24ME516	DESIGN OF TRANSMISSION SYSTEM	PCC	L T P C 3 0 0 3

Prerequisite:	24ME305, 24ME411

COURSE OBJECTIVES:

✓	Describe the fundamentals of power transmission systems.
✓	Apply design principles to determine parameters of belt, rope, and chain drives for efficient power transmission.
✓	Apply gear design concepts to develop spur, helical, bevel, and worm gears considering strength and wear.
✓	Apply design procedures to analyze and design shafts, keys, and couplings under combined loading conditions.
✓	Apply selection and design principles to choose appropriate bearings and lubrication systems for engineering applications.
✓	Analyze advanced transmission systems and emerging technologies to evaluate their performance and applications.

UNIT - 1	**INTRODUCTION TO POWER TRANSMISSION**	8

Applications: *Automotive transmission systems – Industrial machinery – Conveyors – Machine tools – Agricultural equipment*

Types of transmission systems – Selection of transmission systems – Kinematics of machines – Power transmission fundamentals – Materials for transmission components – Design considerations and standards – Failure theories in transmission components.

UNIT - 2	**BELT, ROPE AND CHAIN DRIVES**	8

Applications: *Elevators – Hoisting equipment – Conveyor systems – Crushers – Textile machinery*

Flat belts and V-belts – Velocity ratio – Slip and creep – Belt tensions – Power transmission capacity – Design of belt drives – Rope drives – Chain drives – Sprocket design – Lubrication and maintenance.

UNIT - 3	**GEAR DRIVES**	8

Applications: *Automobile gearboxes – Industrial speed reducers – Wind turbines – Robotics – Marine drives*

Types of gears – Spur gear geometry – Gear tooth forces – Bending and wear failure – Gear design using Lewis equation – Helical gears – Bevel gears – Worm gears – Gear materials and heat treatment.

UNIT - 4	**SHAFTS, KEYS AND COUPLINGS**	8

Applications: *Turbine shafts – Pump shafts – Motor drives – Machine spindles – Heavy duty transmission systems*

Design of transmission shafts – Torsion and bending – Combined loading – Shaft design based on strength and rigidity – Keys and splines – Rigid and flexible couplings – Design of flange coupling.

UNIT - 5	BEARINGS AND LUBRICATION	8

Applications: *Automotive wheel hubs – Industrial gearboxes – Electric motors – Turbines – High-speed machinery*

Sliding contact bearings – Hydrodynamic lubrication – Rolling contact bearings – Bearing life estimation – Selection of bearings – Lubricants and lubrication methods – Failure of bearings.

UNIT - 6	ADVANCED TRANSMISSION SYSTEMS AND CURRENT TRENDS	5

Applications: *Electric vehicle drivetrains – Automated manufacturing – Aerospace transmission – Wind energy systems – Smart and lightweight transmission*

Planetary gear systems – CVT (Continuously Variable Transmission) – Gearbox layout design – Transmission efficiency – Vibration and noise control – Condition monitoring – Lightweight materials and additive manufacturing in transmission components.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

1.	Summarize the fundamentals and selection criteria of power transmission systems used in engineering applications.
2.	Use design principles to calculate parameters of belt, rope, and chain drives for effective power transmission.
3.	Use gear design concepts to develop spur, helical, bevel, and worm gears considering strength and wear factors.
4.	Use design procedures to determine the dimensions of shafts, keys, and couplings under combined loading conditions.
5.	Use selection and design principles to determine suitable bearings and lubrication systems for engineering applications.
6.	Examine advanced transmission systems and emerging technologies to assess their performance and applications.

TEXT BOOKS:

1.	Budynas R.G. & Nisbett J.K., *Shigley's Mechanical Engineering Design*, 12th Ed., McGraw Hill, 2026.
2.	Khurmi R.S. & Gupta J.K., *Machine Design*, S. Chand, 2022.
3.	Bhandari V., *Design of Machine Elements*, 5th Ed., McGraw Hill, 2020.

