Shri. Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

(Approved by AICTE, New Delhi, Recognized by Government of Maharashtra & Affiliated to BATU University, Lonere)

NBA Accredited Programs, Accredited By NAAC 'A' Grade,

ISO 9001:2015 Certified

Teaching and Evaluation scheme as per NEP-2020

Department of Mechatronics Engineering

SHARAD INSTITUTE OF TECHNOLOGY COLLEGE OF ENGINEERING, YADRAV · DEPT. OF MECHATRONICS ENGINEERING

Head
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Abbreviations

L: Lecture

T: Tutorial

P: Practical

CA1- Continuous Assessment 1

CA2- Continuous Assessment 2

MSE: Mid Semester Exam

ESE: End Semester Exam

BSC: Basic Science Course

ESC: Engineering Science Course

PCC: Programme Core Course

PEC: Programme Elective Course

MDM: Multidisciplinary Minor

OE: Open Elective

VSEC: Vocational and Skill Enhancement Course

AEC: Ability Enhancement Course

IKS: Indian Knowledge System

VEC: Value Education Course

RM: Research Methodology

CEP: Common Engineering Project

FP: Field Project

CC: Co-curricular Courses

ELC: Experimental Learning Course

HSSM: Humanity Social Science and Management

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Teaching and Evaluation Scheme for TY B. Tech.

Department of Mechatronics Engineering

Semester: V & VI

SHARAD INSTITUTE OF TECHNOLOGY COLLEGE OF ENGINEERING YADRAV
DEPT. OF MECHATRONICS ENGINEERING

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Department: Mechatronics Engineering **Rev:** Course Structure/01/2023-24

Class: T.Y. B.Tech **Semester: V**

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
23MT3501	PCC	Theory of Machines and Mechanisms	3	-	-	3	10	10	30	50	100	3
23MT3502	PCC	Strength of Materials	3	-	-	3	10	10	30	50	100	3
23MT3503	PCC	CAD/CAM/CAE	2	-	-	2	10	10	30	50	100	2
23MT3504	PEC	Program Elective Course -I	3	-	-	3	10	10	30	50	100	3
23MTMDXX	MDM	Multidisciplinary Minor	3	-	-	3	10	10	30	50	100	3
23OEMT33	OE	Open Elective-III	3	-	-	3	10	10	30	50	100	3
23MT3505	PCC	Theory of Machines and Mechanisms Laboratory	-	-	2	2	25	25	-	-	50	1
23MT3506	PCC	Industrial Measurement Laboratory	-	-	2	2	25	25	-	-	50	1
23MT3507	PCC	Python Programming Laboratory	-	-	2	2	15	15	-	20	50	1
23MT3508	VSEC	CAD/CAM/CAE Laboratory	-	-	2	2	15	15	-	20	50	1
23HSSM05	VEC	Aptitude Skills – III	1	-	-	1	25	25	-	-	50	Audit
23HSSM06	VEC	Language Skills - III	-	-	2	2	25	25		-	50	Audit
23MT3509	CEP	Mini Project - IV	-	-	2	2	25	25		-	50	1
23MT3510	VSEC	Industrial Training / Field Training	-	-	-	-	-	-	-	50	50	Audit
		Total	**18**	**-**	**12**	**30**	**215**	**215**	**180**	**390**	**1000**	**22**

List of Multidisciplinary Minor Basket (MDM-III)

Basket 1 (Automation) :23MTMDA3: Green Building Management and smart Automation
Basket 2(Design and Manufacturing): 23MTMDB3:3 D Printing Technology
Basket 3(Software): 23MTMDC3: Database management system

List of Program Elective Courses (PEC)

23MT3504A: Operation and Supply Chain Analytics
23MT3504B: Wireless Communication
23MT3504C: Industrial Networking
23MT3504D: Basics of Cloud Computing

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Department: Mechatronics Engineering **Rev:** Course Structure/01/2023-24

Class: T.Y. B.Tech **Semester: VI**

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
23MT3601	PCC	Design of Machine Elements and Transmission Systems	3	-	-	3	10	10	30	50	100	3
23MT3602	PCC	Control System	3	-	-	3	10	10	30	50	100	3
23MT3603	PCC	Industrial Automation and Robotics	2	-	-	2	10	10	30	50	100	2
23MT3604	PCC	Internet of Things	2	-	-	2	10	10	30	50	100	2
23MT3605	PEC	Program Elective Course -II	3	-	-	3	10	10	30	50	100	3
23MTMDXX	MDM	Multidisciplinary Minor	3	-	-	3	10	10	30	50	100	3
23MT3606	PCC	Design and Simulation Laboratory	-	-	2	2	25	25	-	-	50	1
23MT3607	PCC	Control System Laboratory using MATLAB	-	-	2	2	15	15	-	20	50	1
23MT3608	PCC	Industrial Automation and Robotics Laboratory	-	-	2	2	15	15	-	20	50	1
23MT3609	PCC	Internet of Things Laboratory	-	-	2	2	25	25	-	-	50	1
23HSSM07	VEC	Aptitude Skills – IV	1	-	-	1	25	25	-	-	50	Audit
23HSSM08	VEC	Language Skills - IV	-	-	2	2	25	25	-	-	50	Audit
23MT3610	ELC	Capstone Project - I	-	-	4	4	25	25	-	50	100	2
		Total	**17**	**-**	**14**	**31**	**215**	**215**	**180**	**390**	**1000**	**22**

Course Category	PCC	PEC	MDM	OE	VSEC	ELC	CEP	Total
Cumulative Sum of Credits	25	06	06	03	01	02	01	44
NEP Guideline	18-22	12	06	02	02	00	00	40-44

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Semester V

Theory of Machines and Mechanisms

23MT3501	PCC	Theory of Machines and Mechanisms	3-0-0	3 Credits

Teaching Scheme	**Evaluation Scheme**
Lecture: 3 hrs/week	CA –I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Engineering Physics

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain fundamental kinematic concepts, mechanisms, and their applications in mechanical systems.
CO2	Apply graphical methods to determine velocity and acceleration in planer mechanism using Relative velocity and Klien's construction method.
CO3	Analyze the effect of friction on torque transmission in screws, pivot and collar bearings.
CO4	Explain the basics of Gear, Gear Geometry and types of gear profiles.
CO5	Evaluate power transmission efficiency in belt drives.
CO6	Construct Cam Contour for given motion.

