-Apply)** **CO4-** Analyse element characteristic equation and generation of global equation**(BL4-Analyze)** **CO5-** Develop element characteristic equation and generation of global equation. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Introduction-Different approaches in Finite Element Method - Direct Stiffness approach, simple examples, Variational approach, Elements of variational calculus - Euler Lagrange equation, Rayliegh Ritz method, Weighted Residual methods, Point Collocation method, Sub domain Collocation method, Galarkins method - Steps involved in FEM.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-II	Types of elements used Interpolation Polynomials - Linear elements Shape function - Analysis of simply supported beam - Element and Global matrices - Two-dimensional elements, triangular and rectangular elements - Local and Natural Co-ordinate systems.	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-III	Finite element formulation of field problems Classification of partial differential equations - Quasiharmonic equation - Steady state problems - Eigen value problems - Propogation problems - Examples, Torsional problem - Fluid flow and Heat transfer problems - Acoustic vibrations.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-IV	Finite element formulation of solid mechanics problems Axial force member - element matrices for axial force members - Truss element analysis of pinned truss - Two dimensional elasticity problems	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-V	Numerical methods in fem Evaluation of shape functions - One dimensional & triangular elements, Quadrilateral elements, Isoperimetric elements - Numerical Integration, Gauss Legendre quadrature - Solution of finite element equations - Cholesky decomposition, Skyline storage - Computer implementation.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. Larry J Segerlind ,“ Applied Finite Element Analysis”, John Wiley, 1984. 2. Bathe K.J., “Finite Element Procedures”, Prentice Hall, 1994.
Articles	
References Books	3. Huebner and Thornton E.A., “The Finite Element Method for Engineers”, John
MOOC Courses	https://www.mooc-list.com/tags/finite-element-method
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	1	1	1	1	1	3	2	3	3	3
CO3	1	2	3	2	1	2	2	2	2	1	2	3	3	3	2
CO4	1	3	3	3	2	-	3	2	-	-	2	2	3	2	2
CO5	3	2	3	3	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Simulation and Modeling
Course Code	MEE0817

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Knowledge of mechanical systems and computer programming			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. To recall the basic system design of mechanical engineering systems**(BL1-Remember)** **CO2-** 2. To understand the computer system simulation**(BL2-Understand)** **CO3-** 3. To develop the model considering system and environment**(BL3-Apply)** **CO4-** 4. To analyze the results of models.**(BL4-Analyze)** **CO5-** 5. To evaluate the design through various software**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	PHYSICAL MODELING -Concept of system and environment, continuous and discrete system, linear and nonlinear system, stochastic activities, static and dynamic models, principles used in modeling, Basic simulation modeling, Role of simulation in model evaluation and studies, Advantages and Disadvantages of simulation. Modeling of Systems, Iconic analog; Mathematical Modeling	Lectures with PPT, Quiz, Group discussion, case study	
Unit-II	COMPUTER SYSTEM SIMULATION Technique of simulation, Monte Carlo method, experimental nature of simulation, numerical computation techniques, continuous system models, analog and hybrid simulation, feedback systems, Buildings simulation models of waiting line system, Job shop, material handling and flexible manufacturing systems	Lectures with PPT, Quiz, Group discussion, case study	
Unit-III	PROBABILITY CONCEPTS IN SIMULATION Stochastic variables, discrete and continuous probability functions, random numbers, generation of random numbers, variance reduction techniques, Determination of the length of simulation runs, Output analysis.	Lectures with PPT, Quiz, Group discussion, case study	
Unit-IV	SYSTEM DYNAMICS MODELING Identification of problem situation, preparation of causal loop diagrams and flow diagrams, equation writing, level and rate relationship; Simulation of system dynamics model	Lectures with PPT, Quiz, Group discussion, case study	
Unit-V	VERIFICATION AND VALIDATION Design of simulation experiments, validation of experimental models, testing and analysis. Simulation languages comparison and selection, study of SIMULA, DYNAMO, STELLA, POWERSIM; Simulation software	Lectures with PPT, Quiz, Group discussion, case study	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Gordon G., System simulation, Prentice Hall. 2. Payer T.,Introduction to system simulation, McGraw Hill. 3. Spriet, Computer Aided Modeling and Simulation, W.I.A.