REFERENCES:

1.	Juvinall R.C., Marshek K.M., *Fundamentals of Machine Component Design*, 7th Ed., Wiley, 2024.
2.	Budynas R.G. & Nisbett J.K., *Shigley's Mechanical Engineering Design*, 12th Edition, McGraw Hill, 2024.
3.	Orthwein W., *Machine Component Design*, Jaico Publishing House, 2013.

OTHER SOURCES:	
1.	https://ocw.mit.edu/courses/mechanical-engineering/-Machine Design
2.	https://www.edx.org/learn/mechanical-engineering-Mechanical Design & Manufacturing
3.	https://www.agma.org/-AGMA (American Gear Manufacturers Association), Authoritative source for gear design standards.

CO – PO MAPPING

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	2	1	1
2	3	3	2	1	-	-	-	-	-	-	-	3	2	2
3	3	3	3	1	-	-	-	-	-	-	-	3	2	2
4	3	3	2	1	-	-	-	-	-	-	-	3	2	2
5	3	2	2	1	-	-	-	-	-	-	-	2	2	2
6	2	2	2	2	-	-	-	-	-	-	1	2	2	3
Low (1) Medium (2) High (3)														

Assessment Weightage:

Formative Assessment		Summative Assessment
CIA	Experiential Learning	End semester examination
20%	20%	60%

CIA- Continuous Internal Assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	20%	10%	20%	10%	15%	15%
U	40%	30%	30%	30%	25%	30%
Ap	40%	60%	50%	60%	60%	45%
An	-	-	-	-	-	10%
E						
C						

Suggested experiential learning assessment activities

Vertical I (5 marks)	Vertical II (5 marks)	Vertical III (10 marks)
Assignments	Real time problem solving tasks	Case studies
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
XX	Date:	XX	Date:

24ME517	DESIGN FOR MANUFACTURING AND ASSEMBLY	PCC	L T P C 3 0 0 3

Prerequisite:	Engineering Graphics, Strength of Materials, Manufacturing Processes

COURSE OBJECTIVES:

✓	Explain the principles of design for manufacturability**.**
✓	Apply material selection and design principles to develop components considering manufacturing processes such as welding, casting, and forging.
✓	Apply design guidelines to develop components that facilitate machining, assembly, and manufacturing efficiency.
✓	Apply casting design principles to modify components for manufacturability, cost reduction, and process optimization.
✓	Analyze environmental factors and lifecycle assessment methods to evaluate sustainable product design solutions.
✓	Analyze modern manufacturing trends and data-driven approaches to improve design, production efficiency, and sustainability.

UNIT - 1	**INTRODUCTION**	7

Applications: *Applications: Automobile Engine Assembly – Motorcycle Gearbox – Hydraulic Valve Block – Smartphone Chassis – Robotic Arm Joint.*

General design principles for manufacturability – Strength and mechanical factors – Mechanism selection – Process capability – Feature tolerances – Geometric tolerances – Assembly limits – Datum features – Tolerance stack-up.

UNIT - 2	**FACTORS INFLUENCING FORM DESIGN**	8

Applications: *Automobile Chassis – Pressure Cooker Body – Crankshaft – Pump Casing – Aircraft Seat Structure.*

Material selection – Influence of materials on form design – Design of welded members – Design of forgings and castings – Working principles and manufacturing considerations.

UNIT - 3	**COMPONENT DESIGN – MACHINING CONSIDERATION**	10

Applications: *Steering Knuckle – Machine Tool Spindle – Electric Motor Shaft – Fuel Injector Body – Robotic Gripper.*

Design features facilitating machining – Drilling and milling considerations – Keyways – Dowelling procedures – Reduction of machined areas – Design for economy – Design for clampability – Design for manual and automated assembly – Robotic assembly.

UNIT - 4	**COMPONENT DESIGN – CASTING CONSIDERATION**	8

Applications: *Differential Housing – Pump Impeller – Cylinder Head – Gearbox Casing – Brake Caliper.*

Parting line considerations – Minimizing core requirements – Redesign of cast members – Identification of uneconomical design – Group technology – Computer applications in DFMA.

