Minutes of Meeting of Board of Studies for Department of Mechanical Engineering, University of Engineering & Management, Jaipur held on Date – 04th July 2025.

The Meeting of Board of Studies for Department of Mechanical Engineering was held on **04th July 2025** at **02:30 PM** in at University of Engineering & Management premises. The following members were present:

1. Dr. Umesh Gurnani, Associate Prof. & Head of Department, Mechanical Engineering, UEM Jaipur.
2. Dr. Anurag Hamilton, Professor, Mechanical Engineering, UEM Jaipur.
3. Mr. Mandeep Singh, Assistant Professor, Mechanical Engineering, UEM Jaipur.
4. Mr. Iqbal Ahmad, Assistant Professor, Mechanical Engineering, UEM Jaipur.
5. Mr. Sasthi Charan Hens, Assistant Professor, Mechanical Engineering, UEM Jaipur.
6. Mr. Ravindra Maanju, Assistant Professor, Mechanical Engineering, UEM Jaipur.
7. Mr. Vinod Yadav, Assistant Professor, Mechanical Engineering, UEM Jaipur.
8. Prof. G. S. Dangayach, Professor HAG, Mechanical Engineering, MNIT Jaipur
9. Dr. Anupam Krishna, Director, Eurasia Research, Jaipur

Dr. Umesh Gurnani, Head of Department, Mechanical Engineering, UEM Jaipur welcomed all the members of Board of Studies before commencement of the meeting. Thereafter agenda points of the meeting of Board of Studies were taken up for discussion.

The Board of Studies of Department of Mechanical Engineering, UEM Jaipur took the following resolutions:

Agenda Item No-1:
To Confirm the Minutes of Meeting of last BOS meeting of the Department of Mechanical Engineering

The minutes of the last meeting of Board of studies was circulated to all the members in advance through mail. As there was no observation raised in the meeting, it was confirmed.

Agenda Item No-2:
To read the Action Taken Report of last Board of Studies meeting held on 29.11.2024.

The agenda wise Action Taken Report of the last meeting of Board of Studies for Department of Mechanical Engineering held on 29th Nov. 2024, was circulated to all the members in advance through mail. As there was no observation raised, it was confirmed.

Agenda Item No-3
To report on updating/modification/restructuring of syllabus for next academic session keeping in view of the policy for common syllabus for all the institutions of the IEM-UEM group.

The syllabus was updated and restructured after modification including all important content which was decided by members of board of studies keeping in view the model curriculum shared

by AICTE. The organization is willing to have a common syllabus for all the institutions run by IEM-UEM group. A detailed mapping of syllabus in line with MIT online courses and AICTE model curriculum have also been added in detailed syllabus to ensure that all topics including technological advancements are covered by students of Mechanical Engineering. Apart from discussion on credit points of each subjects, placing the subjects in right year and right semester was also ensured by the BOS team.
All the points in syllabus were highly appreciated by members and inputs were received by them for successful implementation of those points. The inputs on marks for extracurricular activities were also noted.

Agenda Item No-4
To report on course mapping for current syllabus and online certifications from Infosys Springboard and Linkedin Learning.

The online certification programs for students of Mechanical Engineering have been introduced with respect to a MoU signed with Infosys Springboard team to make them learn and interact directly with corporate trainers regarding the need of industry. Infosys will be leading this online platform and providing maximum possible courses relevant to students of Engineering to enhance their know-how about the technological advancements. A similar platform is also shared by Linkedin Learning which includes similar courses where students are being encouraged by teachers to join and begin a new era of hybrid learning.

Agenda Item No-5
Any other inputs by the BOS members

Few of the below mentioned points were shared by members to be incorporated in UEMJ curriculum.

1.) External members suggested to incorporate an open Elective subject of "Application of sustainability" in 7th sem.

2.) Subject "Industry 4.0" should be renamed as "Industry 5.0" in B.Tech 7th sem.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
(Approved by AICTE and recognized by UGC, Ministry of HRD, Govt. of INDIA)
'Gurukul', 6 Kms. from Chomu on Sikar Road, Udaipuria Mod, Chomu, Jaipur-303807 (Rajasthan)
Phone : 01423-205168, Email: vc@uem.edu.in, Website : www.uem.edu.in

Attendance Sheet for Meeting of Board of Studies

Department of Mechanical Engineering
University of Engineering & Management, Jaipur

Date – 04th July, 2025

S.no.	Name	Designation	Signature
1	Dr. Umesh Gurnani	Head of Department, Mechanical Engineering, UEM Jaipur(Chairman)	
2.	Prof. Anurag Hamilton	Professor, Department of Mechanical Engineering, UEM Jaipur (Member)	
3.	Prof. Mandeep Singh	Assistant Professor, Department of Mechanical Engineering, UEM Jaipur (Member)	
4.	Iqbal Ahmad	Assistant Professor, Department of Mechanical Engineering, UEM Jaipur (Member)	
5.	Sasthi Charan Hens	Assistant Professor, Department of Mechanical Engineering, UEM Jaipur (Member)	
6.	Ravindra Maanju	Assistant Professor, Department of Mechanical Engineering, UEM Jaipur (Member)	
7.	Vinod Yadav	Assistant Professor, Department of Mechanical Engineering, UEM Jaipur (Member)	
8.	Prof. G. S. Dangayach	Professor HAG, Department of Mechanical Engineering, MNIT Jaipur (External Member)	
9.	Dr. Anupam Krishna	Director, Eurasia Research, Malviya Nagar, Jaipur	

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New Syllabus Outline Structure

