Shri Shankaracharya Technical Campus, Bhilai

(AnAutonomousInstitute AffiliatedtoCSVTUBhilai)

SchemeofTeaching&Examination(Effectivefrom2020-2021Batch)

B. Tech. (Mechanical Engineering) Fifth Semester

Sl.No.	Boardof Studies(BOS)	Courses(Subject)	Course Code	Periodper Week			Schemeof Examination			Total Marks	Credit
				L	T	P	Theory/Lab				
							ESE	CT	TA		
1.	Mechanical Engineering	Design of Machine Elements	ME107501	2	1	-	100	20	30	150	3
2.	Mechanical Engineering	Heat and Mass Transfer	ME107502	2	1	-	100	20	30	150	3
3.	MechanicalEngineering	Artificial Intelligence &Machine Learning Applications in Mechanical Engineering	ME107503	2	1	-	100	20	30	150	3
4.	Mechanical Engineering	Dynamics of Machine	ME107504	2	1	-	100	20	30	150	3
5.	Mechanical Engineering	Professional Elective-1	(Refer Table-1)	3	-	-	100	20	30	150	3
6.	Mechanical Engineering	Machine Design Lab	ME107591	-	-	2	25	-	25	50	1
7.	Mechanical Engineering	Heat and Mass Transfer Lab	ME107592	-	-	2	25	-	25	50	1
8.	Mechanical Engineering	Artificial Intelligence & Machine Learning Applications in Mechanical engineering Lab	ME107593	-	-	2	25	-	25	50	1
9	Mechanical Engineering	MinorProject-I	ME107594	-	-	2	25	-	25	50	1
10.	Mechanical Engineering	Practical Training/ Internshipassessment (Report&Seminar)	ME107595	-	-	2	-	-	25	25	1
11.	Mechanical Engineering	ConstitutionofIndia	ME100596	-	-	-	-	-	25	25	-
Total				**11**	**4**	**10**	**600**	**100**	**300**	**1000**	**20**

Note:

(a)Abbreviationsused:L-Lecture,T-Tutorial, P-Practical, ESE-EndSemesterExam,CT-ClassTest,TA-Teacher'sAssessment

(b) Thedurationof endsemesterexaminationofalltheorypaperswillbeofthreehours.

(c)ConstitutionofIndia willbeconductedby/relevantdisciplineasdecidedbytheDirector.

Table1:ProfessionalElective-I			
Sl.No.	**BoardofStudies(BOS)**	**Course (Subject)**	**CourseCode**
1.	MechanicalEngineering	Industrial Hydraulics	ME107521
2.	Mechanical Engineering	Composite Materials	ME107522
3.	Mechanical Engineering	Power Plant Engineering	ME107523
4.	Mechanical Engineering	Computer Graphics	ME107524
5.	Mechanical Engineering	Operations Research	ME107525

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B. Tech. (Mechanical Engineering) SixthSemester

Sl.No.	Boardof Studies (BOS)	Courses(Subject)	Course Code	Periodper Week			Schemeof Examination			Total Marks	Credit
				L	T	P	Theory/Lab				
							ESE	CT	TA		
1.	Mechanical Engineering	Refrigeration and Air-Conditioning	ME107601	2	1	-	100	20	30	150	4
2.	Mechanical Engineering	Finite Element Methods	ME107602	2	1	-	100	20	30	150	3
3.	Mechanical Engineering	CAD/CAM/CAPP	ME107603	2	1	-	100	20	30	150	3
4.	Mechanical Engineering	Professional Elective-II	(Refer Table-1)	2	1	-	100	20	30	150	3
5.	Mechanical Engineering	Open Elective-1	(Refer Table-2)	3	-	-	100	20	30	150	3
6.	Mechanical Engineering	Refrigeration and Air-Conditioning Lab	ME107691	-	-	2	25	-	25	50	1
7.	Mechanical Engineering	Finite Element Methods Lab	ME107692	-	-	2	25	-	25	50	1
8.	Mechanical Engineering	CAD/CAM/CAPP Lab	ME107693	-	-	2	25	-	25	50	1
9	Mechanical Engineering	MinorProject-II	ME107694	-	-	2	50	-	25	75	1
10.	Mechanical Engineering	Essence of Indian Knowledge Tradition	ME100596	-	-	-	-	-	25	25	-
Total				**11**	**4**	**8**	**625**	**100**	**275**	**1000**	**20**

Table1:Professional ElectiveII

Sl.No.	BoardofStudies(BOS)	Course (Subject)	CourseCode
1.	Mechanical Engineering	Quality Control &Total Quality Management	ME107621
2.	Mechanical Engineering	Energy Management & Audit	ME107622
3.	Mechanical Engineering	Internet of Things (IoT)	ME107623
4.	Mechanical Engineering	Product Design & Development	ME107624
5.	Mechanical Engineering	Rapid Prototyping	ME107625

Table2:OpenElective-I				
Sl.No.	**BoardofStudies(BOS)**	**Course (Subject)**	**CourseCode**	**Link**
1.	Civil Engineering	Project Construction Planning and Control	CE100641	https://archive.nptel.ac.in/courses/105/106/105106149/
2.	Civil Engineering	Remote Sensing Principle & Application	CE100642	https://nptel.ac.in/courses/105101206
3.	Computer Science & Engineering	Robotics	CSE100643	https://onlinecourses.nptel.ac.in/noc22_me109/preview
4.	Computer Science & Engineering	Data Visualization	CSE100644	https://onlinecourses.nptel.ac.in/noc22_cs72/preview
5.	Computer Science & Engineering	Pattern Recognition and Visual Recognition	CSE100645	https://onlinecourses.nptel.ac.in/noc22_ee119/preview
6.	Computer Science & Engineering	Predictive Analysis	CSE100646	
7.	Electrical & Electronics Engineering	Hybrid Electric Vehicle	EEE100647	
8.	Electrical & Electronics Engineering	Grid Integration of Renewable Energy Sources	EEE100648	
9.	Electrical Engineering	Renewable Energy Systems	EE100649	nptel.ac.in/courses/1031032061
10..	Electrical Engineering	Industrial Automation and PLC	EE100650	nptel.ac.in/courses/108105062
11.	Electronics & Telecommunication Engineering	Introduction to Wireless and Cellular Communications	ET100651	https://nptel.ac.in/courses/106106167
12.	Electronics & Telecommunication Engineering	Cryptography & Network Security	ET100652	https://nptel.ac.in/courses/106105162
13.	Information Technology	Human Computer Interaction	IT100653	https://nptel.ac.in/courses/106106177
14.	Information Technology	Virtual reality	IT100654	https://nptel.ac.in/uacourses/10610613
15.	MBA	Management for Technocrats	MG100655	https://nptel.ac.in/courses/110105146 https://onlinecourses.nptel.ac.in/noc22
			MG100656	https://onlinecourses.swayam2.ac.in/nou22_mg07/
16.	MBA	Industrial Management	MG100657	https://onlinecourses.swayam2.ac.in/nou22_mg06/preview
			MG100658	https://onlinecourses.nptel.ac.in/noc22_mg81/preview
17.	Mechanical Engineering	Operation Research	ME100659	https://nptel.ac.in/courses/110106062
18.	Mechanical Engineering	Engineering Economics	ME100660	https://nptel.ac.in/courses/112107209

Note:

(a) Abbreviations used : L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Exam, CT- Class Test, TA- Teacher's Assessment

(b) 1/4th of total strength of students subject to minimum of 20 students is required to offer an elective in the department in aparticular academic session.