UNIT - 5	**DESIGN FOR THE ENVIRONMENT**	7

Applications: *Electric Vehicle Battery Pack – Refrigerator – Plastic Bottle – LED Housing – Washing Machine*

Environmental objectives – Global and regional issues – Lifecycle assessment – Weighted sum assessment – Techniques to reduce environmental impact – Sustainable product design guidelines.

UNIT - 6	BUSINESS STATISTICS AND CURRENT TRENDS	5
Applications: *Cost optimization in product design – Production forecasting – Assembly time reduction analysis – Risk assessment in manufacturing – Data-driven decision making – Smart and sustainable manufacturing systems.* Digital Manufacturing and Industry 4.0 – IoT-enabled production systems – AI-based process optimization – Design for Sustainability – Circular economy concepts – Lean manufacturing integration – Modular product design – Smart assembly systems – Additive manufacturing integration in DFMA – Green manufacturing and resilient supply chains.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:	
At the end of the course the students would be able to	
1.	Explain the key principles and considerations of design for manufacturability in product development.
2.	Apply material selection and design principles to develop components considering welding, casting, and forging processes.
3.	Apply design guidelines to develop components that improve machining, assembly, and manufacturing efficiency.
4.	Apply casting design principles to modify components for enhanced manufacturability and cost effectiveness.
5.	Analyze environmental factors and lifecycle assessment methods to evaluate sustainable product design solutions.
6.	Analyze modern manufacturing trends and data-driven approaches to enhance design and production efficiency.

TEXT BOOKS:	
1.	Ulrich K.T., Eppinger S.D., *Product Design and Development*, 7th Edition, McGraw-Hill, 2020.
2.	Anderson D.M., *Design for Manufacturability*, 2nd Edition, Productivity Press, 2020.
3.	Boothroyd G., Dewhurst P., Knight W., *Product Design for Manufacture and Assembly*, 3rd Edition, CRC Press, 2011.

REFERENCES:	
1.	El Wakil S.D., *Processes and Design for Manufacturing*, 4th Edition, CRC Press, 2026.
2.	Handbook of Manufacturing Systems and Design: An Industry 4.0 Perspective, CRC Press, 2024.
3.	Favi C. et al., *Design for Manufacturing and Assembly*, Springer, 2021.

OTHER SOURCES:	
1.	Manufacturing Systems, Product Design &Development Courses https://ocw.mit.edu
2.	Courses on Product Design, Lean Manufacturing & Industry 4.0 https://www.coursera.org
3.	Manufacturing, Sustainable Design & Digital Manufacturing

	https://www.edx.org

CO – PO MAPPING

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	-	1	-	-	-	-	-	-	1	2	2
2	2	2	2	-	1	-	-	-	-	-	-	1	2	2
3	3	2	2	-	1	-	-	-	-	-	-	1	3	2
4	2	2	2	-	1	-	-	-	-	-	-	1	2	3
5	2	2	2	-	1	-	-	-	-	-	-	1	1	2
6	2	2	2	-	1	-	-	-	-	-	1	1	2	2
Low (1) Medium (2) High (3)														

Assessment Weightage:

Formative Assessment		Summative Assessment
CIA	Experiential Learning	End semester examination
20%	20%	60%

CIA - Continuous Internal Assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	25%	20%	15%	5%	15%	10%
U	35%	30%	25%	35%	50%	40%
Ap	40%	50%	60%	60%	35%	50%
An						
E						
C						

Suggested experiential learning assessment activities

Vertical I (5 marks)	Vertical II (5 marks)	Vertical III (10 marks)
Assignments	Field Visits	Paper Presentations
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
XX	Date:	XX	Date:

24ME518	HEAT AND MASS TRANSFER	PCC	L T P C 3 1 0 4
Prerequisite:	**24ME304, 24ME413**		

COURSE OBJECTIVES:

✓	To understand the fundamental principles of steady-state and transient heat conduction.
✓	To apply concepts of forced and free convection to practical heat transfer problems.
✓	To analyze phase change heat transfer phenomena and evaluate heat exchanger performance.
✓	To apply radiation heat transfer laws and network methods in engineering systems.
✓	To understand and apply principles of diffusion and convective mass transfer.
✓	To gain awareness of enhanced heat transfer techniques and recent trends in heat transfer.