Articles	
References Books	1. Sushil, System Dynamics, Wiley Eastern Ltd. 2. Shannon R.E., System simulation, Prentice Hall. 3.. Allan Carrie, " Simulation and Manufacturing", Jhon Wiley & Sons
MOOC Courses	https://www.my-mooc.com/es/mooc/simulation-and-modeling-of-natural-processes/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
CO3	1	1	-	-	1	1	-	-	-	-	1	1	2	2	2
CO4	2	2	1	-	2	2	1	-	1	-	2	1	3	3	3
CO5	3	3	1	1	3	2	1	-	1	-	3	1	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Project Management
Course Code	MEE0818

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Knowledge of industrial engineering and operation research.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. To recall the managerial concepts.**(BL1-Remember)** **CO2-** 2. To describe the project organization and cost estimation.**(BL2-Understand)** **CO3-** 3. To develop the blueprint of the project.**(BL3-Apply)** **CO4-** 4. To analyze the financial aspects of the project.**(BL4-Analyze)** **CO5-** 5. To evaluate the project planning and modification of the network models.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Project Management Concepts: Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems and procedures for implementation. Project direction	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Project Organization and Project Contracts: Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Project Appraisal & Cost Estimation: Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Project Planning & Scheduling: Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Modification & Extensions of Network Models: Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management- essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, PH Inc. 2. Lock, Gower, Project Management Handbook. 3. Cleland and King, VNR Project Management Handbook. 4. Wiest and Levy, Management guide to PERT/CPM, PHI. 5. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBS Publishers, 2002. 6. S. Choudhury, Project Scheduling and Monitoring in Practice. 7. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.
Articles	
References Books	1. John M Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall of India, 2002. 2. Smith N. J. (Ed), Project Management, Blackwell Publishing, 2002. 3. Robert K. Wysocki, Robert Back Jr. and David B. Crane, Effective Project Management, John Wiley, 2002. 4. Jack R Meredith and Samuel J Mantel, Project Management: A Managerial Approach, John Wiley, 4th Edition, 2000.
MOOC Courses	https://www.coursera.org/courses?query=project%20management
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	2	-	2	2	2	2	3	2	2	2	3
CO2	1	1	1	1	2	2	2	2	2	2	3	-	2	2	3
CO3	2	2	2	3	1	1	1	1	2	3	3	-	3	2	3
CO4	3	3	2	3	2	-	-	-	2	2	3	-	3	2	3
CO5	3	3	2	3	2	-	2	-	2	2	3	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Production and Operation Management
Course Code	MEE0819

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	knowledge of industrial engineering and operation research.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. To recall the industrial engineering and management concepts.**(BL1-Remember)** **CO2-** 2. To describe the production planning and control.**(BL2-Understand)** **CO3-** 3. To develop the planning of resources and operations.**(BL3-Apply)** **CO4-** 4. To analyze the financial aspects of the material procurement and maintenance management.**(BL4-Analyze)** **CO5-** 5. To evaluate the Production planning and master scheduling.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Operations Management: Introduction, systems concept, decisions, organization, objectives and evolution of operations management, comparing production of tangible goods and services, operations strategy, type of production systems, role of production manager.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-II	Facilities Planning & Production Planning Control: Plant location, plant layout and material handling, layout analysis, procedures such as CORELAP, CRAFT etc. Organization and functions of PPC CAPP, make or buy decision, forecasting methods and its relationship with product life cycle, case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-III	Aggregate Planning and Master Scheduling: Strategies of aggregate planning, graphic and charting methods, application of LP, master scheduling, job shop scheduling and sequencing algorithms Gantt chart, line balancing, LOB, case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-IV	Maintenance Management: Types of maintenance strategies, breakdown, preventive and predictive maintenance, individual and group replacement policies, case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-V	Materials Management: As part of supply chain, purchasing, stores and vendor selection, inventory models, selective inventory control, MRP, MRP-II, lot size techniques, just - in – time system of manufacturing, Kaizen, Total Productive Maintenance (TPM), BPR, SCM, ERP etc. and case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Hop W, Spearman M; Factory Physics; TMH 2. Charry S.N.; Production & Operations Management; TMH. 3. Chase, Acquilino, Production & Operations Managment, TMH. 4. Eilon S. Production Planning and Control, McMillon Pub. 5. Vollmann; Mfg planning and control for SCM; TMH
Articles	
References Books	1.Nahmias Steven; Production and Operations analysis; TMH 2. Bedi Kaniska; Production and Operations Management; Oxford Pub 3. Dobler & Lee, Purchasing & Materials Management, PHI. 4. Chitle A.K., Gupta R.C. Materials Management, PHI. 5. Monk Joseph; Schaum's outline of Operations Management; McGraw Hill.