(c) Choice of elective course once made for an examination cannot be changed in future examinations.

(d) The duration of end semester examination of all theory papers will be of three hours.

SYLLABUS

B.TECH. (MECHANICAL ENGINEERING)

FIFTH SEMESTER

B. Tech. (Mechanical Engineering) Fifth Semester

Design of Machine Elements					
CourseCode	**ME107501**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	20	**30**	**50**	**4 Hours**

Note: Design data book by PSG and Bhandari are allowed in the examination

Course Objectives	Course Outcomes

		July 2022	1.00	Applicable for AY 2022-23 Onwards	
Chairman (AC)	Chairman (BoS)	Date of Release	Version		

To design and analyze components subjected to static and variable loads. To design and analyze basic elements of machine e.g. shafts, axle and clutches. To design and analyze welded and riveted joints. To design and analyze rolling contact and journal bearings. To design and analyze spur, helical and bevel gears	At the end of this course, the students are expected to be able to: **CO1:** Apply knowledge of machine design for understanding, formulating and solving engineering problems. **CO2:** Acquire knowledge and hands-on competence in applying the concepts in the design and development of mechanical systems. **CO3:** Demonstrate creativeness in designing new systems components and processes in the field of engineering. **CO4:** Identify, analysis, and solve mechanical engineering problems useful to the society. **CO5:** Work effectively with engineering and science teams as well as with multidisciplinary designs.

Unit – I: **[CO1]**

General Considerations: Selection of Materials, Design Stress, Factor of Safety, Stress concentration factor in tension, bending and torsion, Theories of failures. Notch sensitivity, Design stress for variable and repeated loads, Fatigue stress concentration factor, Endurance diagrams. **[7 hrs.]**

Unit – II: **[CO2]**

Shafts and Axles: Transmission shaft, Design against static load, Design against fluctuating load, Design for strength and torsional rigidity, Design of hollow shafts.

Clutches: Friction clutches, Friction materials, Torque transmitting capacity, Single & Multiple plate clutch, Centrifugal clutch.**[7 hrs.]**

Unit – III: **[CO3]**

Welded joints: Types of welded joints, Stresses in butt and fillet welds, Strength of welded joints, Location and dimension of weld design, Eccentrically loaded joint in plane of welds, Welded joint subjected to bending moment.

Riveted Joints: Types of rivet heads, Types of riveted joints, Failure of riveted joint, Strength of rivet joint, Efficiency of riveted joint, Design of riveted joint for boiler. **[7 hrs.]**

Unit – IV: **[CO4]**

Rolling Contact Bearings - Types of ball and roller bearings, Selection of bearing for radial and axial load, bearing life, Design for cyclic loads and speeds, Mounting and lubrication.

Journal Bearings: Types of lubrication, Viscosity, Hydrodynamic theory of lubrication, Somerfield number, Self-contained bearings, Bearing materials.**[7 hrs.]**

Unit-V **[CO5]**

Spur Gears - Force Analysis, Selection of Material, Number of Teeth, Face Width, Beam Strength of Gear Tooth, Effective Load on Gear Tooth, Estimation of Module Based on Wear Strength, Lewis equation, Gear Design for Maximum Power Transmitting Capacity, Gear Lubrication.

Helical Gears: Terminology of Helical Gears, Virtual Number of Teeth, Tooth Proportions, Force Analysis, Beam Strength of Helical Gears, Effective Load on Gear Tooth, Wear Strength of Helical Gears.

Bevel Gears: Terminology of Bevel Gears, Force analysis **[8 hrs.]**

Text Books

S. No.	Title	Author(s)	Publisher
1	Design of Machine Elements	V. B. Bhandari	Tata McGraw-Hill
2	Mechanical Engineering Design	J. E. Shigley	McGraw Hill

Reference Books

S. No.	Title	Author(s)	Publisher
1	Machine Design: An Integrated Approach	Norton	Pearson Education
2	Analysis and Design of Machine Elements	W. Jiang	Wiley

3	A Textbook of Machine Design	Sharma & Aggarwal	S. K. Kataria& Sons
4	Machine Design: Fundamentals and Applications	P. C. Gope	PHI Learning
5	Machine Design	Sundararajamoorthy&Shanmugam	Anuradha Publications

B. Tech. (Mechanical Engineering) FifthSemester

Heat and Mass Transfer					
CourseCode	**ME107502**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**50**	**3 Hours**

Course Objectives	**Course Outcomes**
To introduce students to basic modes of heat transfer. To make student capable of Computing temperature	**Student will be able to:** **CO1** Understand the basic modes of heat transfer.

		July 2022	1.00	Applicable for AY 2022-23 Onwards	
Chairman (AC)	Chairman (BoS)	Date of Release	Version		

distribution in steady-state heat conduction To make student understand and interpret heat transfer through extended surfaces. To develop the capability to interpret and compute forced and free convective heat transfer. To explain the principles of radiation heat transfer and understand the numerical formula for heat conduction problems. To develop the capability of designing heat exchangers using LMTD and NTU methods. To introduce to computer software for solving basic Heat Transfer problems.	Compute temperature distribution in steady-state heat conduction **CO2** Understand and interpret heat transfer through extended surfaces. **CO3** Interpret and compute forced and free convective heat transfer. **CO4** Understand the principles of radiation heat transfer and understand the numerical formula for heat conduction problems. Design heat exchangers using LMTD and NTU methods. **CO5** Use computer software to solve basic Heat Transfer problems**.**

UNIT I: [CO 1]

Introduction to Heat Transfer: Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

Conduction: General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems. Initial and boundary conditions.

Steady State one-dimensional Heat conduction: Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance. Analogy between heat and electricity flow; Thermal contact resistance and overall heat transfer coefficient; Critical radius of insulation.

[7 hrs.]

UNIT II:[CO 2]

Fins: Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

Transient Conduction: Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler's charts. **[7 hrs.]**

UNIT III: [CO 3]

Forced Convection: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

Natural Convection : Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.[**7 hrs.]**

UNIT IV: [CO 4]

Thermal Radiation: Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non-black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Greenhouse effect.