UNIT - 1	CONDUCTION	12

Applications: *Thermal Insulation, Electronic Cooling, Manufacturing and Material Processing, Automotive and Aerospace Applications*

General Differential equation – Cartesian, Cylindrical and Spherical Coordinates – One Dimensional Steady State Heat Conduction – plane and Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces, Unsteady Heat Conduction – Lumped Analysis – Semi Infinite and Infinite Solids – Use of Heisler‘s charts.

UNIT - 2	CONVECTION	12

Applications: *Cooling of Electronic Equipment, power plants, refrigeration, HVAC, and chemical process industries. Convective cooling of engines, brakes, and exhaust systems*

.

Boundary Layer Concept – Forced Convection: External Flow – Flow over Plates, Cylinders Spheres and Bank of tubes. Internal Flow – Entrance effects. Free Convection – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres. Combined free and forced Convection, **thermal management systems.**

UNIT - 3	PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS	12

Applications of Phase Change Heat Transfer*: Boilers, condensers, Thermal Energy Storage Systems.* ***Applications of Heat Exchangers:*** *Automotive Radiators, Oil coolers and intercoolers, etc*

.

Nusselt‘s theory of condensation – Regimes of Pool boiling and Flow boiling, correlations in boiling and condensation. Heat Exchanger Types - Overall Heat Transfer Coefficient – Fouling Factors. LMTD and NTU methods.

UNIT - 4	RADIATION	10

Applications: *solar collectors, solar water heaters, solar cookers, Furnaces, satellites, space stations, and thermal protection systems**,** Microwave ovens, Radiation pyrometers.*

Radiation laws, Black Body and Grey body Radiation. Shape Factor. Electrical Analogy. Radiation Shields. Gas Radiation.

UNIT - 5	**MASS TRANSFER**	**8**

Applications: *food processing, paper industry, textile drying, and spray dryers**,** Petroleum refineries, chemical plants, water purification**,** gas purification, CO_2 removal, SO_2 scrubbing.*

Basic Concepts – Diffusion Mass Transfer – Fick‘s Law of Diffusion – Steady state Molecular Diffusion-Mass diffusion with Homogenous Chemical Reactions. Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations.

UNIT - 6	**RECENT TRENDS**	**6**

Applications: *Cooling of high-power LEDs and batteries, Laptop and CPU cooling, Waste heat recovery systems, Automotive radiators and intercoolers, and Thermal insulation.*

Methods of enhanced heat transfer – Use of extended surfaces and surface modification techniques – Heat transfer enhancement using nanofluids – Heat pipes and their applications – Compact heat exchangers – Environmental radiation and its significance in energy systems.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

1.	Apply principles and methods to solve steady and unsteady-state heat conduction problems.
2.	Apply principles of forced and free convection to estimate heat transfer for internal and external flow situations.
3.	Solve phase change heat transfer problems involving boiling and condensation using standard correlations and assess heat exchanger performance using LMTD and NTU methods
4.	Apply radiation heat transfer laws and radiation network methods to analyze and solve radiation exchange problems in engineering systems.
5.	Apply appropriate mass transfer correlations to analyze and solve diffusion and convective mass transfer problems in engineering applications
6.	Understand enhanced heat transfer techniques and recent trends in heat transfer

TEXT BOOKS:

1.	R.C.Sachdeva, - Fundamentals of Engineering Heat & Mass transfer, IV edition New Age International Publishers, 6th Edition, 2022.
2.	Kothandaraman, C.P.,- Fundamentals of Heat and Mass Transfer, New Age International, New Delhi, 4th Edition, 2022.
3.	Holman, J.P., - Heat and Mass Transfer, Tata McGraw Hill, 2022.