Course Contents:

Unit 1:Fundamentals of Kinematics and Mechanisms Classification of mechanisms, Basic kinematic concepts and definitions – Kinematic Link, Pair, Chain and its types, Types of constrained motion, Machine & Mechanism, Structure, Degrees of freedom for planer mechanism, Kutzbach and Grublers criteria, Four bar Chain mechanism, Single Slider crank chain , Double slider chain mechanism and its Kinematic inversions, Condition of correct steering.	[6]
Unit 2: Velocity and Acceleration Analysis Concept of relative Velocity and acceleration of a point on link, Inter-relation between linear and angular velocity and acceleration, Velocity and acceleration diagrams using relative velocity method for four bar pin jointed linkages and four bar single slider crank linkages, Velocity and acceleration of single slider crank mechanism by Klein's construction.	[7]

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Unit 3: Friction Introduction to friction- Types of friction, Coefficient of friction, Friction on rough horizontal plane, Inclined plane, friction between nut and screw, Friction Circle, Friction at pivot and collars, Classification of Clutches, torque transmitting capacity of plate clutch.	[7]
Unit 4: Toothed Gearing Classification of gears, Introduction to gear types- Spur, Helical, Spiral gears. Gear geometry, Theory of Spur gear in detail, Interference in involute tooth gears and methods for its prevention, Path of contact, Contact ratio. Types of Gear trains - Simple, Compound, Reverted, Epicyclic gear train, Numericals on tabular method for finding the speeds of elements in gear train, Torques in gear train.	[7]
Unit 5:Belts and Dynamometers Types of belt drives, Materials used for belts, Velocity ratio of belt drive, Slip and creep of belt, length of belt, Power transmitted by belt, Angle of lap. Classification of dynamometers, Study of rope brake and Prony brake absorption dynamometer.	[6]
Unit 6: Cams and Followers Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, simple harmonic motion, uniform acceleration and retardation, Cycloidal. Determination of cam profile based on given motion of reciprocating knife edge and roller follower with and without offset.	[7]
Text Books: 1. R.S. Khurmi & J.K. Gupta, Theory of Machines, S. Chand Publishing. 2. S.S. Rattan, Theory of Machines, McGraw Hill Education. 3. A.Ghosh & A.K. Mallik, Theory of Mechanisms and Machines, East-West Press. 4. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill, 2009.	
Reference Books: 1. J. E. Shigely, J. J. Uicker, "Theory of Machines and Mechanisms", Tata McGraw Hill Publications, New York, International Student Edition, 1995. 2. Thomas Beven, "Theory of Machines", CBS Publishers and Distributors, Delhi. 3. G.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, "New Age Int. Publications Ltd. New Delhi. 4. Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi.	

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Strength of Materials

23MT3502	PCC	Strength of Materials	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA –I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Engineering Mechanics, Engineering Graphics

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the fundamental concepts of stress, strain, and elastic constants, and Hooke's law.
CO2	Solve equation of axial deformation, strain energy, and composite systems for beams
CO3	Construct shear force and bending moment diagrams.
CO4	Analyze bending and shear stresses in beams of various cross-sections.
CO5	Determine principal stresses and failure theories.
CO6	Solve torsion, pressure vessel, and column buckling problems.

Course Contents:

Unit 1: Review of Stress, Strain and Elastic constants Concept of Stress (Tensile, Compressive, Shear) and Strain, (Linear, Lateral, Shear, and Volumetric), Hooke's Law, Stress-strain diagram, Elastic Constants: Young's Modulus, Bulk Modulus, Modulus of Rigidity, Poisson's Ratio, Poisson's ratio, Relationship between Elastic Constants, Factor of safety, Material properties, Thermal stress and strain	[6]
Unit 2: Axial Load and Elastic Deformation Simple and Composite Bars, Strain Energy, Resilience and proof resilience, Principle of Superposition, Impact loading, Toughness, Fatigue, Matrix Representation of Stress and Strain	[6]
Unit 3: Shear Force and Bending Moment Introduction, Types of Loading, Types of Supports, Types of beams, Loads and Reactions, Sign conventions of shear forces and bending moments, Relationship between shear force and bending moments Rate of loading, Shear force and bending moment diagrams for point loads and uniform distributed loads (UDL) for different types of beams.	[7]
Unit 4: Bending Stresses and Shear Stresses **Section Modulus, Moment of Resistance, (MOR), Bending Stress:** Symmetric pure bending of beams, Bending equation, Flexure formula, moment of resistance of cross-	[6]

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sections, Design of rectangular and circular (solid and hollow) sections, Stress distribution for L, I and T sections **Shear Stresses**: Distribution of shear stresses in beams of various commonly used sections such as circular, rectangular, I, and T.	
Unit 5: Principal Stress-Strain and Theories of Failure Normal and shear stresses on any oblique planes and Derivations, Concept of Principal planes, Positions of principal planes and planes of maximum shear, Analytical Method, Graphical Method (Mohr's Circle Method): Properties, construction and numerical, plane stresses, Theories of failure (Without derivation).	[7]
Unit 6: Torsion of shaft, Pressure Vessels and Theory of Columns **Torsion of Circular Shafts:** Theory of pure torsion, Derivation of torsion equations, Polar section modulus, power transmitted **Pressure Vessels:** Longitudinal and circumferential stresses in thin cylinders, derivations **Buckling of columns:** Buckling of columns for different end conditions	[7]
Text Books: 1. Strength of Materials, S. Ramamruthum, DhanpatRai and Sons, New Delhi. 2. Strength of Materials, R. K. Bansal, Laxmi Publication, 4th Edition. 3. Strength of Materials, Khurmi Gupta, S. Chand Publication. 4. Strength of Materials, R.K. Rajput, S. Chad Publication 5. Mechanics of structure, S.B Junnerkar,Charotar Publication House 6. Strength of Materials, S. S. Bhavikatti, Vikas Publication House 7. Strength of Materials, Timoshenko and Young, CBS Publication 8. Mechanics of Materials, S. S. Ratan, Tata McGraw Hill Publication, 2009 9. Strength of Materials,B. K. Sarkar, McGraw Hill Publication, 2003.	
Reference Books: 1. Strength of Materials, Beer and Johnson, CBS Publication 2. Strength of Materials, G.H. Rider,MacMillan India Ltd 3. Strength of Materials, Nag and Chanda, Willey India Publication 4. Advanced Mechanics of Materials, Boresi, Willey India Publication 5. Strength of Materials, Den Hartong, McGraw Hill Publication	

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CAD/CAM/CAE

23MT3503	PCC	CAD/CAM/CAE	2-0-0	2 Credits

Teaching Scheme	**Evaluation Scheme**
Lecture: 2 hrs/week	CA –I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the role of CAD, CAM, and CAE in engineering and describe FEA fundamentals.
CO2	Apply geometric modeling techniques and CAD transformations for effective product design.
CO3	Analyze CNC programming methods and CAM integration for various manufacturing operations.
CO4	Evaluate the application of FEA and CAE tools for solving engineering problems.
CO5	Design advanced manufacturing setups incorporating AI, VR, AR, and automation strategies.
CO6	Develop intelligent quality control and Industry 4.0 solutions using digital twins, IoT, and smart factory concepts.