Heat Exchanger: Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.
Introduction to Mass Transfer: Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film. **[7 hrs.]**

UNIT V: **[CO 5]**
Introduction to basic Computer solvers for Heat Transfer Problems: Introduction to MATHCAD, Engineering Equation Solver (EES), Finite Element Heat Transfer (FEHT), Microsoft Excel.
Solution of basic Heat transfer Problems Using Software: Solution of Fourier's Law and Heat Conduction equation, multimode heat transfer problems. **[8 hrs.]**

Text Books

S. No.	Title	Author(s)	Publisher
1	Heat Transfer	S.P.Sukhatme	TMH, New Delhi
2	Heat & Mass Transfer	D.S.Kumar	S.K. Kataria& Sons, Delhi
3	Software Solutions to Problems on Heat Transfer, part 1	M. Thilumaleshwar	Bookboon.com

Reference Books

S. No.	Title	Author(s)	Publisher
1	Fundamentals of Heat and Mass Transfer	Incroperra& DeWitt	John Wiley and Sons
2	Heat and Mass Transfer, a practical approach.	Yunus A Cengel	McGraw-Hill
3	Heat Transfer	J.P. Holman	McGraw-Hill
4	Heat and Mass Transfer	R Yadav	Central Publishing House
5	Heat and Mass Transfer Data Book	C.P.Kothandaraman. & S. Subramanyan.	New Age, Delhi
6	Heat Transfer	P.S.Ghosh	Oxford University Press
7	Heat And Mass Transfer Fundamentals And Applications	Yunus,ACengel and A J Ghajar	TMH, New Delhi
8	A Course In Heat And Mass Transfer-	S.C. Arora & S Domkundwar,	S DhanpatRai, Delhi

B. Tech. (Mechanical Engineering) FifthSemester

Artificial Intelligence &Machine Learning Applications in Mechanical engineering					
CourseCode	**ME107503**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**50**	**3 Hours**

Course Objectives	Course Outcomes

		July 2022	1.00	Applicable for AY 2022-23 Onwards	
Chairman (AC)	Chairman (BoS)	Date of Release	Version		

To provide a basic foundation on different concepts of Artificial Intelligence. Learn feature extraction and selection techniques for processing data set. Explore the basic algorithms used in classification and regression problems. Understand steps involved in development of machine learning model. To expose students to the implement and analyze machine learning model in mechanical engineering problems.	At the end of this course, the students are expected to be able to: **CO1:** Demonstrate fundamentals of artificial intelligence and machine learning. **CO2:** Apply the concepts of feature extraction and selection techniques for processing data set. **CO3:** Apply the machine learning algorithm for classification and regression based problem in the field of mechanical engineering. **CO4:** Devise and Develop a machine learning model using various steps. **CO5:** Explain concepts of reinforced and deep learning and simulate machine learning model in mechanical engineering problems.

Unit – I: **[CO1]**
History of AI, Comparison of AI with Data Science, Need of AI in Mechanical Engineering, Introduction to Machine Learning. Basics: Reasoning, problem solving, Knowledge representation, Planning, Learning, Perception, Motion and manipulation.
Approaches to AI: Cybernetics and brain simulation, Symbolic, Sub-symbolic, Statistical.
Approaches to ML: Supervised learning, Unsupervised learning, Reinforcement learning**.** **[7 Hrs]**

Unit – II: **[CO2]**
Feature extraction: Statistical features, Principal Component Analysis.
Feature selection: Ranking, Decision tree - Entropy reduction and information gain, Exhaustive, best first, Greedy forward & backward, Applications of feature extraction and selection algorithms in Mechanical Engineering.**[7 Hrs]**

Unit – III: **[CO3]**
Classification: Decision tree, Random forest, Naive Bayes, Support vector machine.
Regression: Logistic Regression, Support Vector Regression. Regression trees: Decision tree, random forest, K-Means, K-Nearest Neighbor (KNN). Applications of classification and regression algorithms in Mechanical Engineering.
[8 Hrs]

Unit – IV: [CO4]
Development of ML Model: classification, clustering, regression, ranking. Steps in ML modeling, Data Collection, Data pre-processing, Model Selection, Model training (Training, Testing, K-fold Cross Validation), Model evaluation (understanding and interpretation of confusion matrix, Accuracy, Precision, Recall, True positive, false positive etc.), Hyper parameter Tuning, Predictions.
Characteristics of Reinforced learning; Algorithms: Value Based, Policy Based, Model Based; Positive vs Negative Reinforced Learning; Models: Markov Decision Process, Q Learning. Characteristics of Deep Learning, Artificial Neural Network, Convolution Neural Network.Application of Reinforced and Deep Learning in Mechanical Engineering.
[7 Hrs]
Unit – V:: [CO5]
Application: Applications of AI in CAD, CAPP, Human Machine Interaction, Material Inspection, Process Optimization, Fault Detection, Dynamic System Order Reduction, Image based part classification, Tuning of control algorithms.
[7 Hrs]

Text Books

S. No.	Title	Author(s)	Publisher
1	Mathematics for Machine Learning	Marc Peter Deisenroth, ,A. Aldo Faisal, Cheng Soon	Cambridge University Press, ISBN 9781108679930, 2020

		Ong	
2	Machine Learning and Artificial Intelligence	Ameet V Joshi	Springer Nature Switzerland AG,ISBN 978-3-030-26621-9, 2020
3	Artificial Intelligence – Building Intelligent Systems	Parag Kulkarni & Prachi Joshi	PHI learning Pvt. Ltd., ISBN 978-81-203-5046-5, 2015
4	Artificial Intelligence: A Modern Approach (Fourth Edition)	Stuart Russell & Peter Norvig	Pearson,ISBN 978-0134610993, 2020

Reference Books

S. No.	Title	Author(s)	Publisher
1	Emerging Trends and Applications of Machine Learning (2nd edition)	Arun Solanki, Sandeep Kumar, Anand Nayyar	IGI Global, ISBN 978-1522596431, 2018
2	Foundations of Machine Learning	MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar	MIT Press, ISBN: 9780262018258, 2018
3	Artificial Intelligence in Mechanical and Industrial Engineering	Kaushik Kumar, DivyaZindani, J. Paulo Davim	CRC Press, ISBN 9780367441760, 2021
4	Artificial Intelligence and Machine Learning Fundamentals	Zsolt Nagy	Packt Publisher, ISBN 978-1789801651, 2018
5	Artificial Intelligence (2nd edition)	Elaine Rich, Kevin Knight	TMH Publication, ISBN 978-0070087705, 2009

B. Tech. (Mechanical Engineering) FifthSemester

Dynamics of Machines					
CourseCode	**ME107504**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**50**	**3 Hours**

Course Objectives	Course Outcomes

		July 2022	1.00	Applicable for AY 2022-23 Onwards	
Chairman (AC)	Chairman (BoS)	Date of Release	Version		

1. To introduce the approaches and mathematical models used in dynamic analysis of machinery. 2. To develop understanding of functions and characteristics of governors. 3. To impart knowledge of inertia forces in mechanisms, gyroscopic effects in airplanes, ships and road vehicles, balancing of machine parts, vibration analysis.	At the end of this course, the students are expected to be able to: **CO1:** Explain principles of operation of mechanical governors and analyze its performance parameters. **CO2:** Determine the forces and couples for static and dynamic conditions of four-bar mechanisms and slider crank mechanisms to keep the system in equilibrium. **CO3:** Determine gyroscopic couple and effects related to plane disc, aero plane, ship and two wheels and four wheels vehicles. **CO4:** Apply the theory of balancing to rotating and reciprocating masses. **CO5:** Explain principles of vibrations of different systems and analyze related practical problems.