4.	Yunus A.Cengel,-Heat Transfer A Practical Approach–Tata McGraw Hill, 5th Edition – 2022.
5.	
REFERENCES:	
1.	Frank P. Incropera and David P.Dewitt – Fundamentals of Heat and Mass Transfer, John Wiley & Sons, 7th Edition, 2020.
2.	S.P.Venkateshan, - Heat Transfer, Anebooks, New Delhi, IIIrd edition 2020.
3.	Nag.P.K., - Heat Transfer and MassTransfer, Tata McGraw Hill, New Delhi, IIIrd edition 2011.
4.	Ozisik, M.N.– Heat Transfer, McGraw Hill Book Co., 2022.
5.	Yadav,R.,— Heat and Mass Transfer, Central Publishing House, 2012.
OTHER SOURCES:	
1.	NPTEL – Heat Transfer https://nptel.ac.in/courses/112101097
2.	NPTEL – Advanced Heat Transfer https://nptel.ac.in/courses/112106158
3.	MIT OpenCourseWare – Heat Transfer https://ocw.mit.edu/courses/mechanical-engineering/heat-transfer
4.	https://youtu.be/alijQ5YrApk
5.	https://youtu.be/1to7_c3KX7Q

CO – PO MAPPING

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
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2	3	3	3	2	–	–	–	1	–	–	1	3	2	1
3	3	3	3	2	–	–	–	1	–	–	1	3	2	1
4	3	3	3	2	–	–	–	1	–	–	1	3	2	1
5	3	3	3	2	–	–	–	1	–	–	1	3	2	1
6	2	2	2	1	–	–	–	1	–	–	1	2	2	1
Low (1) Medium (2) High (3)														

Assessment Weightage:

Formative Assessment		Summative Assessment
CIA	Experiential Learning	End semester examination
20%	20%	60%

CIA- Continuous Internal Assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	10%	10%	10%	10%	10%	10%
U	30%	30%	30%	30%	30%	30%
Ap	60%	60%	60%	60%	60%	60%
An						
E						
C						

Suggested experiential learning assessment activities

Vertical I (5 marks)	Vertical II (5 marks)	Vertical III (10 marks)
Quiz	Case Studies	Online Certificate Course
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
XX	Date:	XX	Date:

Assessment Weightage:

For Theory component:

Formative Assessment		**Summative Assessment**
CIA	Experiential Learning	End semester examination
20%	20%	60%

24ME515	AUTOMOBILE ENGINEERING	PCC	L T P C 3 0 0 3
Prerequisite:			

COURSE OBJECTIVES:

✓	To study the construction and working principle of various parts of an automobile.
✓	To study the practice for assembling and dismantling of engine parts and transmission system.
✓	To study various transmission systems of automobile.
✓	To study about steering, brakes and suspension systems.
✓	To study alternative energy sources.
✓	To know the Recent developments in Automobile Engineering.

UNIT - 1	**VEHICLE STRUCTURE AND ENGINES**	8

Applications: *Real world applications of Engines.*

Types of automobiles vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines components functions and materials, variable valve timing (VVT).

UNIT - 2	**ENGINE AUXILIARY SYSTEMS**	8

Applications: *Real world applications of Engine auxiliary systems.*

Electronically controlled gasoline injection system for SI engines, **hydrogen engines**, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT - 3	**TRANSMISSION SYSTEMS**	8

Applications: *Real world applications of Transmission systems.*

Clutch types and construction, gear boxes manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle, Hotchkiss drive and Torque tube drive.

UNIT - 4	**STEERING, BRAKES AND SUSPENSION SYSTEMS**	8

Applications: *Real world applications of Vehicle auxiliary systems.*

Steering geometry and types of steering gear box, Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), Electronic brake force distribution (EBD) and Traction Control.

UNIT - 5	**ALTERNATIVE ENERGY SOURCES**	8

Applications: *Real world applications of Energy sources.*

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles, Engine modifications required, Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels.