For

B.Tech in Mechanical Engineering

Effective from Academic Year 2025-2026

DEPARTMENT OF MECHANICAL ENGINEERING

7th SEMESTER

SL NO	Category	Paper Code	Paper Name	L	T	P	Total Contact Hrs	Credits
Theory Papers								
1	PEC	PECME701	Professional Elective -III	3	0	0	3	3
2	OEC	OECME701	Open Elective-I	3	0	0	3	3
3	OEC	OECME702	Open Elective-II	3	0	0	3	3
6	HSMC	HSMME701	HSS/Management Elective-2 (A. Operation Research/ B. Industrial Psychology)	3	0	0	3	3
4	HSMC	ESPME701	Essential Studies for Professionals (ME) - VII	2	0	0	2	0.5
Practical / Sessional Papers								
5	PRJ	PRJME781	Project-V	0	0	8	8	4
6	HSMC	SDP781	Skill Development for Professionals - VII	0	0	2	2	0.5
			TOTAL				**24**	**17**
For B.Tech Honours Degree								
7	MOOCS	MOOCS	MOOCs Certificate Courses (NPTEL SWAYAM)	-	-	-	-	-
For B.Tech with Minor Degree in Robotics								
8	MD	RBME781	Project in Robotics I	1	0	2	3	2
For B.Tech with Minor Degree in Sustainable Energy Engineering								
9	MD	SEEME701	Solar Energy Technologies and System Design	1	1	2	3	3
For B.Tech with Minor Degree in Artificial Intelligence and Machine Learning								
10	MD	AIMLME701	Applications of AI/ML	3	0	0	3	3
Mandatory Courses								
11	IFC	IFC	Industry and Foreign Certification (IFC)	0	0	0	0	0
12	MAR	MAR	Mandatory Additional Requirements (MAR)	0	0	0	0	0

List of Professional Elective -III (PECME701)

A. PECME701A Automobile Engineering
B. PECME701B Material Handling
C. PECME701C Industrial Engineering
D. PECME701D Industrial Robotics
E. PECME701E Aerospace Engineering
F. PECME701F Agricultural Engineering
G. PECME701G Biomedical Engineering
H. PECME701H Food Technology
I. PECME701I Nuclear Engineering

List of Open Electives for Open Elective-I (OECME701)

A. OECME701A Principal & Practice of management
B. OECME701B Process Planning and Cost Estimation
C. OECME701C Renewable Energy Engineering

List of Open Electives for Open Elective-II (OECME702)

A. OECME702A Industry 4.0
B. OECME702B Optimization Techniques

C. OECME702C Data Analytics

8th SEMESTER

SL NO	Category	Paper Code	Paper Name	L	T	P	Total Contact Hrs	Credits
Theory Papers								
1	HSMC	HSMME801	Universal Human Values-2	2	0	0	2	2
2	OEC	OECME801	Open Elective-III	3	0	0	3	3
3	HSMC	ESP802	Essential Studies for Professionals - VIII	2	0	0	2	0.5
Practical / Sessional Papers								
4	PRJ	PRJME881	Project-VI (Prototype & Testing)	0	0	8	8	4
5	PRJ	PRJME882	Comprehensive viva	0	0	0	0	1
6	HSMC	SDP881	Skill Development for Professionals - VIII	0	0	2	2	0.5
			TOTAL				**17**	**11**
For B.Tech Honours Degree								
7	MOOCS	MOOCS	MOOCs Certificate Courses (NPTEL/SWAYAM)	-	-	-	-	-
For B.Tech with Minor Degree in Robotics								
8	MD	RBME881	Project in Robotics II	0	0	4	4	2
For B.Tech with Minor Degree in Sustainable Energy Engineering								
9	MD	SEEME801	Solar Energy System Installations and Maintenance	1	1	2	3	3
Mandatory Courses								
10	IFC	IFC	Industry and Foreign Certification (IFC)	0	0	0	0	0
11	MAR	MAR	Mandatory Additional Requirements (MAR)	0	0	0	0	0

List of Open Electives for Elective-III

A. Total Quality Management
B. Maintenance Engineering
C. Quality & Reliability Engineering
D. Machine Learning
E. Biomechanics & Biomaterials

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Content	Page No.
7th sem Course Structure	
Professional Elective -III	
Open Elective-I	
Open Elective-II	
HSS/Management Elective-2	
i. Industrial Psychology	
ii. Operation Research	
Essential Studies for Professionals (ME) – VII	
Project-V	
Skill Development for Professionals - VII	
Minor degree:	
i. Project in Robotics I	
ii. Solar Energy Technologies and System Design.	
iii. Applications of AI	
MAR	
MOOCs Certificate Courses (NPTEL/SWAYAM)	

B.Tech M.E. 4th Year 7th Semester

SL NO	Category	Paper Code	Paper Name	L	T	P	Total Contact Hrs	Credits
Theory Papers								
1	PEC	PECME701	Professional Elective -III	3	0	0	3	3
2	OEC	OECME701	Open Elective-I	3	0	0	3	3
3	OEC	OECME702	Open Elective-II	3	0	0	3	3
6	HSMC	HSMME701	HSS/Management Elective-2 (A. Operation Research / B. Industrial Psychology)	3	0	0	3	3
4	HSMC	ESPME701	Essential Studies for Professionals (ME) - VII	2	0	0	2	0.5
Practical / Sessional Papers								
5	PRJ	PRJME781	Project-V	0	0	8	8	4
6	HSMC	SDP781	Skill Development for Professionals - VII	0	0	2	2	0.5
			TOTAL				**24**	**17**
For B.Tech Honours Degree								
7	MOOCS	MOOCS	MOOCs Certificate Courses (NPTEL/SWAYAM)	-	-	-	-	-
For B.Tech with Minor Degree in Robotics								
8	MD	RBME781	Project in Robotics I	1	0	2	3	2
For B.Tech with Minor Degree in Sustainable Energy Engineering								
9	MD	SEEME701	Solar Energy Technologies and System Design	1	1	2	3	3
For B.Tech with Minor Degree in Artificial Intelligence and Machine Learning								
10	MD	AIMLME701	Applications of AI	3	0	0	3	3
Mandatory Courses								
11	IEC	IEC	Industry and Foreign Certification (IEC)	0	0	0	0	0
12	MAR	MAR	Mandatory Additional Requirements (MAR)	0	0	0	0	0

List of Professional Electives for Elective-III (Industry) (PECME701)

A. PECME701A Automobile Engineering
B. PECME701B Material Handling
C. PECME701C Industrial Engineering
D. PECME701D Industrial Robotics
E. PECME701E Aerospace Engineering
F. PECME701F Biomedical Engineering
G. PECME701G Agricultural Engineering

List of Open Electives for Open Elective-I (OECME701)

A. OECME701A Principal & Practice of management
B. OECME701B Process Planning and Cost Estimation
C. OECME701C Renewable Energy Engineering

List of Open Electives for Open Elective-II (OECME702)

A. OECME702A Industry 4.0
B. OECME702B Optimization Techniques
C. OECME702C Data Analytics

B.Tech M.E. 7th Semester

Subject Name: Automobile Engineering **Credit: 3**
Subject Code: PECME701A **Lecture Hours: 36**
Pre-requisite: Basic Engineering Knowledge