Course Contents:

Unit 1: Introduction to CAD, CAM, and CAE Evolution & Role of CAD, CAM, and CAE in the Product Lifecycle, Concepts of Computer-Aided Design (CAD): Benefits & Applications, Introduction to Computer-Aided Manufacturing (CAM): Basics & Importance, Fundamentals of Computer-Aided Engineering (CAE), Introduction to Finite Element Analysis (FEA): Need & Applications, Overview of Manufacturing Systems: Traditional vs. Digital Manufacturing.	[4]
Unit 2: Computer-Aided Design (CAD) & Geometric Modeling. Types of CAD Systems: 2D CAD vs. 3D CAD, Geometric Modeling Techniques: Wireframe, Surface, and Solid Modeling, Solid Modeling Techniques: Constructive Solid Geometry (CSG) & Boundary Representation (B-Rep), 2D & 3D Geometric Transformations: Translation, Rotation, Scaling, CAD Data Exchange & Interoperability: IGES, STEP, DXF, STL, Software Configuration of CAD Systems.	[4]
Unit 3: Computer-Aided Manufacturing (CAM) & CNC Introduction to CAM & Its Integration with CAD, NC vs. CNC Machines: Features, Advantages & Limitations, Elements & Classification of CNC Machines, CNC Motion	[4]

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Control Systems: Open & Closed Loop Systems, CNC Coordinate Systems & Tool Path Control, CNC Machine Tools: Structure, Function & Adaptive Control, CNC Programming Basics: Tool Selection, G-Codes & M-Codes, CNC Lathe & Milling Programming: Linear & Circular Interpolation, Pocketing, Contouring, Drilling Cycles, Computer-Integrated Manufacturing (CIM): Introduction & Role.	
Unit 4: Finite Element Analysis (FEA) & CAE Concept of CAE & Its Application in Engineering Analysis, Fundamentals of Finite Element Analysis (FEA): Types of Elements: 1D, 2D, 3D, Degrees of Freedom, Meshing, Shape Functions, Boundary Conditions & Solution Techniques, Structural Analysis Using FEA: Static & Dynamic Analysis, Thermal Analysis & Heat Transfer Problems, Introduction to Computational Fluid Dynamics (CFD) in CAE.	[4]
Unit 5: Advanced Manufacturing Technologies & Automation Introduction to Flexible Manufacturing Systems (FMS), Transfer Systems & Automated Material Handling in FMS, Integration of Artificial Intelligence & Knowledge-Based Engineering in Manufacturing, Virtual Reality (VR) & Augmented Reality (AR) in Manufacturing.	[4]
Unit 6: Computer-Aided Quality Control (CAQC) & Industry 4.0 Fundamentals of Quality Control & Role of Automation in Quality Inspection, Coordinate Measuring Machines (CMM): Types & Applications, Non-Contact Inspection Methods: Laser Scanning, Optical & Ultrasonic Techniques, Intelligent Manufacturing & Smart Factories in Industry 4.0, Introduction to Digital Twin Technology in CAD/CAM/CAE, Future Trends in Manufacturing: IoT, Cyber-physical Systems & AI in Industry 4.0.	[4]

Text Books:

1. M.P. Groover & E.W. Zimmer – CAD/CAM: Computer-Aided Design and Manufacturing, Prentice Hall, 2014.
2. P.N. Rao – CAD/CAM Principles & Applications, McGraw Hill, 2017.
3. Zied Ibrahim R. Sivasubramanian – CAD/CAM, Tata McGraw Hill, 2009.

Reference Books:

1. K. Lalit Narayan, K. Mallikarjuna Rao, and M. Sarcar – Computer-Aided Design and Manufacturing, PHI Learning, 2008.
2. S.R. Otto and J.P. Denavit – Computational Geometry for Design and Manufacture, Wiley, 1995.
3. T. Radhakrishnan – Computer Graphics and Geometric Modeling for Engineers, Wiley, 2001.
4. David F. Rogers & J. Alan Adams – Mathematical Elements for Computer Graphics, McGraw Hill, 2002.
5. Ibrahim Zeid – Mastering CAD/CAM, McGraw Hill, 2005.

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Operation and Supply Chain Analytics

23MT3503A	PEC	Operation and Supply Chain Analytics	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA –I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Outline the supply chain management
CO2	Make use of forecasting and demand planning
CO3	Examine Network design and optimization
CO4	Explain supply chain analytics techniques
CO5	Develop case studies and real-world applications
CO6	Justify Sustainability and Green Supply Chains

Course Contents:

Unit 1: Introduction to Supply Chain Management Basic Concepts and Evolution: Explore foundational principles and the historical development of supply chain management. Supply Chain Drivers and Metrics: Understand key performance drivers such as cost, quality, and service, and the metrics used to evaluate them. Strategic Fit and Scope: Learn how to align supply chain strategies with overall business goals and the extent of supply chain activities.	[7]
Unit 2: Forecasting and Demand Planning Inventory Models: Strategies including Economic Order Quantity (EOQ), safety stock, and reorder points to manage inventory levels. Multi-Echelon Inventory Optimization: Techniques for optimizing inventory across multiple stages of the supply chain. Case Studies: Practical examples of inventory management in various industries to illustrate best practices.	[7]
Unit 3: Network Design and Optimization	[8]

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Principles of Network Design: Core concepts in designing an efficient supply chain network. Optimization Models and Tools: Utilization of tools like Excel Solver for network optimization. Design Under Uncertainty: Strategies for network design considering uncertainties and the need for flexibility Transportation and Logistics	
Unit 4: Supply Chain Analytics Techniques Predictive Analytics and Modeling: Using data to predict future supply chain events and trends. Machine Learning Techniques: Application of machine learning to enhance supply chain analytics.	[6]
Unit 5:Case Studies and Real-World Applications Successful Implementations: Analysis of real-world cases where supply chain analytics have been successfully implemented. Projects and Hands-On Exercises: Practical exercises using real-world data to apply supply chain analytics concepts. Industry-Specific Applications: Tailored examples from industries like retail, manufacturing, and healthcare to demonstrate diverse applications. Trends and Future Directions	[6]
Unit 6: Sustainability and Green Supply Chains Sustainable Practices: Implementing eco-friendly practices in supply chain operations. Regulatory Compliance: Understanding and adhering to environmental regulations. Circular Economy: Embracing the principles of a circular economy to minimize waste and enhance resource efficiency. Risk Management.	[6]
Text Books: 1. Supply chain analytics: concepts, techniques and applications 2. Supply chain metrics that matter 3. Big data analytics in supply chain management: Theory and application	
Reference Books:	
1. Supply chain network design: Applying optimization and analytics to the global supply chain.	