UNIT - 6	EMERGING TECHNOLOGIES AND TRENDS	5
Advanced Driver Assistance Systems (ADAS), Autonomous Driving, Connected Vehicles (V2X), Automotive Infotronics, X-by-Wire Systems, Sensor Fusion, **Electric and Hybrid Vehicles, Fuel Cell.**		
TOTAL: 45 PERIODS		

COURSE OUTCOMES:	
At the end of the course the students would be able to	
1.	Recognize the various parts of the automobile and their functions and materials.
2.	Discuss the engine auxiliary systems and engine emission control.
3.	Distinguish the working of different types of transmission systems.
4.	Explain the Steering, Brakes and Suspension Systems.
5.	Predict possible alternate sources of energy for IC Engines.
6.	Understand about recent developments in Automobile Engineering.
TEXT BOOKS:	
1.	Kirpal Singh, "Automobile Engineering", Vol 1 & 2, Standard Publishers, Delhi, 14th Edition 2025.
2.	Jain K.K, "Automobile Engineering" Tata McGraw Hill Publishers, Delhi, 2021.
REFERENCES:	
1.	Ganesan V, "Internal Combustion Engines", 4th Edition, Tata McGraw-Hill, 2018.
2.	R.K. Rajput, **"**A Textbook of Automobile Engineering", Techno Series, 2024.
3.	G.K. Awari, V.S. Kumbhar, and R.B. Tirpude, **"**Automotive Systems: Principles and Practice", CRC Press, 2021**.**
4.	Mehrdad Ehsani, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles", 3rd Edition, 2022.
OTHER SOURCES:	
1.	https://link.springer.com/article/10.1007/s41104-025-00164-8 (Power optimal torque distribution for over actuated electric vehicles)
2.	https://ieeexplore.ieee.org/document/10320350 (A Case Study on Structural Optimization Design of Shock Absorber Brackets in Automobile Suspension 2023)
3.	https://www.ijat.net/journal/view.php?number=2642 (The Potential of E-Fuel to reduce Fuel Injector Deposits – 2025)

CO – PO MAPPING

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	2	1	-	-	-	-	-	-	-	1	2	1	-
2	3	2	1	-	1	1	-	-	-	-	1	2	1	1
3	3	3	1	-	-	-	-	-	-	-	1	2	1	1
4	3	3	2	1	-	-	-	-	-	-	1	2	1	1
5	2	3	2	1	2	3	-	-	-	-	2	2	2	1
6	2	2	1	-	3	2	-	-	1	-	3	1	2	2
LOW (1) ; MEDIUM (2) ; HIGH (3)														

Assessment Weightage:

Formative Assessment		**Summative Assessment**
CIA	Experiential Learning	End semester examination
20%	20%	60%

CIA- Continuous Internal Assessment

Assessment of course outcome

Cognitive level	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
R	40%	40%	40%	40%	40%	30%
U	60%	60%	50%	50%	50%	50%
Ap						
An			10%	10%	10%	20%
E						
C						

Suggested experiential learning assessment activities

Vertical I (5 marks)	Vertical II (5 marks)	Vertical III (10 marks)
Debate, Assignments	Field visits, Online Certifications	Case studies
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
XX	Date:	XX	Date:

24HSS05	ENGLISH FOR COMPETITIVE EXAMS	EEC	L T P C 2 0 0 2
Prerequisite:	Basic reading and writing skills, basic proficiency, including fundamental grammar and vocabulary in English are desirable.		

COURSE OBJECTIVES:

To make the student conversant with the

✓	Functional vocabulary in exam-oriented contexts.
✓	Functional grammar usage in exam-oriented contexts.
✓	Intermediate-level verbal ability skills required for competitive examinations and campus placements.
✓	Reading comprehension and logical interpretation skills.
✓	Sentence construction, error detection, and verbal reasoning abilities.
✓	Students for time-bound English language sections in recruitment and entrance exams.

UNIT - 1	**VOCABULARY & WORD USAGE**	5

Practices on

Synonyms and antonyms - One-word substitutions - Idioms and phrases - Commonly confused words - Word analogy – Spellings – Word expansion – New words in use.

UNIT - 2	**GRAMMAR & SENTENCE STRUCTURE**	5

Practices on

Parts of speech - Subject–verb agreement - Tenses and verb forms - Articles and prepositions - Active and passive voice - Conversion into Direct/ Indirect narration – Clauses – Speech patterns.

