

**UNIVERSITY POLYTECHNIC
INSTITUTE OF TECHNOLOGY MESRA – 835215 (R)
DEPARTMENT OF AUTOMOBILE ENGINEERING**

IV Semester

NEW COURSE STRUCTURE– To be effective for Diploma 2023-24 [2 nd Year Onwards] Based on CBCS system & OBE model Recommended scheme of study (For Diploma in Automobile Engineering)								
FOURTH	THEORY							
	Program Core Course	DME 401	Strength of Materials	3	0	0	3	
		DAE 403	. Automobile Engine	3	0	0	3	
	Program Elective	PE- I: DPE411/DPE412/DPE413		3	0	0	3	
	Program Elective	PE- II: DPE414/DPE415/DPE456		3	0	0	3	
	Open Elective	OE-I: DOE 417/ DOE 452		3	0	0	3	
	SESSIONAL							
	Program Core Course	DME 402	Strength of Materials Lab.	0	0	2	1	
		DAE 404	Automobile Engine Lab-I	0	0	2	1	
		DME 406	Computer Aided Design (CAD)Lab	0	0	2	1	
	Project	DPR 411	Minor Project	0	0	4	2	
	Mandatory Course	DAU 401	Essence of Indian Knowledge and Tradition	2	0	0	0 (Non-credit)	
	TOTAL CREDITS							20
	Total Lectures per Week				27			
GRAND TOTAL FOR SECOND YEAR						40		

UNIVERSITY POLYTECHNIC
B.I.T., MESRA – 835215 (RANCHI)
SYLLABUS (CBCS)-2023

COURSE: Strength of Materials

PROGRAMME: DIPLOMA							
COURSE CODE: DME 401			Course Title: Strength Of Materials				
COMPULSARY / OPTIONAL: COMPULSARY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

COURSE OBJECTIVE: students will be able to understand about

1.	Understand the fundamentals of solid mechanics, Acquire elementary knowledge of stresses, strains & material properties.
2.	Understand & analyse the basic principles involved in the behaviour of machine parts under simple loading in the context of uni-axial and biaxial system.
3.	Compute shear force and bending moment with different loading condition
4.	Estimate the slope and deflection in different loading conditions
5.	Estimate shear and bending stress in different loading conditions

COURSE OUT COMES:After the completion of this course students will be able to understand about

CO1	To know the mechanical material properties, deformation and stresses induced in different loading condition.
CO2	To know concept of uni-axial and biaxial stress system.
CO3	To Know Computation of shear force and bending moment along with their distribution diagram
CO4	To Compute bending stress, deflection and safe load.
CO5	To Compare strength and stiffness of solid and hollow shaft.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	TITLE: Basic Concepts of Properties of Materials 1.1 Definition, elastic & plastic properties of material. 1.2 Stress & strain diagram for ductile & brittle materials 1.3 Basic concepts of Simple stresses and strains. 1.4 Simple stress and strain in composite sections 1.5 concept of Thermal stresses & elastic constants. 1.6 Relation between elastic constants. Course Outcome: CO1 Teaching Hours: 8 hrs
2	TITLE: Principal Planes and Stresses 2.1 Principal stresses and principal planes, 2.2 Stress in Oblique plane 2.3 Biaxial stress system 2.4 Mohr's circle for biaxial stresses. Course Outcome: CO2 Teaching Hours: 8 hrs
3	TITLE: Bending Moment and shearing forces 3.1 Types of beams, types of support 3.2 Shear force and bending moment diagram for simply supported and Cantilever beam subjected to point load. 3.3 Shear force and bending moment diagram for simply supported and Cantilever beam subjected uniformly distributed loads and combined load. 3.4 Relation between intensity of loading, shear force and bending moment. Course Outcome: CO3 Teaching Hours: 8hrs
4	TITLE: Theory of Bending, slope and deflection of beams 4.1 Concept of theory of simple and Pure bending, 4.2 Relation between slope and deflection 4.3 Assumption in Bending and Bending equation 4.4 calculations of slope and deflection for cantilever & simply supported beams in simple loading condition. 4.5 Simple Numerical problems on standard section for bending stress. Course Outcome: CO4 Teaching Hours :10 hrs
5	TITLE: Torsion 5.1 Concept of Pure Torsion (shear stress) 5.2 Assumptions in theory of pure Torsion 5.3 Torsion equation for solid and hollow circular shafts 5.4 Comparison between Solid and Hollow Shafts. Course Outcome: CO5 Teaching Hours:6hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Strength of Material	S. Ramamrutham, Dhanpat Rai & Publications, New Delhi	ISBN -10; 919743354X
2.	Strength of materials	R. K. Bansal, S chand Publications, New Delhi	ISBN 9789385401961
3.	Strength of material	Beer and Jonson, Tata Mcgrew hill	ISBn 9781259097171
4.	Strength of materials	R. S. Khurmi, Schand of Company Ltd., New Delhi	
5	Strength of materials	G. H. RYDER	