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Wireless Communication

23MT3504B	PEC	Wireless Communication	3-0-0	3 Credits

Teaching Scheme	**Evaluation Scheme**
Lecture: 3 hrs/week	CA –I :10 Marks CA–II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Concepts of electronics and communication

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate the evolution of cellular concept and wireless communication system
CO2	Outline various mobile radio propagation mechanisms and models
CO3	Identify the concepts of multipath propagation and multipath channels
CO4	Analyze the different multi access techniques for wireless communication
CO5	Categorize the technologies used for wireless networking
CO6	Explain basic and advanced wireless systems & standards

Course Contents:

Unit 1: Introduction to Wireless Communication 2G, 3G,4G wireless networks, WLL, Cellular Concept	[4]

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Unit 2: Mobile Radio Propagation: Large Scale Path Loss Large Scale Path Loss: Introduction to Radio Wave propagation, Free Space propagation model, The three Basic Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Outdoor Propagation Models, Indoor Propagation Models	[7]
Unit 3: Mobile Radio Propagation: Small-Scale Fading and Multipath Small-Scale Fading and Multipath: Small-Scale Multipath Propagation, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of small-Scale Fading	[6]
Unit 4: Multi Access Technique for Wireless Communication Introduction, Frequency Division multiple Access (FDMA), Time Division Multiple Access (TDMA) Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA), Comparison of Multi Access Techniques	[6]
Unit 5: Wireless Networking: Introduction to Wireless Networks Development of Wireless Networks, Routing in Wireless Networks, Common Channel Signaling (CCS), Integrated services Digital networks (ISDN), Signaling System No. 7 (SS7), Universal Mobile Telecommunication System (UMTS).	[6]
Unit 6: Wireless Systems & Standards AMPS and ETACS, United States Digital Cellular (IS-54 ad IS-136), Global System for Mobile (GSM), Personal Access Communication Systems (PACS), Pacific Digital Cellular (PDC), Introduction to 5G network and technologies used in 5G	[7]

Text Books:

1. Wireless Communications Principals & Practice- Theodore S. Rappaport, (P.E.)
2. Wireless & Mobile Network Architecture- Yi-Bing Lin, Imrich Chiamtac (John Wiley)
3. Fundamental of Wireless Communication- David Tse, Pramod Viswanath (Cambridge)

Reference Books:

1. Introduction to Wireless and Mobile Systems -Dharma Prakash Agarwal, Qing An Zeng (Cengage Learning, Inc)
2. Wireless Communications - Andrea Goldsmith (Cambridge University Press)

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Industry Networks

23MT3503C	PEC	Industry Networks	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA –I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain Network Fundamentals
CO2	Identify network access
CO3	List IP connectivity
CO4	Determine IP services
CO5	Interpret security fundamentals
CO6	Explain automation and program ability

Course Contents:

Unit 1: Network Fundamentals Network Hardware: Understanding different types of network devices like routers, switches, and wireless access points. Network Topologies: Learning about different network layouts and their characteristics. Cabling and Interfaces: Understanding different types of cables and their properties, as well as identifying potential issues with interfaces. IP Addressing: Learning about IPv4 and IPv6 addressing, subnetting, and private addressing. TCP/UDP: Understanding the difference between these two transport layer protocols. Wireless Principles: Understanding basic wireless concepts and technologies. Virtualization: Learning about virtualization fundamentals and technologies. Switching Concepts: Understanding basic switching concepts and how switches operate.	[7]
Unit 2: Network Access VLANs: Understanding VLANs and their configuration. Spanning Tree Protocol: Understanding how STP works and its importance in a network. EtherChannel: Learning about EtherChannel and its benefits.	[7]

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Wireless LANs: Understanding different wireless LAN concepts and configurations	
Unit 3: IP Connectivity Static and Dynamic Routing: Understanding and configuring static and dynamic routing protocols. Routing Protocols: Learning about different routing protocols like OSPF and EIGRP. Security: Understanding basic network security concepts and configurations.	[8]
Unit 4: IP Services DHCP: Understanding and configuring DHCP servers. DNS: Understanding DNS and its role in the network. NTP: Understanding and configuring NTP servers. NAT: Understanding and configuring Network Address Translation.	[6]
Unit 5:Security Fundamentals Threats and Vulnerabilities: Understanding common network threats and vulnerabilities. Security Measures: Learning about different security measures and configurations.	[6]
Unit 6: Automation and Programmability Automation Tools: Understanding the role of automation in network management. APIs: Understanding how APIs can be used to automate network tasks.	[6]

Text Books:

1. CCNA 200-301official cert guide library
2. Behrouz A. Forouzan Data Communication and Networking McGraw-Hill Higher Education ISBN-13 978-0-07296775-3
3. Behrouz A. Forouzan: TCP/IP Protocol Suit McGraw Hill Education ISBN-13 978-0073376042
4. A.S. Tanenbaum Computer Networks PRENTICE HALL ISBN-10: 0-13-212695-8 ,ISBN13:978-0-13-212695-3
5. Godbole Achyut Data Communication and Networks McGraw Hill Education ISBN-10 9780071077705,ISBN-13 978-0071077705

Reference Books:

1. CCNA Preparation Library (640-801)
2. CCNA Certification Exam Guide
3. Comer Douglas E. TCP/IP Principles, Protocols and Architectures PEARSON ISBN 10: 0-13-608530-X ISBN 13: 9780-13-608530-0

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Basics of Cloud Computing

23MT3503D	PEC	Basics of Cloud Computing	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA –I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Nil

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain fundamental concepts of cloud computing.
CO2	Illustrate the components of cloud architecture, including cloud types, service models, and standard reference models.
CO3	Apply fundamental concepts of Amazon Web Services (AWS) and Microsoft Azure to configure, deploy, and manage basic cloud infrastructure components.
CO4	Analyze various virtualization techniques, structures, and implementation levels
CO5	Evaluate various cloud security challenges, governance architectures, and IAM standards
CO6	Formulate a comprehensive solution using Google Cloud tools to address a real-world problem

Course Contents:

Unit 1: Introduction to Cloud Computing Introduction to distributed and cluster computing, Definition of Cloud, Evolution of Cloud Computing, Importance of Cloud Computing, Characteristics, Pros and Cons of Cloud Computing, Migrating into the Cloud, Seven-step model of migration into a Cloud, Trends in Computing.	[6]
Unit 2: Cloud Architecture Cloud computing types -Public, Private and Hybrid Clouds, Cloud Reference Model-, Cloud Service Models: SaaS, PaaS, IaaS, Layered Cloud Architecture Design, NIST Cloud Computing.	[6]
Unit 3: Cloud Platforms Amazon Web Services (AWS): Amazon Web Services and Components, Elastic Cloud Computing (EC2), Amazon Storage System-S3 Bucket, AWS Identity and Access Management (IAM). Microsoft Cloud Services: Azure core concepts.	[6]
Unit 4: Virtualization in Cloud Computing-	[6]

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Basics of Virtualization, VPC, Types of Virtualizations, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.	
Unit 5: Cloud Security Basics of Cloud security- Issues and Challenges, Categories of Cloud computing security, Cloud Security Governance, Architecture of security governance, Deployment Framework, Virtual Machine security, IAM security standards.	[6]
Unit 6: Cloud Computing Applications- Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking, Google Cloud Application.	[6]

Text Books:

1. Mastering Cloud Computing, Buyya R, Vecchiola C, Selvi S T, McGraw Hill Education (India), 2013.
2. Cloud Computing Bible, Barrie Sosinsky, Wiley Publishing Inc. 2011(Unit,VI)
3. Buyya R, Broberg J, Goscinski A, "Cloud Computing - Principles and Paradigms", Wiley, 2011.
4. K. Chandrasekaran - "Essentials of Cloud computing", 2015, Taylor & Francis Group, LLC.