Relevant Links: STUDY MATERIAL **NPTEL**

Objectives:

- The objective of this subject is to provide knowledge about various systems involved in automobile engine.
- Able to learn about different components of IC Engines.
- Different automobile engine systems line diagrams

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Mapping with Text Books
1	**Introduction**	History of automobiles; Classification of automobiles; Power plant classification; Engine terminology; Types of cycles; Working principle of an IC engine; Advanced classification of engines and multi cylinder engines; Engine balance and firing order.	***IIT Indor Syllabus:*** https://people.iitism.ac.in/~academics/assets/course_structure_new_cat_mech_mech.pdf ***IIT Delhi Syllabus:*** https://web.iitd.ac.in/~rayyan/curriculum/ucic/senate_191-ME-Automotive_Design.pdf ***International Standard:*** https://www.upc.edu/graduen/386/bachelors-degree-in-automotive-engineering.pdf	3		Automobile Mechaniess, Dr. N.K. Giri – Chapter 1,2 and 3
2	**Fuel System, Ignition System and Electrical system**	*Spark Ignition engines* – fuel tank, fuel filter, fuel pump, air filter, carburetor, direct injection of petrol engines; *Compression Ignition engines* – fuel injection (air and solid), pressure charging, super charging and turbo	***IIT Indor Syllabus:*** https://people.iitism.ac.in/~academics/assets/course_structure_new_cat_mech_mech.pdf ***IIT Delhi Syllabus:*** https://web.iitd.ac.in/~rayyan/curriculum/ucic/senate	4		Automobile Mechaniess, Dr. N.K. Giri – Chapter 4,5,6 and 9

	charging, *Ignition systems* – components, battery ignition, magneto ignition, electronic ignition and ignition timing. *Main electrical circuits* - generating & starting circuit, lighting, indicating devices	***International Standard:***		
Lubricating System and Cooling System	Functions & properties of lubricants, methods of lubrication, Oil filters, oil pumps, oil coolers, Characteristics of an effective cooling system, types of cooling systems, Radiator, thermostat, air cooling & water cooling	***IIT Indor Syllabus:*** ***IIT Delhi Syllabus:*** ***International Standard:***		Automobile Mechanics, Dr N.K. Giri – Chapter 7,8
Chassis & Transmission	Parts of automobile body, *Automobile frames* – functions, constructions, sub frames, materials and	***IIT Indor Syllabus:***		Automobile Mechanics, Dr N.K. Giri – Chapter 10, 11

		defects; *Transmission* – axles, clutches, propeller shafts, differential, gear boxes, automatic transmission, electronic transmission control, functions and types of front and rear axles, types and functions of clutches, Hotchkiss drive torque tube drive, traction control.	.pdf ***IIT Delhi Syllabus:*** https://web.iitd.ac.in/~ravim/curriculum/ugc/senate_191/ME_Automotive_design.pdf ***International Standard:*** https://www.upc.edu/grau/en/386/bachelors_degree_in_automotive_engineering.pdf			
	Steering, Braking and Suspension	Steering mechanism, steering gear box types, wheel geometry; Brakes – principle, functions, types, construction, operation and parking brake; *Suspension* - types of spring shock absorbers, objectives and types of suspension system, rear axle suspension, electronic control and proactive suspension system.	***IIT Indor Syllabus:*** https://people.iiti.ac.in/~academics/assets/course_structure/new/cat/mech/mech.pdf ***IIT Delhi Syllabus:*** https://web.iitd.ac.in/~ravim/curriculum/ugc/senate_191/ME_Automotive_design.pdf ***International Standard:*** https://www.upc.edu/grau/en/386/bachelors_degree_in_automotive_engineering.pdf			Automobile Mechaniess, Dr. N.K. Giri – Chapter 12 and 17

	Automotive Air Conditioning:	Ventilation, heating, air condition, refrigerant, compressor and evaporator.	***IIT Indor Syllabus:*** https://people.iitism.ac.in/~academics/assets/course_structure_new/cat_mech/mech.pdf ***IIT Delhi Syllabus:*** https://web.iitd.ac.in/~ravimr/curriculum/ucic/senate-191/ME-Automotive-Design.pdf ***International Standard:*** https://www.upc.edu/grau/en/386/bachelors-degree-in-automotive-engineering.pdf			Automobile Mechaniess, Dr. N.K. Giri – Chapter 22
	Wheels and Tyers	Wheel quality, assembly, types of wheels, wheel rims. Construction of tyres and tyre specifications.	***IIT Indor Syllabus:*** https://people.iitism.ac.in/~academics/assets/course_structure_new_cat_mech_mech.pdf ***IIT Delhi Syllabus:*** https://web.iitd.ac.in/~ravimr/curriculum/ucic_senate-191/ME-Automotive-Design.pdf ***International Standard:*** https://www.upc.edu/g			Automobile Mechaniess, Dr. N.K. Giri – Chapter 13

			raju-en/386/bachelors-degree-in-automotive-engineering.pdf			
	Recent Trends	E-vehicles; Satellite-based navigation; Automated steering; Environment effect and mitigation.	***IIT Indor Syllabus:*** https://people.iitm.ac.in/academics/assets/course_structure_new/cat/mech/mech.pdf ***IIT Delhi Syllabus:*** https://web.iitd.ac.in/raviur/curriculum/ucic/senate191/ME Automotive Design.pdf ***International Standard:*** https://www.upc.edu/grau/en/386/bachelors-degree-in-automotive-engineering.pdf			Automobile Mechaniess, Dr. N.K. Giri – Chapter 23

Text /Reference Books:

1. Dr. N. K. Giri, Automobile Mechanics, Khanna Book Publishing, 2020
2. A.K. Babu, S.C. Sharma, Automobile Mechanics, Khanna Book Publishing, 2019.
3. A.K. Babu, S.C. Sharma, Automobile Engines, Khanna Book Publishing, 2019.
4. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.

5. Jain K.K. and Asthana R.B., Automobile Engineering, Tata McGraw Hill, New Delhi, 2002.
6. Heitner J., Automotive Mechanics, 2nd ed., East-West Press, 1999.
7. Heisler H., Advanced Engine Technology, SAE International Publ., USA, 1998.