Unit – I **[CO1]**

Governors: Types of governors, force analysis of Porter, Proel and Hartnell governors. Controlling force, Stability, Sensitiveness, Isochronism, Effort and Power. **[7 hrs.]**

Unit – II **[CO2]**

Static force Analysis: Static equilibrium. Equilibrium of two and three force members. Members with two forces and torque, free body diagrams, Static force analysis of four bar mechanism and Slider-crank mechanism with and without friction.

Dynamic force Analysis: D 'Alembert's principle, Inertia force, Inertia torque. Dynamic force analysis of four-bar mechanism and Slider crank mechanism without friction. **[7 hrs.]**

Unit – III **[CO3]**

Gyroscope: Vectorial representation of angular motion, gyroscopic couple. Effect of gyroscopic couple on plane disc, aero plane, ship, stability of two wheels and four wheels vehicles. **[8 hrs.]**

Unit – IV **[CO4]**

Balancing of Rotating Masses:

Static and dynamic balancing, balancing of single rotating mass by balancing masses in same plane and in different planes. Balancing of several rotating masses by balancing masses in same plane and in different planes.

Balancing of Reciprocating Masses:

Inertia effect of crank and connecting rod, Single cylinder engine, balancing in multi cylinder-inline engine (primary and secondary forces).**[7 hrs.]**

Unit – V **[CO5]**

Undamped free Vibrations (Single Degree of Freedom)

Types of vibrations, Definitions, Simple Harmonic Motion (SHM), Methods of analysis – (Newton's method, Energy method & Rayleigh's methods). Derivations for spring mass systems, Natural frequencies of simple systems, springs in series and parallel, Torsional and transverse vibrations, Effect of mass of spring.

Damped free Vibrations (Single Degree of Freedom)

Types of damping, Analysis with viscous damping - Derivations for overdamped, critically damped and under damped systems, Logarithmic decrement.

Forced Vibrations (Single Degree of Freedom):

Analysis of forced vibration with constant harmonic excitation, Magnification factor, Vibration isolation, Transmissibility ratio, Excitation of support (absolute and relative). **[7 hrs.]**

Text Books

Sl. No.	Title	Author(s)	Publisher
1.	Theory of Machines	S. S. Rattan	Tata McGraw Hill, New Delhi
2.	Theory of Machines	Thomas Bevan	CBS/ Cengage Publishers

Reference Books

Sl. No.	Title	Author(s)	Publisher
1.	Theory of Machines and Mechanisms	J. J. Uicker, G. R. Pennock, & J. E. Shigley	Oxford Univ. Press
2.	Theory of Mechanisms and Machines	A. Ghosh, A. K. Mallick	EWP Press
3.	Mechanisms and Machine theory	J. S. Rao, R. V. Dukkipati	Wiley-Eastern Ltd., New Delhi
4.	Theory of Machines	P.L. Ballaney	Khanna Publishers, New Delhi

B. Tech. (Mechanical Engineering) FifthSemester

Industrial Hydraulics					
CourseCode	**ME107521**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**50**	**3 Hours**

Course Objectives	Course Outcomes
•To Learn basic concepts and terminologies of hydraulics. •To understand construction and working of various hydraulic power system •To understand the constructional details of pumps and actuators •To understand various valves and auxiliaries & rectification of their problems •To understand the hydraulic circuits & develop Hydraulic Circuits •To understand accumulators and intensifiers	At the end of this course, the students are expected to be able to: **CO1:** Acquire knowledge and hands-on competence in applying the concepts of industrial hydraulics in the design and development of mechanical system. **CO2:** Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular. **CO3:** Identify, analysis, and solve mechanical engineering problems useful to the society. **CO4:** Work effectively with engineering and science teams as well as with multidisciplinary designs. **CO5:** Acquire knowledge ofHydraulic Circuits.

Unit – I: [CO1]

Fluidics: Technology, Terminology, types of fluid logic elements, amplifiers, logic states, methods of obtaining input signals and power outputs, application of fluidics, third generation fluidics.**[7 hrs.]**

Unit – II: [CO2]

Hydraulic Fluid: Types of hydraulic fluids, properties of fluid, selection of fluids, JIC/ISO symbols for hydraulic circuits.
Fluid Power System: Components, advantages, applications in the field of Machine Tools, material handling, presses, mobile and stationary machines, clamping & indexing devices etc., transmission of power at static and dynamic states.
[7hrs.]

Unit – III:[CO3]

Pumps: Types, classification, principle and working of vane, gear, radial and axial plunger pumps, power and efficiency calculations, selection of pumps for hydraulic transmission.
Actuators: Linear and rotary actuators, hydraulic motor types & construction methods of control of acceleration, types of cylinder and mountings, calculation of piston velocity, thrust under static and dynamic application.
[7 hrs.]

Unit – IV:[CO4]

Control of Fluid Power: Principle, working types of the following valves, pressure control, direction control, flow control, relief valves, sequence values etc. **[7hrs.]**

Unit – V:[CO5]

Hydraulic Circuits: Meter in, meter out circuits, Pressure control for cylinders, Flow divider circuits, Circuit illustrating use of pressure reducer valves, sequence valve, counter balance valves, unloading valves with the use of electrical control, accumulators etc. Accumulators and Intensifiers: Types, function, application, selection and design procedure.
[8hrs.]

Text Books

S. No.	Title	Author(s)	Publisher
1	Hydraulic Machines including fluidics	Dr. Jagdish Lal	Metropolitan Book Company, New Delhi
2	Introduction to Fluid Power	Sahastrabadhe	NiraliPrakashan, Pune

Reference Books

S. No.	Title	Author(s)	Publisher

1	Industrial Hydraulics manual	Vickers	
2	Industrial Hydraulics	Pipenger& Hicks	Mc Graw Hill Company, New York
3	Hydraulics Vol. 1 & 2	Rexroth	
4	Fluid Power	Goodwin	

B. Tech. (Mechanical Engineering) FifthSemester

Composite Materials					
CourseCode	**ME107522**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**50**	**3 Hours**

Course Objectives		**Course Outcomes**			
		July 2022	1.00	Applicable for AY 2022-23 Onwards	
Chairman (AC)	Chairman (BoS)	Date of Release	Version		

•To be familiar with classification & characteristics of composite material and their application. •To gain the knowledge about manufacturing methods, testing and environmental issue related with composite material •To train students to be able to design composite structures, select composite materials, conduct stress analyses of selected practical applications using laminated plate theories appropriate strength criteria. •To be familiar with the properties and response of composite structures subjected to mechanical loading under static and cyclic conditions	At the end of this course, the students are expected to be able to: **CO1:** Acquire knowledge and hands-on competence in applying the knowledge of composite materials in the design and development of mechanical systems. **CO2:** Demonstrate creativeness in designing new systems components in the field of engineering. **CO3:** Work effectively with engineering and science teams as well as with multidisciplinary designs. **CO4:** Understand the various stress produced. **CO5:** Understand various theories of composite laminates.