Reference Books:

1. J. Hurwitz, R. Bloor, M. Kaufman, and Dr. F. Halper - "Cloud computing for Dummies", 2010, Wiley Publishing, Inc
2. R. L. Krutz, R. D. Vines - "Cloud Security", 2010, Wiley Publishing, Inc. 4. T. Erl, Z.
3. Mahmood, R. Puttini - "Cloud computing: Concepts, Technology & Achitecture", 2013 Arcitura Education Inc.

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Basket 1 (AUTOMATION): Green Building Management and Smart Automation

23MTMDA3	MDM	Green Building Management and Smart Automation	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA –I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

Course Outcomes: At the end of the course students will be able to -

CO1	Explain the principles of green buildings and their role in sustainability.
CO2	Apply green building certification frameworks in sustainable construction
CO3	Examine the role of materials and indoor environment quality in sustainable buildings.
CO4	Analyze energy management strategies and radiant cooling in buildings.
CO5	Evaluate renewable energy integration and smart grid systems.
CO6	Assess the role of smart automation in enhancing building performance and sustainability.

Course Contents:

Unit 1:Introduction to Green Buildings Concept of green buildings and their role in sustainability, Comparison: Traditional vs. Green Buildings, Environmental, Economic, and Social Benefits of Green Buildings, Requisites for Constructing a Green Building, Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions, Green Buildings in India.	[6]
Unit 2: Green Building Certifications and Regulatory Frameworks Importance of green building certification in sustainable construction, Overview of certification systems: Leadership in Energy and Environmental Design (LEED), Steps to achieve LEED Certification, Green Rating for Integrated Habitat Assessment (GRIHA), Bureau of Energy Efficiency (BEE) Star Ratings, Indian Green Building Council (IGBC) Certification, Government policies for green buildings.	[7]
Unit 3: Green Building Materials and Indoor Environment Quality Introduction- Low emitting materials, Building and material reuse, Construction waste management, Life cycle cost assessment of building materials and products, Factors affecting indoor environment quality, Ventilation and filtration, Building materials and	[7]

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finishes- Emittance level, Indoor Environment quality- Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels.	
Unit 4: Energy Management Systems in Green Buildings Role of energy management in sustainable building operations, Principles of Energy Management in Green Buildings, Benefits, Energy consumption in buildings, Passive & Active Design Strategies for energy management in green buildings, Building Energy Management Systems (BEMS), Radiant cooling technology in buildings.	[7]
Unit 5: Renewable Energy Integration in Green Buildings Importance of renewable energy in sustainable construction, role of renewables in reducing carbon footprint, Overview of Net-Zero Energy Buildings (NZEBs) and their significance, Types of Renewable Energy Sources for Green Buildings, Energy Storage Systems for Green Buildings, Smart Grid and Renewable Energy Management.	[6]
Unit 6:Smart Automation in Buildings Introduction to Smart Buildings and Intelligent Infrastructure, Role of AI, ML, and IoT in smart automation, Building Automation Systems (BAS) and Integration - SCADA and PLC-based control systems, Cloud-based automation for remote monitoring, Smart HVAC Control & Occupancy-Based Automation, Real-time occupancy sensors for dynamic energy management, Fire safety and automated emergency response.	[7]

Text Books:

1. Sam Kubba, "Hand book of Green building Design and construction", Elsevier Architecture Press.
2. Kibert, C. "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 2005
3. Abe Kruger and Carl Seville, "Green building: principals and practice in residential construction", Cengage Learning.
4. Mike Montoya, Green Building Fundamentals, Pearson, USA, 2010.

Reference Books:

1. Traci Rose Rider ,W. W. Norton & Company Publisher - Understanding Green Building Guidelines: For Students and Young Professionals,.
2. S N Saud Al-Humairi & Asif Hajamydeen- Sustainable Smart Cities and the Future of Urban Development, IGI Global Publishing house, ISBN13: 9798369367407.
3. K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao - Alternative Building Materials and Technologies – New Age International Publishers
4. Charles J. Kibert, Sustainable Construction - Green Building Design and Delivery, John Wiley & Sons, New York, 2008.

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Basket 2 (DESIGN AND MANUFACTURING): 3D Printing Technology

23MTMDB3	MDM	3D Printing Technology	3-0-0	3 credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA–I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Engineering Physics, Engineering Chemistry, Basics of mechanical engineering.

Course Outcomes:

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

CO1	Explain the fundamentals of 3D printing technology and its role in modern manufacturing.
CO2	Identify different liquid-based and solid-based 3D printing technologies
CO3	Explain the powder-based 3D printing techniques and assess their industrial significance.
CO4	Compare various 3D printing materials.
CO5	Discover the use of reverse engineering methodologies for product development using 3D printing.
CO6	Evaluate the applications of 3D printing in various industries such as aerospace, healthcare, and automotive.

Unit 1: Fundamentals of 3D Printing & Additive Manufacturing: Introduction to Additive Manufacturing (AM): Evolution, comparison with traditional manufacturing. 3D Printing Workflow: CAD modeling, STL file generation, slicing, printing, post-processing. Advantages and Limitations of 3D Printing. On demand manufacturing – Direct material deposition – Shape Deposition Manufacturing.	[7]
Unit 2: Liquid-Based and Solid-Based 3D Printing Technologies: Liquid-Based Systems: Stereolithography (SLA): Process, materials, advantages, limitations, and applications. Solid-Based Systems: Fused Deposition Modeling (FDM): Working principle, materials, advantages, and uses. Laminated Object Manufacturing (LOM): Process details, advantages, and industrial applications.	[7]

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Unit 3: Powder-Based 3D Printing Technologies. Selective Laser Sintering (SLS): Process principles, materials, bonding techniques Industrial applications and research developments, Three-Dimensional Printing (3DP): Printing process, materials, and case studies Laser Engineered Net Shaping (LENS): Process principles, materials Customized plastic and metal part production	[8]
Unit 4:3D Printing Materials Polymers: PLA, ABS, Nylon– Properties and Applications. Metals: Titanium, Aluminum, Stainless Steel, Inconel – Mechanical properties, industries using metal 3D printing. Ceramics & Composite Materials. Biomaterials for Medical Applications. Recycling and Sustainability in 3D Printing.	[8]
Unit 5: Reverse Engineering in 3D Printing 3D Scanning and Digitization Techniques. Data Processing for 3D Printing: Model reconstruction and modification. Selection of RE Systems, Software, and Hardware. Applications in Product Development and Manufacturing	[6]
Unit 6: Applications & Industry Case Studies Aerospace: Lightweight structures, fuel-efficient parts Automotive: Rapid prototyping, spare parts, on-demand manufacturing Healthcare & Bio-Printing: Prosthetics, implants, tissue engineering Construction & Consumer Goods: 3D printed houses, electronics, footwear, and jewelry.	[6]

Textbook/s

1. Ian Gibson, David Rosen, Brent Stucker – Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Springer, 2nd Edition, 2015.
2. Chua Chee Kai, Leong Kah Fai, Lim Chu Sing – Rapid Prototyping: Principles and Applications, World Scientific, 4th Edition, 2019.
3. Andreas Gebhardt, Jan-Steffen Hötter – Additive Manufacturing: 3D Printing for Prototyping and Manufacturing, Hanser Publications, 2016.