Online Resources:

1. https://archive.nptel.ac.in/courses/107/106/107106088/

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1	Identify the different parts of the automobile.
CO2	Explain the working of various parts like engine, transmission, clutch, brakes etc.,
CO3	Demonstrate various types of drive systems and analyze the environmental implications of automobile emissions and suggest suitable regulatory modifications.
CO4	Evaluate future developments in the automobile technology

1.

Subject Name: Industrial Engineering **Credit: 3**
Subject Code: PECME701C **Lecture Hours: 36**
Pre-requisite: Basic Engineering Knowledge

Relevant Links: STUDY MATERIAL **NPTEL**

COURSE OBJECTIVES:

To provide introductory knowledge on Industrial Engineering, concept of Productivity and work study.
To make familiar about facility layout and planning, systems of production planning and control and technics of inventory management.

Course Content:

Module number	Topic	Sub-topics	Book name and chapter	Mapping with Industry and International Academia	Lecture Hours	Corresponding Assignment
	Introduction to Industrial Engineering and Productivity:	Definition and Functions of Industrial Engineering, Origin and development of factory system, Contribution of Taylor and Gilbreth Productivity: Definition of productivity, Factors Influencing Productivity, Causes of Low Productivity, Productivity Measurement Models, Productivity Improvement Techniques.		**International Standard:** https://ocw.mit.edu/courses/2-051-introduction-to-heat-transfer-fall-2015/pages/syllabus/ **AICTE-prescribed syllabus:** https://www.aicte-india.org/downloads/MODEL_SYLLABUS_FOR_UG_%20Mech_%20Engg.pdf **Industry Mapping: MATLAB**	3	
	Work Study:	Basic Concept, Steps Involved in Work Study, Techniques of Work Study, Human Factors in the Application of Work Study. Method Study: Basic Concept, Steps Involved in Method Study, Recording Techniques, Operation Process Charts, Flow Process Charts, Two-Handed-Process Charts, Multiple Activity Charts,			10	

		Flow Diagrams. String Diagrams, Principles of Motion Economy, Micro-Motion Study, Therbligs, SIMOCharts. Work Measurement: Basic Concept, Techniques of Work Measurement, Steps Involved in Time Study, Time Study Equipment, Performance Rating, Basic concept and Procedure of Work Sampling Study.				
	Facility Layout and Planning:	Nature, Significance and Scope of Facility layout and design; Steps in facility layout planning, Assembly Line Balancing. Material Handling: Definition, Objective and Principles of Material Handling, Classification of Material Handling Devices.			10	
	Production Planning and Control:	Introduction to Production Systems, Types of production systems, Need and functions of PPC. Forecasting: Definition and Functions of Forecasting, Forecasting techniques: li Aggregate production planning, Capacity Planning, ERP, Master Production Schedule. Basic sequencing and scheduling techniques.			4	
	Introduction to	Importance and areas of materials			9	

	Inventory Management:	management, Introduction to Inventory: Definitions, Need for inventory, Types of inventory, Inventory costs; Structure of inventory models, Deterministic models; safety stock, inventory control systems; Selective inventory management. MRP and JIT-based production systems, Concept of zero inventory, Fundamental concepts of purchasing, storing, distribution, and value analysis & engineering.				

Course Outcomes:

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

1. Understand the concepts of Industrial Engineering. Explain production systems and their characteristics.
2. Understand the role of productivity in streamlining a production system.
3. Describe different aspects of work system design and facilities design pertinent to manufacturing industries
4. Apply forecasting and scheduling techniques to production systems. Apply the inventory management tools in managing inventory

Learning Resources:

1. S.C. Sharma, Industrial Engineering and Management, Khanna Book Publication,2016.
2. O.P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publication,1980.
3. M.T. Telsang, Industrial Engineering and Production Management, S. Chand Publishing, 2018.
4. K.B. Zandin and H.B. Maynard, Maynard's Industrial Engineering Hand Book, McGraw Hill Education,2001.
5. ILO, Introduction to Work Study, Oxford and IBH Publishing,1992.
6. B. Mahadevan, Operations Management: Theory and Practice, Pearson,2010.

7. S.N. Chary, Production and Operations Management, McGraw-Hill Education,2019.
8. K. Bedi, Production and Operations Management, Oxford University Press,2004.
9. A. Tompkins, J.A. White, Y.A. Bozer, and J.M.A. Tanchoco, Facilities Planning, Wiley, 2005.
10. S. Ray, Introduction to Materials Handling, New Age International,2016.
11. S.L. Narasimhan, D.W. McLeavy and P.J. Billington, Production Planning and Inventory Control, Prentice Hall,2009.
12. E.A. Silver, D.F. Pyke and R. Peterson, Inventory Management and Production Planning and Scheduling, John Wiley,1998.

Subject Name: Industrial Robotics **Credit: 3**

Subject Code: PECME701B **Lecture Hours: 36**

Pre-requisite: Mechatronics, Robotics & Control

Relevant Links: **STUDY MATERIAL** **NPTEL**

Course Content:

Module number	Topic	Sub-topics	Book name and chapter	Mapping with Industry and International Academia	Lecture Hours	Corresponding Assignment
1.	Introduction:	Brief history of robotics; definition of robot; Main components of robot: manipulator, sensors, controller, power conversion unit; Robot geometry: types of joints, workspace, number of degrees of freedom; Common configurations used in arms: rectangular, cylindrical, spherical, jointed; Classification of robot according to coordinate system: cartesian, cylindrical, polar, articulated or jointed; Classification of robots according to control method: non-servo, servo; Robot specifications: payload, accuracy, repeatability resolution, maximum tip speed, reach stroke;				4
2	Robot End Effector	End effector: definition, gripper, tools; Gripper: main parts, source of power, Types of grippers;				4

		mechanical grippers, vacuum cups, magnetic grippers, adhesive grippers, Hooks, scoops, ladles, universal gripper; Robot Tools: Spot welding gun, pneumatic impact wrench, pneumatic nut runner, inert gas welding torch, heating torch, grinder, spray painting gun.				
3.	Robot Actuators:	Definition; Characteristics: power to weight ratio, stiffness, compliance, reduction gears; Conventional actuators: hydraulic actuator, pneumatic actuator, electric motor, direct drive motor, stepper motor, servo motor; Special actuators: magnetostrictive, shape memory alloy, elastomer.				4
4.	Robot Sensors:	Definition; of Sensor and transducer; Calibration; Basic categories of measuring devices: analog, discrete; Main types of sensors: position, velocity, acceleration, force and pressure, torque, slip and tactile, proximity. Definition of digital image, generation of digital image; Robot Vision System: definition, use, functions, components, classification; vision cameras; Techniques of image processing and analysis: Image data reduction, segmentation, feature extraction,				9