Unit – I: **[CO1]**
Introduction to Composites: Definition, classification/ types and characteristics of composite materials; Basic composite constituents – fiber and matrix; Properties of unidirectional long fiber and short fiber composites; Polymeric materials and polymeric composites; Honeycomb and Sandwich Composite Structure; Application areas of composites. **[7 hrs.]**

Unit – II:[CO2]
Manufacturing, Testing and Environmental Issues: Molding, pultrusion, filament winding, other advanced manufacturing techniques; Quality inspection and testing – uniaxial tension test, uniaxial compression test, shear test, fracture toughness testing of composites. Environmental Issues related with composite manufacturing and their applications.**[7hrs.]**

Unit – III: [CO3]
Material Properties: Orthotropic and Anisotropic materials; properties relating stress to strain, properties relating temperature to strain, properties relating moisture to strain, properties relating stress (or strain) to failure, Failure Criterion – Maximum Stress and Maximum Strain; Review of force tensors, stress tensors, strain tensors.
[7hrs.]

Unit – IV:[CO4]
Elastic Response Analysis: Hooke's law for orthotropic and anisotropic materials; Linear Elasticity for Anisotropic Materials; Unidirectional composite laminates; Rotations of Stresses, Strains; Residual Stresses; Stress and environmental effects on composites behavior. **[7hrs.]**

Unit – V:[CO5]
Composite Laminates: Thin-plate theory, classical lamination theory; Angle-ply and cross ply laminates; Static, dynamic and stability analysis for simple cases of composite plates; Inter laminar stress behavior; Composite Joints; Design with Composites. **[8hrs]**

Text Books

S.No.	Title	Author(s)	Publisher
1	"Analysis and Performance of Fiber Composites"	Agarwal, B. D., and Broutman L. J.	John Wiley and Sons, NewYork
2	"Fiber Reinforced Composites: Materials, Manufacturing and Design",	Mallick, P. K.	Marcel Dekker Inc

3	"Mechanics of Composite Materials and Structures"	Mukhopadhyay, M.	University Press, India.

Reference Books

S. No.	Title	Author(s)	Publisher
1	"Primer on Composite Materials, Analysis"	Halpin, J. C.	Techomic Publishing Co
2	"Composite Materials Technology: Processes and Properties"	Mallick, P. K. and Newman, S.	HansenPublisher,Munish
3	"Stress Analysis of Fiber – Reinforced Composite Materials"	Hyer, M. W	McGraw-Hill, NewYork
4	"Engineering Mechanics of Composite Materials"	Issac M. Daniel and OriIshai	Oxford University Press-2006, FirstIndian Edition – 2007.

B. Tech. (Mechanical Engineering) FifthSemester

Power Plant Engineering					
CourseCode	**ME107523**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**

Scheme	**100**	**20**	**30**	**50**	**3 Hours**

Course Objectives	Course Outcomes
•To impart knowledge on sources of energy and types of power plants. •To understand construction and working of Steam Power Plants, Hydro Electric power station, diesel power station, and Nuclear Power Station •To impart knowledge about various performance characteristics and its analysis •To impart knowledge about variable load problem •To impart knowledge about terms and factors associated with power plant economics	At the end of this course, the students are expected to be able to: **CO1:** Demonstrate a basic understanding of various types of power plants. **CO2:** Acquire knowledge and hands-on competence in the design and development of mechanical systems associated with power plants. **CO3:** Compare different energy resources and choose the most appropriate based on local conditions. **CO4:**Perform simple techno-economical assessments of energy resources **CO5:**Design power plant that meet specific energy demands, that are economically feasible and have a minimal impact on the environment

Unit – I: **[CO1]**

Elements of Power Plant: General Sources of power, Importance of Central Power Stations, types of power stations – steam, nuclear, diesel and hydro – Elements of modern power stations (Steams only) brief layout and arrangement of elements and complements, sitting of different power stations, foundation. Elements of Electric power systems primary and secondary distribution substations (in brief) **[7hrs]**

Unit – II: **[CO2]**

Steam Power Plant: Steam power plants, selection of working medium, Heat Balance in steam cycles, Heat rates, comparison of efficiencies gas loop, fuels and fuel handling. Equipments, fuel gas cleaning and ash handling. Air pre-heater, feed water pre-heaters, steam re-heaters, deaerators, feed water treatment, pumping and regulation water walls, modern developments in steam boilers, Important instrumentation and piping of gas and water loop. Factors to be controlled from maximum efficiency and variable output. **[7hrs]**

Unit – III: **[CO3]**

Hydro Electric power station: Potential power with reference to rainfall and catchments area, Water storage, equipment used in hydroelectric power stations. Characteristics of hydraulic turbines. Comparison of the factors governing the cost of hydro steam and diesel power stations.

Diesel power station: Suitability of diesel engines for bulk power, advantages and limitations of diesel, power stations, efficiency and heat balance. **[7hrs]**

Unit – IV **[CO4]**

Nuclear Power Station: Evolution of nuclear energy from atoms by fission and fusion. Chain reactions, fission materials, types of reactors, gas cooled, boiling water liquid, metal cooled and fast reactor, arrangements of various elements in a nuclear power station, stem cycles and boilers coolant heat exchangers, Reactor control, Reactor shielding and safety methods.**[7Hrs]**

Unit – V **[CO5]**

Variable load problems: Idealized and realized load curves, effect of variable load on plant design and operation variable load operation and load dispatch.

Power station Economics: Source of income, cost of plant and production, elements of cost, depreciation and replacement theory of rates. **[8hrs]**

Text Books

S. No.	Title	Author(s)	Publisher
1	Power Plant Engineering	P.K. Nag	Tata McGraw-Hill Pub. Com., New Delhi
2	A Course in Power Plant Engineering	S.C. Arora, Domkundwar	DhanpatRai& Co.

Reference Books

S. No.	Title	Author(s)	Publisher
1	Text Book of Power Plant Engineering	R.K. Rajput	Laxmi Publications
2	Power Plant Engineering	P.C. Sharma	S.K. Kataria& Sons
3	Power Plant Engineering	G.R. Nagpal	Khanna Publishers
4	Steam and gas turbine and power plant engineering-	R. Yadav	CPH Allahabad.