Reference Books

1. Ali K. Kamrani, Emad Abouel Nasr – Engineering Design and Rapid Prototyping, Springer, 2010.
2. L. Lu, J.Y.H. Fuh, Y.-S. Wong – Laser-Induced Materials and Processes for Rapid Prototyping, Springer, 2001.
3. Joachim Behrendt, David L. Bourell, Richard Crawford – 3D Printing of Metals: Current Developments and Research Opportunities, Springer, 2018.
4. Matthew Di Prima et al. – Additive Manufacturing for Medical Applications, ASTM International, 2020.
5. Richard Hague – Direct Writing and Additive Manufacturing: From Prototyping to Production, Wiley, 2021.
6. L. Jyothish Kumar, Pulak M. Pandey, David Ian Wimpenny – 3D Printing and Additive Manufacturing Technologies, Springer, 2019.

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Basket 3 (SOFTWARE): Database Management System

23MTMDC3	MDM	Database Management System	3-0-0	3 Credits

Teaching Scheme	**Evaluation Scheme**
Lecture: 3 hrs/week	CA–I :10 Marks CA –II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Data Structures

Course Outcomes: At the end of the course, students will be able to:

CO1	Outline the concepts of database system
CO2	Illustrate the fundamental concepts of the Relational Data Model and normalization
CO3	Apply fundamental SQL commands using appropriate data types.
CO4	Apply various SQL operators, functions, clauses, joins, and nested queries to retrieve, manipulate, and analyze data from relational databases.
CO5	Analyze the role and implementation of database objects
CO6	Examine transaction processing mechanisms

Course Contents:

Unit 1: Introduction to Database system Data, Database, Database management system, File system Vs DBMS, Applications of DBMS, Levels of Data Abstraction, Overall structure of DBMS Architecture: - Two tier and Three tier architecture of database. Data Models: - Hierarchical, Networking, Relational Data Models, object-oriented model	[5]
Unit 2: Relational Data Model Fundamentals of RDBMS: records, fields, data types, Tables, Tuples, Domains, Attributes, Key concept, :- Candidate Key, Super Keys, , Primary Key, Foreign Key, Normalization: 1NF, 2NF, 3NF E-R model : - ER diagram Notations, ER Diagrams, Strong Entity set, Weak Entity set, Types of Attributes, extended features of E-R model.	[6]

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Unit 3: Introduction to SQL Introduction to SQL: -Data types, Components of SQL: Data Definition Language (DDL), Data Manipulation language (DML), Data Control Language (DCL), DQL and their associated commands . Integrity constraints: I/O constraints, Business rule constraints	[7]
Unit 4: SQL operators and functions Operators:- Relational, Arithmetic, Logical, Set operators Functions:- in built functions, Numeric , Date and time, String functions, Aggregate Functions. Clauses:- Where, Group by ,Order by, Having. Joins: Types of Joins, Nested queries.	[6]
Unit 5:Interactive SQL Views : Concept ,Create ,Update, Drop Views, , views and joins ,views and subqueries Sequences :- Concept ,Create, Alter , Drop, Use of Sequence in table, Index: Concept ,Types of Index , Create ,Drop Indexes Synonyms: Create, drop	[6]
Unit 6: Transaction management and Concurrency control Transaction concept, A simple transaction model, ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping model, Recovery systems-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, checkpoint, Shadow paging.	[6]

Text Books:

1. A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", fifth Edition McGraw-Hill
2. Rob, Coronel, "Database Systems", Seventh Edition, Cengage Learning.

Reference Books:

1. Ramez Elmasri, Shamkant Navathe,"Fundamentals of Database Systems", Seventh Edition, Pearson Publication
2. Abraham Silberschatz , Henry Korth , S. Sudarshan, "ISE Database System Concepts", Seventh Edition, McGraw-Hill Education

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Theory of Machines and Mechanisms Laboratory

23MT3505	PCC	Theory of Machines and Mechanisms laboratory	0-0-2	1 Credits

Teaching Scheme	Evaluation Scheme
Practical: 2 hours/week/batch	CA –I :25 Marks CA –II :25 Marks

Pre-Requisites: Applied Physics

Course Outcomes: At the end of the course students will be able to -

CO1	Explain the fundamental concepts of mechanisms.
CO2	Apply graphical methods such as relative velocity analysis and Klein's construction to determine velocity and acceleration in planar mechanisms.
CO3	Construct Cam profile for specific motion.
CO4	Examine effect of slip on power transmission of belt.
CO5	Determine the torque transmitted in gear train.

List of Experiments:

1. Demonstration of simple linkage models/mechanisms.
2. Study of Various Types of Steering Gear Mechanisms.
3. Graphical solutions to problems on velocity and acceleration in given mechanism by relative velocity method. (Use drawing sheet)
4. Klien's construction method for velocity and acceleration analysis of slider crank mechanism. (Use drawing sheet)
5. Construct cam profile for various types of follower motion. (Use drawing sheet)
6. Experiment on measurement of Slip of belt.
7. Evaluate torque transmitted in Gear train.

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Text Books:

5. R.S. Khurmi & J.K. Gupta, Theory of Machines, S. Chand Publishing.
6. S.S. Rattan, *Theory of Machines,* McGraw Hill, New Delhi..
7. P.L.Ballany, Thery of Machines & Mechanism, Khanna Publication, New Delhi.
8. A.Ghosh & A.K. Mallik, Theory of Mechanisms and Machines, East-West Press.
9. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGrawHill, 2009.

Reference Books:

4. J. E. Shigely, J. J. Uicker, "Theory of Machines and Mechanisms", Tata McGraw Hill Publications, New York, International Student Edition, 1995.
5. Thomas Beven, "Theory of Machines", CBS Publishers and Distributors, Delhi.
6. G.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, "New Age Int. Publications Ltd. New Delhi.
7. Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi.