		object recognition; Application of robot vision system.				
5.	Robot Kinematics :	Definition of Robot kinematics, Tool frame and base frame. Word – coordinate system, Direct kinematics, Inverse kinematics, Describing position and orientation of an object in space, Homogenous transformation, Translational transformations, Rotational transformations, Denavit- Hartenberg representation.				7
6.	Robot Programming	Definition of robot programming; Different methods of robot programming: teach-pendant programming, key board programming; Programming languages: VAL II, AML/2, ARM BASIC				4
7.	Industrial Applications of Robots	Welding, Spray painting, Grinding; Material Transfer: machine loading and unloading, Processing operation; Assembly operation; Inspection. Special applications: underwater prospecting and repairs, Mining, Space Exploration, Surgery.				4
						36

Course Outcomes:
Student will understand

1. the basic idea about robotics.
2. end effectors and different drive system used in robotics
3. sensors and actuator
4. robot kinematics, basic programing and its application.

TEXT AND REFERENCE BOOKS:

1. S.K. Saha, Introduction to Robotics, The McGraw-Hill Publication

REFERENCE BOOKS:

2. Klafter, Richard D. Chmielewski, Thomas A. and Negin, Michael (2001) - Robotic Engineering: An Integrated Approach, Prentice-Hall of India Pvt. Limited.
3. Mikell P. Groover, Mitchell. Weiss, Roger N. Nagel, Nicholas G. Odrey, Industrial Robotics: Technology, Programming and Applications, McGraw-Hill International Edition
4. S.R. Deb, Robotics Technology and Flexible Automation, Tata McGraw-Hill Publication.
5. Niku, Saeed B., Introduction to Robotics Analysis, Systems, Applications. Prentice Hall of India Private Limited. New Delhi
6. Koren, Yoram, Robotics for Engineers, McGraw-Hill Book Company, Singapore
7. Hegde, Ganesh S., A Textbook on Industrial Robotics, Laxmi Publications (P) Ltd.

PEL-ME	Renewable Energy Engineering	3L: 0T: 0P	3 credits

Objectives:

1. To acquire knowledge of technical competency combined with research to generate innovative solutions in Energy engineering.
2. To be acquainted with a variety of options in energy sources.
3. To prepare the students to exhibit a high level of professionalism, integrity, environmental and social responsibility, and life-long independent learning ability with environment in mind.

Contents

Introduction: Basic concepts of energy; Introduction to Renewable Energy Technologies; Energy and Environment – global warming, acid rains, depletion of ozone layer; Global and Indian Scenario of renewable energy sources; Energy storage - necessity and energy storage methods.

Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Measurement of solar radiation data.

Solar Thermal Systems: Introduction; Basics of thermodynamics and heat transfer; Flat plate collector; Evacuated Tubular Collector, Solar air collector, Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning; Thermal energy storage systems.

Solar Photovoltaic Systems: Introduction; Solar cell Fundamentals; Characteristics and classification; Solar cell, Module, panel and Array construction, Photovoltaic thermal systems.

Wind Energy: Introduction; Origin and nature of winds; Wind turbine siting; Basics of fluid mechanics; Wind turbine aerodynamics, wind turbine types and their construction; Wind energy conversion systems.

Fuel cells: Overview; Classification of fuel cells; Operating principles; Fuel cell thermodynamics.

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies; Urban waste to energy conversion; Biomass gasification.

Other forms of Energy: Introduction: Nuclear, ocean and geothermal energy applications; Origin and their types; Working principles.

Text /Reference Books:

1. O.P. Gupta, "Energy Technology", Khanna Book Publishing, New Delhi.
2. V.V.N. Kishore, "Renewable Energy Engineering and Technology: Principles and Practice," Routledge, 1st Edition, 2019.
3. N. Jenkins and J. Ekanayake, "Renewable Energy Engineering," Cambridge University Press, 1st Edition, 2017.
4. G. Boyle, "Renewable Energy," OUP Oxford, 2nd Edition, 2009.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ph44/preview
2. https://onlinecourses.swayam2.ac.in/nou22_ge71/preview

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Acquire, apply and share in depth knowledge in the area of Energy Engineering and Management.
2. An ability to apply engineering and scientific principles for the effective management of energy systems.

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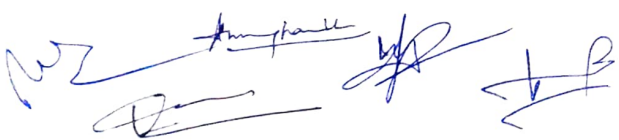
Subject Code: PRJME781	**Category:** Project, Seminar, and Industrial Training
Subject Name: Project-V	**Semester**: Seventh
L-T-P: **0-0-8**	**Credit: 4**
Pre-Requisites: Manufacturing Processes, Manufacturing Technology	

Objectives:

It is intended to start the project work early in the seventh semester and carry out both design and fabrication of a mechanical device whose working can be demonstrated. The design is expected to be completed in the seventh semester and the fabrication and demonstration will be carried out in the eighth semester.

Course Outcomes:

1. Select a suitable research gap through literature to solve the real-life problems faced by the society
2. Understand the concept of simulation through practical work.
3. Present the results from the work comprehensively through presentation and develop a comprehensive report
4. Present his/her work in a conference or publish the work in a peer reviewed journal



Solar Energy Technologies and System Design

Course Code	SEE-401
Course Title	Solar Energy Technologies and System Design
Number of credits	3[Lecture(15hours):1,Practical(15hours):2,Social(15hours):1]
Course category	SEE
Pre-requisite	None

Course Objective:

This course will offer

- An introduction to various solar PV and solar thermal technologies
- Basic parameters of solar PV panels and systems
- Standard test conditions under which the parameters are measured
- Design of solar PV system for electrical energy requirements, sizing of PV modules, battery, electronics, etc
- Design of solar thermal system for given thermal energy requirements

Course Content

D. Theoretical Learning

Each lecture is assumed to be of one hour. In content column, if possible breakdown the content of 1 hour in sub-topics