UNIT - 3	**SENTENCE LEVEL VERBAL ABILITY**	5

Practices on

Fill in the blanks - Sentence types and structure - Sentence completion - Para-jumbles (short passages) - Sentence rearrangement– Identifying detail, main ideas – Following signpost words – Opening phrases

UNIT - 4	**READING COMPREHENSION**	5

Practices on

Short and medium passages - Main idea and supporting details - Vocabulary in context - Factual and inferential questions - Passage-based grammar - Improving global reading skills – Linking ideas – Summarizing – Understanding argument – Identifying opinion/attitude and making inferences - Critical reading.

UNIT - 5	**VERBAL REASONING & LOGICAL ABILITY**	5

Practices on

Analogies - Word classification - Logical sequence of sentences - Statement and conclusion (basic level) - Cause and effect- Assertion and Reason

UNIT - 6	**COMPETITIVE EXAM PRACTICE & STRATEGIES**	5

Practices on

English section patterns in placement and competitive exams - Time management strategies -Common exam traps and errors - Accuracy vs. speed techniques -Cloze tests (basic to moderate level)- Mock Test Strategies

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

1.	Use appropriate vocabulary in competitive exam questions.
2.	Use appropriate grammar in competitive exam questions.
3.	Identify and correct common grammatical and contextual errors.

4.	Understand and analyze reading passages with improved speed.
5.	Solve intermediate-level verbal reasoning questions accurately
6.	Apply exam strategies to improve performance in verbal sections
TEXT BOOKS:	
1.	S.P. Bakshi, Objective General English, Arihant
2.	Wren & Martin, High School English Grammar and Composition
3.	Arun Sharma, Verbal Ability and Reading Comprehension
REFERENCES:	
1.	Wren & Martin, High School English Grammar and Composition
2.	M. Ashraf Rizvi – Effective Technical Communication
3.	Previous year question papers (Banking, SSC, GATE, PSU)
OTHER SOURCES:	
1.	https://learnenglish.britishcouncil.org/
2.	https://www.indiabix.com/
3.	https://www.grammarly.com/blog
4.	https://dictionary.cambridge.org/

CO – PO MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
2	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
3	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
	Low (1) Medium (2) High (3)														

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	60%	60%	40%	40%	40%	40%
U	40%	40%	60%	60%	40%	60%
Ap					20%	
An						
E						
C						

Recommended by BOS		Approved by ACM	
XX	Date:	XX	Date:

24ME520	THERMAL & HEAT TRANSFER LABORATORY	PCC	L T P C 0 0 3 1.5
Prerequisite:	**24ME413, 24ME518**		

COURSE OBJECTIVES:

✓	Understand and evaluate the performance of thermal engineering systems such as compressors, refrigeration systems, steam generators, and turbines through experimental investigation.
✓	Analyze heat conduction phenomena and determine thermal conductivity of different materials using standard laboratory apparatus.
✓	Investigate convective heat transfer mechanisms under natural and forced convection and evaluate associated heat transfer coefficients.
✓	Examine radiative heat transfer principles and determine radiation properties such as emissivity and Stefan–Boltzmann constant experimentally.
✓	Develop experimental skills, data interpretation ability, and technical reporting competence relevant to real-world thermal engineering applications.

PART- I THERMAL ENGINEERING

LIST OF EXPERIMENTS:		**10**
1.	Performance test on a two stage Reciprocating Air compressor.	
2.	Determination of COP of a refrigeration system.	
3.	Experiments on Psychrometric processes.	
4.	Study of Steam Generators and Turbines.	
5.	Valve Timing and Port Timing diagrams.	
6.	Determination of Flash Point and Fire Point of various fuels / lubricants.	
7.	Performance test on 4 - stroke diesel engine.	