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Industrial Measurement Laboratory

23MT3506	PCC	Industrial Measurement Laboratory	0-0-2	1 Credits

Teaching Scheme	Evaluation Scheme
Practical: 2 hours/week/batch	CA –I :25 Marks CA –II :25 Marks

Pre-Requisites: Engineering Mechanics, Engineering Mathematics, Engineering Physics

Course Outcomes: At the end of the course students will be able to -

CO1	Evaluate mechanical properties (tensile strength, torsional resistance, impact toughness, and thermal stress) of materials
CO2	Analyze the stress-strain behavior under various loading conditions (axial, thermal, and impact) using both experimental methods and computational tools.
CO3	Justify the knowledge associated with various linear and angle measuring instruments.
CO4	Illustrate the methods used for the measurement of screw threads, gear parameters and flatness of given component

List of Experiments:

Following experiments should be performed from list.

Group A: (4 Experiments should be done from list)

1.To perform a tensile test on ductile and brittle materials.

2.To perform a torsion test on mild steel circular sections.

3.To measure thermal stress in materials.

4.To perform an impact test for evaluating material toughness.

5.To analyze stress and strain under different loading conditions using ANSYS/MATLAB.

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Group B: (4 Experiments should be done from list)

1. Study and use of Linear Measuring Instruments
2. Study and use of various Comparators
3. Study and use of Angle Measuring Instruments
4. Understand Screw Thread Measurement
5. Study and Measurement of Thread parameters using Profile Projector.
6. Study of Spur Gear Measurement

Text Books:

1. Strength of Materials, S. Ramamruthum, DhanpatRai and Sons, New Delhi.
2. Strength of Materials, R. K. Bansal, Laxmi Publication, 4th Edition.
3. Strength of Materials, Khurmi Gupta, S. Chand Publication.
4. Strength of Materials, R.K. Rajput, S. Chad Publication
5. R.K. Jain, "Engineering Metrology", Khanna Publisher,
6. I.C. Gupta, "Engineering Metrology", Dhanpat Rai Publications.
7. N Sidheshwar,P Kannaiah,"Machine Drawing",TATA Magraw hill,2009.
8. Anand Bewoor, Vinay Kulkarni, "Metrology & Measurement" The McGraw-Hill Comp.

Reference Books:

1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.
2. D.S. Bedi, Strength of Materials, Khanna Book Publishing Company, 2018.
3. R. Subramanian, Strength of Materials, Oxford University Press, 2007.
4. Beckwith T.G, and N. Lewis Buck, Mechanical Measurements, Addison Wesley, 1991,5th edition
5. N.V Raghavendra and L. Krishnamurthy, Engineering Metrology and Measurements, Oxford University Press, 2014.
6. Serope Kalpakjian and Steven R. Schmid, Manufacturing, Engineering & Technology, Pearson, Sixth Edition

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Python Programming Laboratory

23MT3507	PCC	Python Programming Laboratory	0-0-2	1 Credit

Teaching Scheme	Evaluation Scheme
Practical: 2 hours/week/batch	CA –I :15 Marks CA –II :15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Computer Organization

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

CO1	Explain and apply essentials and fundamentals of Python Programming
CO2	Make use of Decision making and Looping statements
CO3	Analyze the concepts of functions, modules.
CO4	Build code using standard library functions/packages

List of Experiments:

At least minimum 8 experiments should be performed from the following list

1. a) Write python program display welcome message on screen.
   b) Implement the python program to read data from user and display data on screen.
2. Implement a python programs using following operators:
   i) Arithmetic ii) Relational & logical iii)Assignment iv)Bitwise v) Membership vi) Identity
3. Implement a python program to demonstrate the use of following conditional statements:
   i) if statement ii) if..else statement iii) if..elif..else statement iv) nested if statement
4. Implement a python program to demonstrate the use of following looping statements:
   i) while loop ii) for loop iii) nested loop
5. a)Implement a python program to perform following operations on the List:
   i) Create a List ii) Access List iii)Update List iv)Delete List

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b) Implement python program to perform following operations on the Tuple:

i) Create a Tuple ii) Access Tuple iii) Print Tuple iv) Delete Tuple v) Convert tuple into list and vice-versa

6. a) Implement a python program to perform following operations on the Set: i) Create a Set ii)Access Set iii) Update Set iv) Delete Set

b) Implement a python program to perform following operations on the Dictionary:

i) Create a Dictionary ii)Access Dictionary iii) Update Dictionary iv) Delete Dictionary v) Create Dictionary from list

7. Write a user define function to implement following features: i) function without argument ii) Function with argument iii) Function returning value
8. Write a python program to demonstrate the use of following module: i) math module ii) random module iii) os module
9. Write a python program to implement i) Single inheritance ii) Multiple Inheritance iii) Multilevel inheritance
10. Write python GUI program to import Tkinter package and create a window and set its title

Text Books:

1.Exploring Python, Timothy Budd, Mc Graw Hill Publication, ISBN:9780073523378, August 2010

2. Beginning Python, Peter C. Norton, Alex Samuel, Dave Aitel, Eric Foster-Johnson, Leonard Richardson, Jason Diamond, Aleatha Parker, Michael Roberts, ISBN: 978- 0-7645-9654-4, August 2005.

Reference Books:

1. Python: Create - Modify - Reuse, James O. Knowlton, Wrox Publication, ISBN: 978-0-470-25932-0, July 2008.

2. Professional Python Frameworks: Web 2.0 Programming, Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

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CAD/CAM/CAE Laboratory

23MT3508	VSEC	CAD/CAM/CAE Lab	0-0-2	1 credit

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week/Batch	CA –I :15 Marks CA –II :15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Engineering Graphics, Engineering Mathematics.

Course Outcomes:

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

CO1	Develop 3D models and assemblies using CAD software.
CO2	Make use of CNC turning and milling programs for automated machining.
CO3	Analyze mechanical components using CAE tools for structural and shape optimization.
CO4	Determine the application of industrial robots and automation in manufacturing.

List of Experiments

1. Creating mechanical components using any 3D modeling software.
2. Developing engineering product assemblies and sub-assemblies.
3. CNC Turning Operations – Writing and simulating at least two programs.
4. CNC Milling Operations – Writing and simulating at least two programs.
5. Shape Optimization – Using CAE software to optimize mechanical components.
6. Structural Analysis – Solving at least two structural analysis problems in CAE software.
7. Industrial Robot Case Study – Exploring applications in automated manufacturing.

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Textbooks:

1. "CAD/CAM: Principles and Applications" – P. N. Rao, McGraw Hill, 2017.
2. "CNC Programming Handbook" – Peter Smid, Industrial Press, 2008.
3. "Finite Element Analysis: Theory and Applications with ANSYS" – Saeed Moaveni, Pearson, 2011.
4. "Automation, Production Systems, and Computer-Integrated Manufacturing" – Mikell P. Groover, Pearson, 2015.

Reference Books:

1. "Computer-Aided Manufacturing" – T. K. Kundra, P. N. Rao, and N. K. Tewari, Tata McGraw Hill, 2013.
2. "Mastering CAD/CAM" – Ibrahim Zeid, McGraw Hill, 2009.
3. "Introduction to Robotics: Mechanics and Control" – John J. Craig, Pearson, 2021.
4. "Rapid Prototyping: Principles and Applications" – Chua Chee Kai, Leong Kah Fai, World Scientific, 2010.