Lecture No.	Contents

1	**Materials for solar energy conversion:** discussion on what are different material categorization, use of semiconductors for converting sunlight into electricity, and use of metals for converting sunlight into heat, basic properties of semiconductors and metals required for conversion, e.g., bandgap, absorption coefficient, solar spectrum and energy of photons
2	**Material parameters:** important material parameters of semiconductors, band gap, absorption coefficient, absorption length, mobility, carrier drift, diffusion coefficient, carrier diffusion, Light absorption and recombination in semiconductors,
3	I-V characterises of P-N junction diode : forward and reverse biasing of P-N junction, forward biased current, reverse bias current, total current of P-N junction, I-V equation and curve
4	**Illuminated P-N Junction as solar cells:** discussion on why P-N junction diode requires power, but solar cell generates power, different quadrant of operations for P-N junction, dark and illuminated behaviour of P-N junction, demonstration through shift in I-V curve, discussion on photovoltaic effect
5	I-V characteristic of solar cells: I-V characteristics of a P-N junction diode under dark (write expression), light illuminated current component, I-V characteristics of a P-N junction diode under illumination, fourth quadrant operation, explain solar cell parameters Voc, Isc, FF, Efficiency using I-V curve, write down expressions
6	**Standard Test Condition and PV module parameters:** discussion on why there is need of STC, Converting solar cells to modules for obtaining required current, voltage and power, STC for solar energy technologies, PV modules parameters, effect of temperature and radiation on output parameters, reasons for variation in actual output of solar PV modules in real-life conditions.
7	**Solar PV technologies (part-I):** discussion on what students have seen in market or real life installations, various material and corresponding PV technologies, thin-film and crystalline Si technologies, commercially available technologies, best efficiencies of solar modules in labs and the commercial market
8	**Solar PV technologies (part-II):** discussion on what students have seen in market or real life installations, various material and corresponding PV technologies, thin-filmand crystalline Si technologies, commercially available technologies, bestefficienciesofsolarmodulesinlabsandcommercialmarket

9	**Typical parameters of c-Si solar cells:** Parameters of commercially produced solar cells and modules, typical values of voltage, current, FF and Efficiency, typical power ratings
10	**Solarthermaltechnologies:** various solar thermal technologies like solar hot water heater, solar cooker, discussion on need of concentration of light for higher temperatures, methods of sunlight concentration, solar concentration for power generation
11	**Design of solar hot water system:** discussion on what should be the solar thermal system components, use of thermosyphon effect, drawing of solar hot water system, estimate the energy required for heating water, estimation of collector area required for delivering required energy, considering typical losses in conversion, efficiency equation of solar thermal system
12	**Design of solar PV system (Part-I):** discussion on what should be the solar PV system components, block diagram of simple (no storage, no electronics) and complicated systems (grid tied with diesel and wind generators), estimating user's electrical energy requirements, sizing solar PV, battery and power conditioning units required in solar system, configuration of battery and panels, fixing input and output parameters of all system components
13	**Design of solar PV system (Part-II):** discussion on what should be the solar PV system components, block diagram of simple (no storage, no electronics) and complicated systems (grid tied with diesel and wind generators), estimating user's electrical energy requirements, sizing solar PV, battery and power conditioning units required in solar system, configuration of battery and panels, fixing input and output parameters of all system components
14	Costing of solar PV system : costing of solar components, per unit costing of panels, batteries, structure, wires, electronics, total system costing
15	Misconception of solar energy generation and Costing of solar system: discussion on what possible misconception people have in mind, generation in rainy season, need of maintenance, high costing of solar PV system, clarifying with data why these are misconception as per current status of technologies, typical costing of solar PV system components on per Watt basis as per current norms, estimating overall system costing, costing of solar thermal systems

E. Practical Learning

Each experiment can be of 2.5 to 3 hours. In the contents, please provide as detailed titles of the experiments as possible, also break down experiments in sub-experiments to give a clear indication of what concepts/observations students are expected to learn in each experiment.

Experiment No.	Contents
Note	**Conduct any of the five experiments listed below**
1	Take a solar panel and look at it carefully, at looking at it comment and write down various aspects of panel, what materials you see are used, how many solar cells are connected, how they are connected, what is the material used in making solar cells (mono or multi-crystalline or any other), what would be per cell parameters, look at name plate rating, does the name plate rating matches with expected outcome based on solar cell configurations
2	Take a solar panel (any wattage, 10, 20, 50, 100, 250, 300 Watt, etc.) and measure its parameters in real conditions, Voc, Isc, FF, Efficiency, repeat the experiments several times. What are your observation on variation in these parameters when you repeat the experiment at 30 min, interval (take at least 5 readings)
3	Measure the effect of sun tracking on output generation by a solar PV module, measure when module is fixed and when it is following the Sun (adjust the orientation of the panel manually), measure power output at every 30 min interval (take at least 5 readings), estimate the energy generated in two conductions and figure out the difference in energy generated when fixed and when tracking the sun.
4	Measure the energy consumed by few loads in the laboratory like lights, fans on the day of your experiments, use power meter and mustimeter, perform the experiments for at least two hour duration
5	Estimate the energy consumed by all appliances used in a lab on monthly basis, design a solar PV system and size various system components for the same, cross-check if your designed system would generate the required energy

F. Social Learning

This activity is crucial and requires careful design. This includes activities outside the classroom and outside the laboratory. Students must do something to apply their knowledge. This can also be exercise to apply the knowledge learned in classroom and laboratory and gather more information/data from society on a topic.

Social experiment No.	Contents
Note	Conduct any of the three experiments / exercises
1	Visit any installation of solar PV system or solar thermal system in your institution or any nearby area. Take note of interconnection of various components of system, make a comment on how system is designed
2	Measure energy consumed by some loads in your home, use power meter and energy meter to carry out measurements, check if the measured energy consumption is as per your expectations.
3	Make an energy consumption estimation of all the electrical loads in your house, is your estimation matched with the electricity bill that you are paying?
4	Based on your monthly electricity requirement of your home, design a solar PV system to fulfil your monthly electricity needs, write a design report on the same.
5	Visit a nearby school, college or any other institution, estimate their load or use their electricity bill for energy requirement, and design a solar system for institution

Tools required:

- Solar system components (panels, battery, structure, wires) for a given design
- Cement and concrete
- Measuring tape, installation tools (angle meter, screw driver, spanner, level meter, etc.)