B. Tech. (Mechanical Engineering) FifthSemester

Computer Graphics					
CourseCode	**ME107524**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**50**	**3 Hours**

Course Objectives	Course Outcomes
To get familiar with Computer input and Output devices To introduce fundamental techniques and methods for two-dimensional and three-dimensional computer graphics To recognize geometric and graphical elements of engineering design problems To understand the algorithms and models for geometric projections, transformations, coordinate systems, parametric curves, hidden surface determination, colour theory, texture mapping, shading and lighting.	At the end of this course, the students are expected to be able to: **CO1:** students will learn how to develop interactive programs that use effectively the graphics functionalities available in contemporary personal computers, **CO2:** students will learn the fundamental principles and technologies upon which these functionalities, and possibly their future evolutions, are based **CO3:** The skills for designing and implementing practical graphic solutions to challenging problems in different application domains. . **CO4:** Proficiency in engineering design and ability to conduct an engineering project. . **CO5:** Understanding of the business environment & Ability to manage information and documentation

Unit – I: **[CO1]**
Input and Output Devices: Keyboard, Mouse, Z mouse Trackball, Joysticks, Data Glove, Digitizers, Light pen, Touch Panels, Image scanners, Printers and Plotters.
Video Display device: Refresh Cathode ray Tubes, Random Scan and Raster Scan monitors, Color CRT Monitors, Flat panel display: LED and LCD Monitors &plasma display, Direct view Storage Tubes, Continuous Refresh and Storage display. **[7hrs]**

Unit – II: **[CO2]**
Output Characteristics: Aspect ratio; Aliasing and Anti-aliasing.
Graphic primitives: Points &Lines, Line drawing Algorithm, DDA and Bresenham's Algorithm. Circle Generation Algorithm: Midpoint circle algorithm .Ellipse Generation Algorithm: Mid-point ellipse algorithm.
Attributes of primitives: Line style, Type, Width, Colour, Character Attributes, Area Filling: Inside-outside test;
Fill Algorithm: Scan-Line Polygon Fill algorithm, Boundary Fill Algorithm - 4 and 8 connected areas; Flood Fill Algorithm. **[7hrs]**

Unit – III: **[CO3]**
Analytical & Synthetic curve: C0, C1 & C2 Continuity, Convex hull, Parametric & non Parametric representation of curves.
Analytic curves: Parabola, Hyperbola
Splines: linear, quadratic, cubic, hermit, Bezier curves: single and multiple segments, Parametric forms of cubic splines
Synthetic Curves: Circle and ellipse drawing **[7hrs]**

Unit – IV **[CO4]**
2D Geometric Transformation: Window and View port: Window definitions, View port definitions, Window and View port relationship; World co-ordinates; Normalized device co-ordinates and Homogenous co-ordinates.

Basic transformation- Translation, Scaling, Rotation, Reflection, Twist, Matrix Representation, Composite Transformations.
3D Geometric Transformation: Basic Transformations, 3D Display parallel &perspective projection.
[7hrs]

Unit – V **[CO5]**
Viewing: Viewing, Device co-ordination system, Image co-ordination system, Viewing transformation. **Clipping**: Point clipping, Line clipping, Cohen- Sutherland clipping, Midpoint clipping method, Sutherland and Hodgeman

Clipping. **[8hrs]**

Text Books

S.No.	Title	Author(s)	Publisher
1	Computer Graphics	Donald hearn and M.Pauline Baker	Prentice Hall of India Pvt Ltd.
2	Introduction to Computer Graphics	N. Krishnamurhy	TMH Publication

Reference Books

S. No.	Title	Author(s)	Publisher
1	Computer Graphics.	Harrington S.	TMH Publication
2	CAD-CAM Theory and Practice	Ibrahim Zeid	TMH Publication
3	Schaum's Outlines Computer Graphics	Xiang and Plastok	TMH, 2nd Edition, 2002.
4	Procedural Elements for Computer Graphics	Rogers	TMH Publication.

B. Tech. (Mechanical Engineering) FifthSemester

Operations Research					
CourseCode	**ME107525**	**L =2**	**T=1**	**P=2**	**Credits=3**
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**50**	**3 Hours**

Course Objectives		Course Outcomes			
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Identify and developed operational research models from the verbal description of the real system. To understand the mathematical tool that are needed to solve linear programming models like the transportation and assignment Models problems. To understand different application areas of operation research like queuing and sequencing models and compute performance measures. To understand use of CPM and PERT techniques, to plan, schedule and control project activities. Understand the usage of game theory and simulation for solving business and optimization problems.	At the end of this course, the students are expected to be able to: **CO1:** Formulate and solve real-world problems as linear programs for better decision-making. **CO2:** Solve specialized linear programming models like the transportation and assignment Models. **CO3:** Understand the systems like queuing and sequencing models and compute performance measures. **CO4:** Use CPM and PERT techniques, to plan, schedule and control project activities. **CO5:** Propose the best strategies using game theory and apply concepts of simulation to optimize practical problems.

Unit – I: **[CO1]**

Introduction: Various stages of Operations Research, fields of application, optimization and its classification.

General Linear Programming Problems (L.P.P.) – Introduction, maximization and minimization of function with and/or without constraints, formulation of a linear programming problem.

Methods to solve an L.P.P. – Graphical Method, Simplex Method, Big-M Method, Degeneracy, Introduction of duality, applications of L.P.P. in Mechanical Engineering. **[7 hrs]**

Unit – II: **[CO2]**

Transportation Problems: Mathematical formulation computational procedures, Stepping Stone Method, Modified Distribution (MODI) Method, Vogel's Approximation Method (V.A.M.), Solution of balanced and unbalanced transportation problems and case of Degeneracy.

Assignment Problems: Mathematical formulation of assignment problems, solution of assignment problems, traveling salesman problems, Aircrew Assignment problems. Applications of assignment problems. **[7 hrs]**

Unit – III: **[CO3]**

Waiting Line Theory: Basic queuing process, basic structure of queuing models, basic elements and characteristics of queuing models, some commonly known queuing situations, Kendall's notation, service time, solution to M/M/1: FCFS/∞/∞ model

Sequencing: Sequencing problems, solution to sequencing problem - Johnson's algorithm, assumptions in sequencing problems, processing of n-jobs through one machine, processing n-jobs through two machines, processing n-jobs through three machines, processing two through m machines, processing n-jobs through m-machines.**[7 Hrs]**

Unit – IV **[CO4]**

Network Analysis: CPM and PERT, network representation and its elements, techniques for drawing network, critical path, time estimation in PERT, types of floats. Resource smoothing and leveling, project cost, optimum project duration, project crashing, updating. **[7 Hrs]**

Unit – V **[CO5]**

Game Theory: Introduction, two person zero sum game, methods for solving two person zero sum game: when saddle point exists, when no saddle point exists, solution of 2xnandmx2game.