PART- II HEAT TRANSFER LABORATORY

LIST OF EXPERIMENTS:		**20**
1.	Thermal conductivity measurement using guarded plate apparatus.	
2.	Thermal conductivity measurement of pipe insulation using lagged pipe apparatus.	
3.	Determination of thermal conductivity of a composite wall, insulating powder, oils, and water.	
4.	Determination of heat transfer coefficient of air under natural convection and forced	

	convection.
5.	Heat transfer from pin-fin under natural and forced convection.
6.	Determination of effectiveness of a tube-in-tube heat exchanger.
7.	Determination of Stefan– Boltzmann constant.
8.	Determination of emissivity of a grey surface.
	TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students is expected to be able to

1.	Conduct and analyze performance tests on refrigeration, air-conditioning systems, and reciprocating air compressors to evaluate key performance parameters.
2.	Determine and analyze thermal conductivity of solids, liquids, and composite systems using conduction heat transfer apparatus.
3.	Evaluate convective heat transfer coefficients under natural and forced convection conditions using experimental methods.
4.	Determine radiative heat transfer properties such as Stefan–Boltzmann constant and emissivity of surfaces through experiments.
5.	Analyze the performance of heat exchangers and thermal systems using experimentally obtained data and standard performance parameters.

CO – PO MAPPING

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	2	1	2	2	–	–	–	1	2	–	3	2	2
2	3	3	1	2	2	–	–	–	1	2	–	3	3	2
3	3	3	2	2	2	–	–	–	1	2	–	3	3	3
4	3	2	1	2	2	–	–	–	1	2	–	2	2	2
5	3	3	2	2	3	–	–	–	1	2	–	3	3	3
Low (1) Medium (2) High (3)														

Assessment Weightage:

Formative Assessment			**Summative Assessment**
CIA	Innovative project/ Field visit	Experimental practices	End semester examination
20%	10%	20%	50%

CIA- Continuous Internal Assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R						
U	20%	20%	20%	20%	20%	20%
Ap	80%	80%	80%	80%	80%	80%
An						
E						
C						

Recommended by BOS		Approved by ACM	
XX		XX	

24ME308	PRODUCT DESIGN (CATIA) LABORATORY	PCC	L T P C 0 0 3 1.5
Prerequisite:	Engineering Graphics, CADD LAB		

COURSE OBJECTIVES:

✓	To develop practical skills in 3D parametric modelling of mechanical components using CATIA.
✓	To create assembly models with appropriate constraints and perform drafting with standard views, dimensions, and Bill of Materials.
✓	To apply CAD tools for visualizing, analysing, and documenting mechanical designs as per industrial standards.

PART I FUNDAMENTALS OF CATIA MODELLING

CAD Introduction Sketch: Solid modeling: Extrude, Revolve, Sweep, Variational sweep and Loft. Surface modeling: Extrude Sweep, Trim, Mesh of curves and Free form. Feature manipulation: Copy, Edit, Pattern, Suppress, History operations. Assembly: Constraints, Exploded Views, Interference check Drafting: Layouts, Standard & Sectional Views, Detailing & Plotting

PART II LIST OF EXPERIMENTS

1.	To create assembly models of Crosshead.
2.	To create assembly models of Safety Valves.
3.	To create assembly models of Non-return valves.
4.	To create assembly models of Connecting rod.
5.	To create assembly models of Piston.
6.	To create assembly models of Crankshaft.
7.	Experiment based on project.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students is expected to be able to

1.	Comprehend the absolute, relative and polar coordinate systems
2.	Create, edit, annotate and plot drawings using basic AutoCAD commands.
3.	Visualize and graphically reproduce complex layouts in drafting and design areas

CO – PO MAPPING

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	2	2	2	1	3	-	-	-	1	1	-	3	3	2
2	2	2	3	2	3	-	-	-	2	1	-	3	3	2
3	2	2	3	2	3	-	-	-	2	2	-	3	3	2
Low (1) Medium (2) High (3)														

Assessment Weightage:

Formative Assessment			Summative Assessment
CIA	Innovative project/ Field visit	Experimental practices	End semester examination
20%	10%	20%	50%

CIA - Continuous Internal Assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3
R	10%	10%	10%
U	30%	30%	30%
Ap	60%	60%	60%
An			
E			
C			

Recommended by BOS		Approved by ACM	
XX		XX	