MOOC Courses	https://www.mooc-list.com/tags/operations-management
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	2	-	2	2	2	2	3	2	2	2	3
CO2	1	1	1	1	2	2	2	2	2	2	3	-	2	2	3
CO3	2	2	2	3	1	1	1	1	1	2	3	-	3	2	3
CO4	3	3	2	3	2	-	-	-	2	2	3	-	3	2	3
CO5	3	3	2	3	2	-	2	-	2	2	3	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Machine learning for Robotics
Course Code	MEE0820

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Knowledge of basic sciences and machine design.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. To recall the theoretical foundations of various learning algorithms.**(BL1-Remember)** **CO2-** 2. To understand the context of supervised and unsupervised learning through real-life examples.**(BL2-Understand)** **CO3-** 3. Apply all learning algorithms over appropriate real-time dataset.**(BL3-Apply)** **CO4-** 4. Evaluate the algorithms based on corresponding metrics identified.**(BL4-Analyze)** **CO5-** 5. Analyze the requirements of Machine Learning applications in context-aware robotic environment.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction to Machine Learning Introduction – Exploration – Learning Paradigms – Role of Machine Learning in Robotic applications	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Supervised Learning – I Linear and Non-Linear – Multi–Class & Multi-Label classification – Linear Regression – Multilinear Regression – Naïve Bayes Classifier – Decision Trees – ID3 – CART – Fine tuning of algorithms for robotic environment.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Supervised Learning – II K-NN classifier – Logistic regression – Perceptrons – Single layer & Multi-layer – Support Vector Machines – Linear & Non-linear – Error Bounds Fine tuning of algorithms for robotic environment.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Unsupervised Learning Real time Datasets – Pre-processing Clustering basics (Partitioned, Hierarchical and Density based) - K-Means clustering – K- Mode clustering – Principal Component Analysis – Kernel PCA - Error Bounds – Ensemble Learning (Random Forest, XGBoost) – Fine tuning of algorithms for robotic environment. Class Imbalance – SMOTE – One Class SVM – Optimization of hyperparameters.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Reinforcement Learning Robotics & Machine Learning Alliance Basics of RL – RL Framework – Markov Decision Process – Exploration Vs Exploitation Design constraints and considerations – setting up the environment – Applications and case studies in Robotics	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1 Ethem Alpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014. 2 Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012. 3 Reinforcement Learning: An Introduction (Adaptive Computation and Machine Learning series) 2nd edition, Richard S. Sutton and Andrew G. Barto, A Bradford Book; 2018, ISBN 978-0262039246
Articles	
References Books	1 Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997. 2 Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014.
MOOC Courses	https://www.mooc-list.com/tags/robotics
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	1	1	1	1	-	1	1	1	1	1	1
CO2	3	3	1	1	2	2	1	3	1	1	1	2	2	2	2
CO3	3	3	3	2	2	2	-	-	1	2	1	2	1	1	2
CO4	3	2	3	2	3	3	-	1	1	2	3	2	2	2	3
CO5	3	3	3	2	-	-	-	3	2	2	2	1	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	Automobile Engineering
Course Code	MEL0825[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of engine parts. body of vehicle and thermodynamics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic parts of I C Engines**(BL1-Remember)** **CO2-** To Understand Transmission and Braking system**(BL2-Understand)** **CO3-** To Apply the knowledge of Braking System & Electrical System. in automobile**(BL3-Apply)** **CO4-** To analyze the braking and suspension system in automobile. **(BL4-Analyze)** **CO5-** To evaluated and summarize the braking, suspension, power transmission and Automobile Air Conditioning..**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Power Unit: Design and Principles of major components, valve mechanism, power and torque characteristics, rolling, air and gradient resistance, tractive effort, gearbox, gear ratio determination, design of gear box.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Transmission: Requirements, clutches, torque converters, overdrive and free wheel, universaljoint, differential gear mechanism of rear axle, automatic transmission, steering, and front axle, castor angle, wheel camber and toe-in, toe-out etc, steering geometry, Ackerman mechanism, under steer and over steer.	Lectures with whiteboard/PPT, Quiz, Group discussion Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Braking System: General requirements, Road tyre adhesion, weight transfer, braking ratio, mechanical brakes, hydraulic Chassis and Suspension System: Loads on the frame, strength and stiffness,brakes, vacuum and air brakes, thermal aspects. Electrical System: Types of starting motors, generator and regulators, lighting system, ignition system, horn, battery.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Introduction to Electric Vehicles: Electric Vehicle – Need – Types, Electric Vehicle Technology – layouts, Batteries – overview and its types. Charging – Methods and Standards. Alternate charging sources – Wireless & Solar, Hybrid Electric vehicles – Classification – Micro, Mild, Full, Plug-in, EV.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Automobile Air Conditioning: Requirements, cooling and heating systems. Cooling and lubrication System: Different type of cooling system and lubrication system Fuel Supply System: Diesel & Petrol vehicle system such as fuel injection pump, injector and fuel pump, carburetor, MPFI	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	To Study of Automobile Chasis.	Experiments	BL2-Understand	2