Simulation: Basic concept of simulation, applications of simulation, merits and demerits of simulation, Monte-Carlo simulation, simulation of Inventory system, simulation of Queuing system. **[8 Hrs]**

Text Books

S. No.	Title	Author(s)	Publisher

1	Operation Research	Hira and Gupta	S. Chand & Co., New Delhi
2	Operation Research	N. D. Vohra	Tata McGraw Hills, New Delhi
3	Operation Research	S. D. Sharma	S. Chand & Co., New Delhi

Reference Books

S. No.	Title	Author(s)	Publisher
1	Operations Research - Theory and applications	J. K. Sharma	Macmillan
2	Operations Research	Hamdy. A. Taha	Tata McGraw Hills, New Delhi
3	Operation Research	Col. D. S. Cheema	University Science Press, New Delhi
4	Operation Research	A. P. Verma	S. K. Kataria& Sons, New Delhi

B. Tech. (Mechanical Engineering) FifthSemester

DESIGN OF MACHINE ELEMENTS LAB					
ME107591	**ME107591**	**L =2**	**T=1**	**P=2**	**Credits=3**
ESE	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	25	**-**	**25**	**50**	**3 Hours**

Course Objectives	Course Outcomes

To design and analyze components subjected to static and variable loads. To design and analyze basic elements of machine e.g. shafts, axle and clutches. To design and analyze welded and riveted joints. To design and analyze rolling contact and journal bearings. To design and analyze spur, helical and bevel gears.	At the end of this course, the students are expected to be able to: **CO1:** Apply knowledge of machine design for understanding, formulating and solving engineering problems. **CO2:** Acquire knowledge and hands-on competence in applying the concepts in the design and development of mechanical systems. **CO3:** Demonstrate creativeness in designing new systems components and processes in the field of engineering. **CO4:** Identify, analysis, and solve mechanical engineering problems useful to the society. **CO5:** Work effectively with engineering and science teams as well as with multidisciplinary designs.

Students have to solve at least TEN design problems out of the below mentioned topics:

1. Design a component subjected to stress concentration.
2. Design a component subjected to reversed stresses for finite life.
3. Design a component subjected to fluctuating stresses for infinite life.
4. Design a shaft on the basis of strength as well as torsional rigidity.
5. Design a shaft on the basis of ASME code.
6. Design a single plate clutch with maximum torque transmitting capacity.
7. Design an eccentrically loaded welded joint in the plane of welds.
8. Design a longitudinal butt joint for boiler.
9. Design and select a deep groove ball bearing for cyclic loads and speeds.
10. Design a journal bearing for the given specification.
11. Design a spur gear on the basis of Lewis equation.
12. Design a helical gear on the basis of Lewis equation.

The results must be plotted in the form of two dimensional or three-dimensional drawings using any CAD software both in component level and assembly level.

List of Equipment/Instruments/Machines/Software Required:

- Any CAD software like AutoCAD, Creo, ProE, CATIA, Solidworks, etc.
- Memory: 8 GB RAM
- Storage: 500 GB internal storage drive
- Monitor/Display: 15" LCD monitor

B. Tech. (Mechanical Engineering) FifthSemester

HEAT AND MASS TRANSFER LAB					
ME107591	**ME107592**	**L =2**	**T=1**	**P=2**	**Credits=3**
	ESE	**CT**	**TA**	**Total**	**ESE Duration**

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ESE	**25**	**-**	**25**	**50**	**3 Hours**

Course Objectives	Course Outcomes
The course should enable the students to: Understand the various forms of heat transfer and their applications in real life problems. Analyze different methods to calculate the heat transfer coefficient in various heat transfer problems. Analyze the theoretical knowledge and apply it in conducting experiments in the forms of heat transfer.	At the end of the course, the student will be able to: CO 1 Determine the thermal conductivity of a metal rod and overall heat transfer coefficient of composite slabs. CO 2 Determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values. CO 3 Evaluate temperature distribution characteristics of steady and transient heat conduction through solid cylinder experimentally. CO 4 Determine surface emissivity of a test plate and Stefan Boltzmann constant CO 5 Estimate performance of a refrigerator and effectiveness of a fin and Double pipe heat exchanger

Any 10 experiments to be conducted during the session.

1 Determination of Thermal Conductivity of a Metal Rod.
2 Determination of Overall Heat Transfer Coefficient of a Composite wall.
3 Determination of Effectiveness on a Metallic fin.
4 Determination of Heat Transfer Coefficient in free Convection
5 Determination of Heat Transfer Coefficient in a Forced Convention
6 Determination of Emissivity of a Surface.
7 Determination of Stefan Boltzmann Constant.
8 Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers.
9 Experiments on Boiling of Liquid and Condensation of Vapour.
10 Performance Test on a Vapour Compression Refrigeration.
11 Performance Test on a Vapour Compression Air – Conditioner.
12 Experiment on Transient Conduction Heat Transfer.
13 Solving Heat Transfer Problems using Software.

List of apparatus required:

1. Composite slab apparatus
2. Heat transfer through lagged pipe
3. Heat transfer through concentric sphere
4. Thermal conductivity of given metal rod
5. Heat transfer in pin fin apparatus
6. Experiment on transient heat conduction
7. Heat transfer in forced convection apparatus
8. Heat transfer in natural convection apparatus
9. Parallel and counter flow heat exchangers
10. Emissivity apparatus
11. Stefan Boltzmann apparatus
12. Critical heat flux
13. Study of heat pipe study
14. Film and dropwise condensation apparatus
15. Math cad/ finite element heat transfer/engineering equation solver

B. Tech. (Mechanical Engineering) FifthSemester

AI ML IN MECHANICAL ENGINEERING LAB					
ME107591	**ME107593**	**L =2**	**T=1**	**P=2**	**Credits=3**

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ESE	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 Hours

Course Objectives	Course Outcomes
To understand the supervised/ unsupervised/ Reinforcement learning approach. To understand the use of acquire, visualize, analyses and extract features the data set. Explore the basic algorithms used in classification and regression problems. Understand steps involved in development of machine learning model. To expose students to the implement and analyze machine learning model in mechanical engineering problems.	At the end of this course, the students are expected to be able to: **CO1:** Demonstrate the fundamentals of artificial intelligence and machine learning data sets and software tools. **CO2:** Apply the concepts of feature extraction and selection techniques for processing data set. **CO3:** Apply the machine learning algorithm for classification and regression-based problem in the field of mechanical engineering. **CO4:** Devise and Develop a machine learning model using various steps. **CO5:** Apply the concept of optimization tool using AI AL in given problems.

List of Experiments (perform any 10 experiments)

1. To study supervised/unsupervised/Reinforcement learning approach.
2. To acquire, visualize and analyses the data set (from time-domain/ frequency-domain/ etc.).
3. To extract features from given data set and establish training data.
4. To select relevant features using suitable technique.
5. To use PCA for dimensionality reduction.
6. To classify features/to develop classification model and evaluate its performance (any one classifier).
7. To develop regression model and evaluate its performance (any one algorithm).
8. Markov process for modeling manufacturing processes.
9. Reinforced Learning for optimizing engineering designs / Robot Guidance and Navigation.
10. GA for optimization of multi-dimensional function / path planning in robotics.
11. NN for parameter and model identification / tuning of Control Algorithms.