Text books and other references

- PV system design Software

https://www.pvsyst.com/
https://www.homerenergy.com/homer/software
https://solargis.com/
• Solar radiation data of any place across the world https://globalsolaratlas.info/map
• Knowledge Centre, Ministry of New & Renewable Energy - Government of India
https://mnre.gov.in/
• Chapter 03, S. P. Sukhatme and J. K. Nayak, Solar Energy – Principles of Thermal Collection and Storage, Tata McGraw Hill, 2008
• Chapter 01, J. K. Nayak and J. A. Prajapati, Handbook On Energy Conscious Buildings, 2006
• C. S. Solanki, Solar Photovoltaic Technology and Systems: A Manual for Technicians,
Trainers and Engineers, Prentice Hall of India, 2013
• PV Installation Professional Resource Guide – NABCEP
http://www.nabcep.org/wp-content/uploads/2016/10/NABCEP-PV-Resource-Guide-10-4-16-W.pdf
• Photovoltaics: Design and Installation Manual, Solar Energy International (SEI), USA
https://www.solarenergy.org/
Minor Degree in Sustainable Energy Engineering (SEE)
• Guide to the Installation of Photovoltaic Systems, Microgeneration certification scheme
(MCS) (Author), Electrical Contractors' Association (ECA), UK, 2012
https://mcscertified.com/standards-tools-library/

Expected outcome of course:

Possible outcomes of course are ability to:

- Estimate the PV plant capacity for any end user by comparing active site area and annual consumption.
- Design plant SLD and simulate the plant performance ratio in simulation software.
- Understand datasheet of major solar components for selection of efficient, optimized, cost effective component from market.
- Identify, handle and operate various installation tools and tackles.
- Install an On grid and Off Grid Solar PV system.
- Monitor and maintain a solar plant for better energy generation and performance.
- Perform visual inspection, analyze the possible dust formation & requirement of cleaning & its frequency.
- Perform continuity tests and Polarity test & Recognize the danger of leaking current
- Identify & Troubleshoot the faults in the system
- Reading & interpretation of Data Sheets, O&M manual & Prepare a maintenance pla

University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

Subject Name: Essential Studies for Professionals-VII
Subject Code: HSMC(ME)702 **Credit: 0.5** **Lecture Hours: 48**

Module number	Topic	Sub-topics	Mapping with International/ National/ StateLevel Exams	Lecture Hours	Corresponding Assignment
1	**Theory of Machines**	**Textbook: Acing the GATE: Mechanical Engineering by Ajay Kumar Tamrakar, Dinesh Kumar HarurSampath, Publisher Wiley (Chapter 3) Theory of Machines**: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains, flywheels and governors; balancing of reciprocating and rotating masses; gyroscope. Vibrations: Free and forced vibration of single degree of freedom	*National Exams:* 1. *GATE: (https://gate2024.iisc.ac.in/wp-content/uploads/2023/07/ me.pdf)* 2. *UPSC Engineering Service Examination: (https://upsc.gov.in/sites/default/files/Notif-ESEP- 23-engl-140922- Final.pdf), Page- 22,23* 3. *UPSC Civil Service Examination: (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), Page- 127- 129* 4. *SSC Junior Engineer:*	16	

		systems, effect of damping; vibration isolation;			
		resonance; critical speeds of shafts **(Chapter 15) Metrology and Inspection:** Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.	*(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/NOTICE_JE_2023_26072023.pdf)* ***5. RRB JE,Technician, & Miscellaneous Category Posts:*** *(https://wcr.indianrailways.gov.in/uploads/files/1658493303114-english%20GDCE%2002_2022.pdf)*		

2	**Advance Professional Knowledge**	**(Chapter 5) Machine Design** :Gears, rolling and sliding contact bearings, brakes and clutches, spring **(Chapter 9) Applications:** **A. Power Engineering**: Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. **B. Refrigeration and air-conditioning:** Vapour and gas refrigeration and heat pump cycles; properties of moist air, psychrometric chart, basic psychrometric processes. **Turbomachinery:** Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines.	***National Exams:*** ***1. GATE:*** ***(https://gate2024.iisc.ac.in/wp-content/uploads/2023/07/ me.pdf)*** ***2. UPSC Engineering Service Examination:*** ***(https://upsc.gov.in/sites/default/files/Notif-ESEP- 23-engl-140922- Final.pdf), Page- 22,23*** ***3. UPSC Civil Service Examination:*** ***(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), Page- 127- 129*** ***4. SSC Junior Engineer:*** ***(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/NOTICE_JE_2023_26072023.pdf)*** ***RRB JE,Technician, & Miscellaneous Category Posts:*** ***(https://wcr.indianrailways.gov.in/uploads/files/16584933031 14-english%20GDCE%2002_2022.pdf)***	16	
		(Chapter 3) **Theory of Mechanics**: Principle of non-traditional	***National Exams:*** ***1. GATE:*** ***(https://gate2024.iisc.a c.in/wp-content/uploads/2023/07/me.pdf)*** ***2. UPSC Engineering Service Examination:*** ***(https://upsc.gov.in/sites/d***		

	Machining and Machine Tool Operations	machining Process, principles of work holding, jigs and fixtures; abrasive machining processes; NC/CNC machines and CNC programming. Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools	*efault/files/Notif-ESEP- 23-engl-140922- Final.pdf), Page- 22,23* 3. ***UPSC Civil Service Examination:*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), Page- 127- 129* 4. ***SSC Junior Engineer:*** *(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/NOTICE_JE_2023_26072023.pdf)* 5. ***RRB JE, Technician, & Miscellaneous Category Posts:*** *(https://wcr.indianrailways.gov.in/uploads/files/1658493303114-english%20GDCE%2002_2022.pdf)*	16	

Text Books:

1. G.K publishers GATE Mechanical Engineering.
2. McGraw Hill GATE 2017 Mechanical Engineering.
3. Wiley GATE 2017 Mechanical Engineering

Subject Name: Skill Development for Professionals- VII **Credit: 0.5 Lecture Hours:48**
Subject Code: HSMC782