Experiment-2	To Study of differential mechanism of an Automobile	Experiments	BL2-Understand	2
Experiment-3	To Study of multiple clutch of an Automobile.	Experiments	BL2-Understand	2
Experiment-4	To Study and demonstration of different circuit of carburettor.	Experiments	BL2-Understand	2
Experiment-5	To Study of the electrical system of Automobile.	Experiments	BL2-Understand	2
Experiment-6	To Study of the Torque convertor.	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. Automobile Engineering, Kripal Singh 2. Automotive Engineering, Hietner 3 Automotive Mechanics, Crouse
Articles	
References Books	1. Automobile Engineering,Narang 2. Automobile Engineering, Newton and Steeds. 3 Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
MOOC Courses	https://archive.nptel.ac.in/courses/107/106/107106088/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	2	-	1	2	1	2	-	-	3	3	-	-	3	2	2
CO3	1	-	2	1	1	-	-	-	2	1	-	-	3	2	2
CO4	-	1	2	3	1	-	-	-	-	-	-	-	3	-	2
CO5	-	1	1	2	1	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2022-2023

(SOET)(BTech-MechanicalEngineering)

Title of the Course	CNC and Flexible Manufacturing Systems
Course Code	MEL0827[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Conventional machining process and production system			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of various types of CNC operations and production systems. **(BL1-Remember)** **CO2-** To understand the Basic concept of G codes, M codes for programming.**(BL2-Understand)** **CO3-** To implement G codes, M codes in programming.**(BL3-Apply)** **CO4-** To analyze the CNC program.**(BL4-Analyze)** **CO5-** To evaluate and summarize the CNC program.							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to CNC Machine Tools: Development of CNC Technology-Principles and classification of CNC machines, Advantages & economic benefits, Types of control, CNC controllers, Characteristics, Interpolators, Applications, DNC concept.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit 2	CNC Programming: Co-ordinate System, Fundamentals of APT programming, Manual part programming-structure of part programme, G & M Codes, developing simple part programmes, Parametric programming, CAM packages for CNC machines-IDEAS, Unigraphics, Pro Engineer, CATIA, ESPIRIT, Mastercam etc., and use of standard controllers- FANUC, Heidenheimer and Sonometric control system.	Lectures with whiteboard/PPT, Quiz, Group discussion	10
Unit 3	Tooling for CNC Machines: Cutting tool materials, Carbide inserts classification; Qualified, semi- qualified and preset tooling, Cooling fed tooling system, Quick change tooling system, Tooling systemfor machining center and turning center, tool holders, Tool assemblies, Tool magazines, ATC mechanisms, Tool management.	Lectures with whiteboard/PPT, Quiz, Group discussion	9
Unit 4	Robotics and Material Handling Systems: Introduction to robotic technology, and applications, Robot anatomy, material handling function, Types of material handling equipment, Conveyer systems, Automated guided vehicle systems, Automated storage/retrieval systems, Work-in-process storage, Interfacing handling and storage with manufacturing.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit 5	Group Technology and Flexible Manufacturing System: group Technology-part families, Parts classification and coding, Production flow analysis, Machine Cell Design, Benefits of Group Technology, Flexible manufacturing systems-Introduction, FMS workstations, Computer control system, Planning for FMS, Applications and benefits.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment 1	To study the features of CNC machine tool.	Experiments	BL2-Understand	2
Experiment 2	To perform facing and turning operations on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 3	To perform the multiple turning operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 4	To perform the drilling operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 5	To perform the boaring operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 6	To perform the grooving operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 7	To perform the threading operation on the given work piece.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Machines P. Radahkrishnan Computer Numerical Control New Central Book Agency H.K. Shivanand, M.M. Benal, V. Koti Flexible Manufacturing System New age international publishers
Articles	
References Books	M.S. Sehrawat and J.S. Narang CNC Machines Dhanpat Rai and Co. Prof. S. K. Sinha CNC Programming using Fanuc Custom Macro McGraw Hill, 2001
MOOC Courses	https://www.mooc-list.com/tags/automotive-engineering
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	2	2	2	2	1	3	1	-	-	3	3	3
CO2	2	-	-	2	1	2	-	-	1	1	-	-	3	2	3
CO3	2	1	2	2	2	2	-	-	-	-	-	-	3	2	3
CO4	2	2	2	2	1	-	-	-	-	-	-	-	2	-	3
CO5	2	1	1	2	2	-	-	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-