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Shri Shankaracharya Technical Campus, Bhilai

(AnAutonomousInstitute AffiliatedtoCSVTUBhilai)

SchemeofTeaching&Examination(Effectivefrom2020-2021Batch)

MINORPROJECT-1					
ME107591	**ET105594**	**L =0**	**T=0**	**P=2**	**Credits=1**
ESE	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	25	**-**	**25**	**50**	**-**

Course Objectives	Course Outcomes
The objective of this course is to improve student's ability to analyze, design and solve complex engineering problems through pedagogies (Project Based Learning) that support them in developing these skills. To develop and enhance student's practical ability to map Program Outcome of analyzing complex engineering problems and design its solution to meet specified need with appropriate considerations for practical problem statementsTo engage actively in team and to use modern tools for implementation.	**On Successful Completion of course the student should be able to** **CO1**: Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach. **CO2**: Reproduce, improve and refine technical aspects of engineering projects applying appropriate techniques, resources, and modern engineering and IT tools. **CO3**: Work as an individual and as a member or leader in teams in development of technical projects. **CO4**: Follow management principle and value health, safety and ethical practices during project. **CO5**: Communicate and report effectively project related activities and findings.

The process to be followed to maintain the quality of student projects is

a) Project allotment in identified technology/area/subject
b) Continuous Monitoring
c) Mid And Final Evaluation

a) Project allotment in identified technology/area/subject

i. Team formation- max. 3-4 students
ii. Mentor allotment- as per the problem statement identified

b) Continuous Monitoring

i) Progress monitoring by Mentor as per time table.
ii) Submission of progress report by student every 15 days

c) Mid & Final Evaluation

i. Project assessment presentation two times during the semester
ii. Rubrics for assessment, real time problem statement (health, safety, social utility, ethical Practices etc), technical skill implementation, use of modern tools, work distribution in team.
iii. Final submission of report to be submitted by student for end semester practical examination based on demonstration.
iv. Display of final projects at the end of semester, date of display to intimated to all for viewing and feedbacks.

Shri Shankaracharya Technical Campus, Bhilai

(AnAutonomousInstitute AffiliatedtoCSVTUBhilai)

SchemeofTeaching&Examination(Effectivefrom2020-2021Batch)

B. Tech. (Mechanical Engineering) FifthSemester

INTERNSHIPASSESSMENT(REPORT&SEMINAR)					
ME107591	ET105595	L =0	T=0	P=2	Credits=1
ESE	ESE	CT	TA	Total	ESE Duration
	-	-	25	25	-

Course Objectives	Course Outcomes
Thepurpose ofinternshipistoexpose studentstorealworkenvironme ntand at thesame timegaintheknowledge throughhands onobservationandjob execution. Fromthe internship,the studentswill also developskillsinwork ethics,communication,manag ement andothers.Thispracticaltraini ng program allowsstudentstointegrate classroomtheorywithworkpla ce practice and develop greater clarity aboutacademic,careergoals andneed to updateknowledge. Students are provided withthe opportunity totesttheirinterestin a particular career before permanentcommitmentsare made.	**Onsuccessful completionofthecourse, the student willbeableto:** **CO1:** Discusstheorganizational structure,tools/software/technology,production activities/service, of theindustry/company. **CO2:**Identify,formulateandmodelindustrialproblemsandfindsolutionapplyingfundam entalprinciplesof engineering. **CO3**:Demonstrateanawarenessofsocial,cultural,global,environmental responsibilityandskillsincommunication, management,leadershipandentrepreneurship. **CO4:**Updatewithallthelatestchangesintechnologicalworld, develop capabilityandenthusiasm for self- improvement throughcontinuous professionaldevelopment andlife-longlearning. **CO5:** Present seminarand submit internship report tocommunicateandreport effectivelytheinternshiprelated activitiesandfindings.

FORMATFORINTERNSHIP REPORT

1. CoverPage (colorprint)
2. InnerPages
   a) CertificatebyCompany/Industry
   b)Declarationbystudent
   c) Acknowledgement
3. Abstract
4. TableofContents
5. ListofTables
6. ListofFigures
7. AbbreviationsandNomenclature(ifany)

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8. Chapters
   - I. Introduction(Anoverviewofthewholereport)
   - II. Formal Trainingprovided(ifapplicable) [Thissectiondescribesthetraining providedthroughformalclassroomtraining environment.Briefdescription ofeachtrainingsessionandits benefittowardsthetraining program]
   - III. Industrial Training [The section should describe the following:
     - Objectives
     - Tools & Technology Used
     - Techniques Studied in Different Departments
     - Software &Tools Used
     - Highlights of Training Exposure (Area, Scope)]
   - IV. Problem Identification/Case study (Discussions)
   - V. Recommendations
9. References
10. Appendices
    - i. Data Sheets (if any)
    - ii. Snapshots (if any)

B. Tech. (Mechanical Engineering) FifthSemester

CONSTITUTIONOF INNDIA					
ME107591	**ME100596**	**L =0**	**T=0**	**P=0**	**Credits=-**
ESE	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	-	**-**	**25**	**25**	**-**

Course Objectives	Course Outcomes
The objective of this course is to introduce studentstotheConstitutionofIndia.	**Onsuccessfulcompletionofthecourse,the studentwillbeableto:** **CO1:**Display understandingabout thehistory and philosophy ofIndianConstitution. **CO2:** Demonstrate clarity about the premises informingthetwinthemesoflibertyand freedom from civil rightsperspective. **CO3:** Display understanding about powers and functionsofIndiangovernment. **CO4:**Exhibitunderstandingabout emergencyrule. **CO5:**Demonstrate understandingaboutstructure andfunctionsoflocal administration.

UNIT–I: **[CO1]**
Introduction: Historical PerspectiveofConstitutionofIndia;Philosophy ofIndianConstitution; Meaningoftheconstitutionlawandconstitutionalism;SalientfeaturesandPreamble.

UNIT–II: **[CO2]**
ContoursofConstitutionalRightsandDuties: Fundamentalrights;SchemeoftheFundamental Dutiesanditslegal status.

UNIT–III: **[CO3]**
OrgansofGovernance: ParliamentaryFormofGovernmentinIndia;Theconstitutionalpowers andstatusofthePresidentofIndia;Judiciary-PowersandFunctions;LocalSelfGovernment– Constitutional SchemeinIndia.

UNIT–IV: **[CO4]**
EmergencyProvisions: National Emergency;PresidentRule;Financial Emergency.

UNIT–V: **[CO5]**
Local Administration: Federal structure and distribution of legislative and financial powers

betweentheUnionandtheStates;TheDirectivePrinciplesofStatePolicy–Itsimportanceand implementation.

Text Books

S.No.	Title	Author(s)	Publisher
1.	Introduction to the Constitution of India	BasuD D	LexisNexis
2.	Principles of Public Administration	Dr SN Myneni	AllahabadLawAgency

ReferenceBooks

S.No.	Title	Author(s)	Publisher
1.	Dr. B.R.Ambedkar Framingof IndianConstitution	BusiSN	AvaPublishers
2.	TheoryandPractices ofModern Government	MGGupta	CentralBookDepot

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