Module number	Topic	Sub- topics	Mapping with International/National/ State Level Exams	Lecture Hours	Corresponding Assignment
1	**Revision and Advanced Problems in Quantitative Aptitude:**	**Textbook:** Quantitative Aptitude for Competitive Examination **Author:** R.S Agarwal **Publishing House:** S. Chand 1. Simple Interest 2. Compound Interest 3. Speed, Time, Distance	***National Exams:*** ***1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26*** ***2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam- 2023-Engl-211222.pdf), pg 20-21*** ***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304 2023.pdf) pg. 20-22*** ***4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023- Notification-Emp-News.pdf) State Level Exams:*** ***1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1*** 2. **Miscellaneous Services Recruitment Examination** (https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp-	12	**Simple Interest:** 1. **The Impact of Time:** Compare the simple interest earned on a fixed principal at a constant rate over different time periods (e.g., 5 years vs. 10 years). 2 **Loan Repayment:** Calculate the total amount to be repaid on a loan with simple interest, including the principal and interest. 3. **Finding the Rate:** Given the principal, time, and interest earned, determine the simple interest rate 4. **Simple Interest in Savings Accounts:** Analyze how simple interest affects the growth of savings in a bank account over time. **Simple Interest:** 1. **The Impact of Time:** Compare the simple interest earned on a fixed principal at a constant rate over different time periods (e.g., 5 years vs. 10 years) 5 **Loan Repayment:** Calculate the total amount to be repaid on a loan with simple interest, including the principal and interest. 6 **Finding the Rate:** Given the principal, time, and interest earned, determine the simple interest rate 7. **Simple Interest in Savings Accounts:** Analyze how simple interest affects the growth of savings in a bank account over time

			content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf) *pg 1*		**Speed, Time, Distance:** 1. **Fuel Efficiency:** Calculate how fuel consumption changes when a vehicle travels at different speeds over a fixed distance. 2. **Travel Planning:** Determine the arrival time of a journey considering the distance, average speed, and rest stops. 3. **Race Analysis:** Analyze the performance of athletes in a race, considering their speeds and distances covered at different intervals. 4. **Distance-Time Graphs:** Interpret distance-time graphs to determine the speed, acceleration, and rest periods of an object.
2	**Revision and Advanced Problems in Reasoning**	**Textbook:** Verbal and Non- Verbal reasoning **Author:** R.S Agarwal **Publishing House:** S. Chand 1. Miscellaneous Problems on Logical Reasoning [CAT level 4] 2. Analytical Puzzle Syllogism	***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304 2023.pdf) pg. 20-22*** ***4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB- ACIO-Recruitment-2023- Notification-Emp-News.pdf) State Level Exams:*** ***1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download***	12	**Miscellaneous Problems on Logical Reasoning (CAT level 4):** 1. **Letter Series and Coding-Decoding:** Complex letter series with multiple interlinked patterns, coding-decoding problems with substitution ciphers and mathematical operations. 2 **Blood Relations and Family Tree:** Extensive family tree problems with multiple generations and complex relationships, including in-laws, step-relations, and adopted family members. 3. **Direction Sense and Distance:** Advanced direction sense problems with multiple turns, distances, and landmarks, incorporating concepts like shadows and

			?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1 **Miscellaneous Services Recruitment Examination** (*file:///C:/Users/UEMK/Downloads/2707970_2019.pdf*) *pg 1*		relative directions. 4. **Ranking and Order:** Complex ranking problems involving multiple criteria, groups, and variables, requiring deduction and elimination. 5. **Data Sufficiency:** Data sufficiency questions with multiple statements, requiring analysis of whether the information is sufficient to answer the question. **Analytical Puzzles:** • Order Based Puzzle • Floor Based Puzzle • Box Based Puzzle • Flat Based Puzzle • Matrix Puzzle • Distance based Puzzle • Schedule Puzzle • Classification Puzzle • Distribution Puzzle **Syllogisms:** • **Either-Or Case** • Neither -Nor Case • No and Some Not case Reverse Syllogism
	Revision and Advanced Questions in Verbal English	**Textbook:** Objective General English **Author:** R.S Agarwal **Publishing house:** S. Chand 1. Miscellaneous 2. Spotting Errors 3. Fillers.	*National Exams:* *1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* *2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21*	12	**1. Miscellaneous:** • Sentence Transformation • Error Correction (General • Idiom and Phrase Usage **2. Spotting Errors:** • Noun Error • Verb Tense Errors

		Advanced Application of 5. Vocabulary 4. Reading Comprehension Curriculum Vitae writing/ Argument Writing	***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304 2023.pdf) pg. 20-22*** ***4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB- ACIO-Recruitment-2023- Notification-Emp-News.pdf)*** ***State Level Exams:*** ***1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1*** ***2.*** **Miscellaneous Services Recruitment Examination** (https://adda247jobs-wp- assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf) ***pg 1***		• Preposition Errors • Article Errors • Pronoun Errors • Adjective Errors • Adverb Errors **3. Fillers:** • **Single Word Fillers:** Provide sentences with blanks and multiple-choice options for the correct word. • **Double Blank Fillers:** Give sentences with two blanks and options for each, requiring students to choose the best combination. • **Phrase Fillers:** Include sentences with blanks that need to be filled with appropriate phrases or idioms. **4. Advanced Application of Vocabulary:** • **Synonym/Antonym Discrimination:** Give words and have students identify synonyms and antonyms from a list of options, emphasizing subtle differences in meaning. • **One Word Substitution** **5. Reading Comprehension:** **6. Curriculum Vitae (CV) Writing/Argument Writing:** • **CV Writing:** Provide guidelines and examples for writing an effective CV, emphasizing proper formatting, concise language, and highlighting relevant skills and experiences. **Argument Writing:** Give a controversial topic or

					issue and have students write an argumentative essay, presenting evidence to support their stance and refuting opposing viewpoints.
4	**Data Interpretation**	**Textbook:** Quantitative Aptitude for Competitive Examination **Author:** R.S Agarwal **Publishing House:** S. Chand 1. Various Charts 2. Diagrams Tables	***National Exams:*** ***1.UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26*** ***2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam- 2023-Engl-211222.pdf), pg 20-21*** ***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_0304 2023.pdf) pg. 20-22*** ***4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment- 2023-Notification-Emp- News.pdf)*** ***5. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023FA65E4FB1C2CF473396B4FD7E5F69CDDE.PDF), pg 22- 23*** ***State Level Exams:*** ***6.Civil Services Executive Exam***	12	Application of Data Analysis in the forms of following charts: 1. Tabular 2. Bar 3. Pie 3. Line Graph

			(WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1 **Miscellaneous Services Recruitment Examination** (https://adda247jobs-wp- assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf) *pg 1*		