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Aptitude Skills III

23HSSM05	VEC	Aptitude Skills- III	1-0-0	Audit

Teaching Scheme	Evaluation Scheme
Lecture: 1hr/Week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Aptitude Skills-I and II

Course Outcomes: At the end of the course, students will be able to:

CO1	Solve the questions on ordering of words & Parts of Speech
CO2	Organize contents of Business Communications such as CV, emails and letters.
CO3	Solve the questions based on jumbled paragraphs and reading comprehension.
CO4	Solve the questions on spotting error and sentence correction.
CO5	Summarize proceedings of any event or conference.
CO6	Discuss about current and critical issues during group discussion.

Course Contents:

Unit 1	Parts of Speech, Punctuation Word Family (Using the same word as different Parts of Speech)	[2] [2]
Unit 2	Analogy, Letter Writing (Formal), E-Mail Writing, CV Writing	[2]
Unit 3	Reading Comprehension, Paragraph Jumbles	[2]
Unit 4	Spotting Errors (in different parts of sentence), Subject-Verb Agreement Sentence Correction, Sentence Completion	[2]
Unit 5	One Word Substitution, Narrating Events/Reports, Summary/Precis Writing	[2]
Unit 6	Dialogue writing Group Discussion, Interview Skills (Using formal notations & gestures etc.)	[2]

Text Books:

1. Raymond Murphy, Essential English Grammar with Answers, Murphy
2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15 March 2017)

Reference Books:

1. Rao and ,D,V,Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition

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Language Skill- III

23HSSM06	VEC	Language Skill- III	0-0-2	Audit

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	CA-I: 25 Marks CA_II: 25 Marks

Pre-Requisites: Language Skill I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop a program to read input and return output.
CO2	Develop a program using data types, Strings and variables
CO3	Develop a program using Unary, Binary and Ternary operator
CO4	Develop a program using Conditional and Logical statements.

1. **Write a Python program to print "Hello, World!"** o Objective: Understand basic syntax, indentation, and output.	[2]
2. **Write a program to demonstrate the use of different types of comments in Python.** o Objective: Single-line and multi-line comments.	[2]
3. **Write a Python program that declares different types of variables and displays their data types using the type() function.** o Objective: Variables, data types, and type identification.	[2]
4. **Write a program to demonstrate type casting and type conversion between int, float, and string.** o Objective: Type conversion, casting functions.	[2]
5. **Write a Python script to perform string operations such as slicing, concatenation, upper(), lower(), and len().** o Objective: String manipulation and built-in functions.	[2]
6. **Write a program to demonstrate the use of all arithmetic, logical, and bitwise operators.** o Objective: Operator functionality.	[2]
7. **Write a Python program to use membership and identity operators with examples.** o Objective: in, not in, is, is not.	[2]
8. **Write a Python program using a ternary operator to find the larger of two numbers.** o Objective: Conditional (inline) expressions.	[2]

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9. **Write a program that takes user input for age and prints whether the person is a child, teenager, adult, or senior citizen using if-elif-else.** o Objective: Conditional statements and user input.	[2]
10. **Write a program to find the sum of the first 10 natural numbers using a while loop.** o Objective: Looping with while.	[2]
11. **Write a Python script to display the multiplication table of a number using a for loop.** o Objective: Looping with for and range().	[2]
12. **Write a program that uses break, continue, and pass statements in appropriate looping scenarios.** o Objective: Loop control statements.	[2]
Text Books: 1. Python Projects (Author: Laura Cassell, Alan Gauld) Wrox publication 2. murach's Python Programming. Aut.:Michael Urban, Joel Murach, murach's Publication.	
Reference Books: 1. Fundamentals of Python (First Program) Cengage MINDTAP Publication 2nd Edition. Author: K.A. Kambert	

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Mini Project -IV

23MT3509	CEP	Mini Project IV	0-0-2	1 Credit

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	CA –I :25 Marks CA –II :25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the method/tools used to develop the solution.
CO4	Demonstrate tangible solutions to the problem
CO5	Describe the solution with the help of a project report and presentation.

The project is a part of addressing societal and industrial needs. Mini project is one of the platforms that students will use to solve real-world challenges. This course focuses on the selection of methods/engineering tools/analytical techniques for problem-solving. Through this course, students gain a thorough understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills, and responsibility.

Guidelines

1. Every student shall undertake the Mini project activity for semester V.
2. The same group of minimum three and maximum of five students who were working for mini project II should work together in Mini project IV
3. The students have to work on different approaches and finalize the best methodology to solve the problem in consultation with the project guide.
4. The students should use different tools /Techniques for the development of the solution to the problem.
5. While developing solutions, the student can take care of effective use of resources, follow ethical practices, finance management,
6. The solution should be optimal, affordable, user-friendly and environment friendly.
7. Critically analysis and testing of the solution provided.

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8. By using IPR, students should reserve their rights of innovations as well as communicate new findings to society with the help of research papers.

The committee of senior faculty members and a project guide will be appointed to monitor the progress and continuous evaluation of each project. The assessment shall be done jointly by the guide and committee members.

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Industrial Training / Field Training

23MT3510	VSEC	Industrial Training / Field Training	0-0-0	Audit

Teaching Scheme	**Evaluation Scheme**
Practical:	End Semester Exam :50 Marks

Course Description: -
Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the fourth semester, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HoD/TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. The report will be evaluated during the fifth semester by the department.
Course Learning Outcomes: -
After successful completion of the course, students will be able to
1. Verify the Technical knowledge in real industrial situations.
2. Develop interpersonal communication skills.
3. Discuss activities and functions of the industry in which the Internship/training has done.
4. Write the technical report.
Prerequisite: - Basics of Mechatronics Engineering, Good written and Oral Communication.
Guideline for Students: -
1. Arrive at work as per schedule, ready to work and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed at workplace.
3. Communicate any concerns with your supervisor and the internship/Training coordinator in a timely manner and respectfully.
4. Demonstrate enthusiasm and interest in what you are doing, ask questions and take the initiative as appropriate.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.
Student's Diary/ Daily Log
The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations,

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impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.
The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor.
Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately after the completion of the training. It will be evaluated on the basis of the following criteria:
• Regularity in maintenance of the diary.
• Adequacy & quality of information recorded.
• Drawings, sketches and data recorded.
• Thought process and recording techniques used.
• Organization of the information.
Internship Report
After completing the internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report. The Internship report should be evaluated on the basis of following criteria:
i. Originality.
ii. Adequacy and purposeful write-up.
iii. Organization, format, drawings, sketches, style, language etc.
iv. Variety and relevance of learning experience.
v. Practical applications, relationships with basic theory and concepts taught in the course.
Evaluation of Internship/Training
The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria: •Quality of content presented. •Proper planning for presentation.
• Effectiveness of presentation.
• Depth of knowledge and skills.
• Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

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