E-REFERENCES:

1. Website: <http>

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	3	1	1	2
CO2	2	2	2	1	2	2	2	1	2	2
CO3	2	2	2	1	2	1	2	1	2	3
CO4	2	2	2	1	2	1	2	1	1	3
CO5	2	3	2	2	2	2	3	1	1	3

UNIVERSITY POLYTECHNIC

B.I.T., MESRA – 835215 (RANCHI)

SYLLABUS (CBCS)-2023

COURSE: Automobile Engine

PROGRAMME: DIPLOMA							
COURSE CODE: DAE403				Course Title: . Automobile Engine			
COMPULSARY / OPTIONAL: COMPULSARY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	Final	Total
3	0	0	3	3	50	50	100

COURSE OBJECTIVE: students will be able to understand about

1	To understand the various concept and basic principles of the engine.
2	To understand the basics components and their working principles of the Engine.
3	Combustion of S.I and CI Engine and their mechanism of the combustion process.
4	Students will enable to understand the air- fuel ratio and ignition systems.
5	Modern trends and technological trends in the Automobile sector

COURSE OUTCOME: After the completion of this course, students will be able to

CO1	Significance of Automotive engine properties in order to analyse a automotive system.
CO2	To concept of automotive engine parts and their applications
CO3	to know characteristics of petrol and diesel engine fuel and their combustion process.
CO4	To study the different types fuel and know their properties and uses of fuel.
CO5	Modern trends and technological trends in the Automobile sector and properties of lubricating oil, Servicing.

COURSE CONTENT DETAILS:

MODULE	TOPIC/SUBTOPIC
1	Introduction: 1:1 Basic units, major components of engine 1:2 mechanism of operation, 1:3 Four- Stroke and two – Stroke Petrol and diesel engine, their applications 1:4 classification of automobile engine. Course Outcome: CO1 Teaching Hours: 8hrs

2	Constructional details of automotive engine: 2:1 Introduction, multi-valve overhead cam system 2:2 Cylinder liner, piston, rings, Connecting rod, crank shaft, Main bearing, Cam shaft 2:3 Valves seats, Valve mechanism, Valve timing gears, 2:4 balancing, flywheel, Vibration damper, timing order. Course Outcome: CO2 Teaching Hours: 8hrs
3	Combustion Phenomenon: 3:1 Characteristics of petrol and diesel engine fuels 3:2 additives, Combustion in S.I. and C.I. engines, flame propagation, 3:3 Detonation, Pre-ignition and diesel knock, 3:4 chamber of S.I. and C.I. engines 3:5 HUCR, octane and cetane number, E.G.R. system. Course Outcome: CO3 Teaching Hours: 8hrs
4	Fuel Feed System Engine: 4:1 Petrol fuel feed system, Petrol pumps, carburettors 4:2 Air fuel ratio of combustion, electronic control of A / F ratios, Petrol injection, 4:3 M.P.F.I. system, injection timing, Air cleaners, manifold, exhaust pipe, Muffler 4:4 supercharging, Turbo charger. Fuel feed system, fuel injection pump, 4:5 fuel injection system testing, fuel feed pump, injector, fuel pump governor 4:6 devices for cold starting, emission control Course Outcome: CO5 Teaching Hours: 8hrs
5	Cooling systems & lubricating system: 5:1 Significance, types of cooling systems and their description, water pump, fan, radiator, cooling system cleaning and maintenance, 5:2 anti – freeze solution. Signification, components, 5:3 Oil strainer, Oil filter, Oil cooler, Oil seal, Crank case ventilation, Oil pressure gauge, Oil level indicator, 5:4 properties of lubricating oil, Servicing and troubleshooting of lubrication system. Course Outcome: CO5 Teaching Hours: 8hrs

References Books:

- | | |
|--------------------------------|------------------------|
| 1. Internal Combustion Engines | Shyam K.Agrawal |
| 2. Internal Combustion Engines | Feruson & Kirkpartrick |

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	1	3	3	3	3	1	2	3
CO2	3	3	1	2	3	2	3	1	3	2
CO3	3	3	1	2	3	3	3	3	2	2
CO4	3	2	1	2	2	2	2	3	1	2
CO5	3	2	1	3	3	3	3	2	3	3

UNIVERSITY POLYTECHNIC
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SYLLABUS (CBCS)-2023
COURSE: Strength of Materials Lab

PROGRAMME: DIPLOMA							
COURSE CODE: DME 402			Course Title: Strength Of Materials Lab				
COMPULSARY / OPTIONAL: COMPULSARY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	60	40	100

Course Objectives: Students will be able to understand about to

1.	Understand the fundamentals of solid mechanics, Acquire elementary knowledge of stresses, strains & material properties.
2.	Understand & analyse the basic principles involved in the behaviour of machine parts under simple loading in the context of uni-axial and biaxial system.
3.	Compute shear force and bending moment with different loading condition
4.	Estimate the slope and deflection in different loading conditions
5.	Estimate shear and bending stress in different loading conditions

Course Outcome: After the completion of this course Students will be able to understand about to

CO1	To know the mechanical material properties, deformation and stresses induced in different loading condition.
CO2	Determine the Rockwell and Brinell Hardness for various materials
CO3	Computation of shear force and bending moment
CO4	Computation of deflection and young's modulus of elasticity
CO5	To determine the torsional strength and Modulus of Rigidity of Material

LIST OF EXPERIMENTS

Sl. No.	Experiments	CO
1	Study of Universal Testing Machine	CO1
2	find out Tensile Strength of mild steel rod	
3	Study of Rockwell Hardness Machine and find out hardness of ductile material	CO2
4	Study of Brinell Hardness Machine. and find out hardness of ductile material	
5	Find out the deflection and Young Modulus of simply supported beam	CO3 & Co4
6	Find out the deflection and Young Modulus of Cantilever beam.	
7	Find out the modulus of Rigidity and angle of twist of solid steel rod by torsion test	CO5
8	Find out the modulus of Rigidity and angle of twist of Hollow steel rod by torsion test	

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Strength of Material	S. Ramamrutham, Dhanpat Rai & Publications, New Delhi	ISBN -10; 919743354X
2.	Strength of materials	R. K. Bansal, S chand Publications, New Delhi	ISBN 9789385401961
3.	Strength of material	Beer and Jonson, Tata Mcgrew hill	ISBn 9781259097171
4.	Strength of materials	R. S. Khurmi, Schand of Company Ltd., New Delhi	
5	Strength of materials	G. H. RYDER	

1 Low 2- Medium 3- High
Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	3	1	1	3
CO2	2	2	2	1	2	2	2	1	1	2
CO3	2	2	5	1	2	1	2	1	1	3
CO4	2	2	2	1	2	1	2	1	1	1
CO5	2	3	2	2	2	2	3	1	1	3

UNIVERSITY POLYTECHNIC
B.I.T., MESRA – 835215 (RANCHI)
SYLLABUS (CBCS)-2023
COURSE: Automobile Engine Lab-I

PROGRAMME: DIPLOMA							
COURSE CODE: DAE: 404				Course Title: . Automobile Engine Lab-I			
COMPULSARY / OPTIONAL: COMPULSARY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOUR/WEEK	CRIDIT	PE	FINAL	TOTAL
0	0	2	2	1	60	40	100

COURSE OBJECTIVES: students will be able to understand about

1	To know the engine Dynamometers.
2	To know the different types diesel engine and Petrol engine
3	To know the concept of breaks & shock absorber and their circuits
4	To know the concept of wheel alignments.
5	To know the concept of diesel engine and Gas turbine.

COURSE OUT COME: After the completion of this course, students will be able to

CO1	To find the basic difference of Engine Dynamometer
CO2	To know the working Diesel & petrol Engine
CO3	To know the working process of different types shock absorber & Breaking system
CO4	To know the working process of wheel alignment
CO5	To know the concept of diesel engine Gas Turbine

LIST OF EXPERIMENTS

1	Engine Dynamometer
2	Diesel Engine Test Bed System
3	Shock Absorber Trainer
4	Brake Test hydraulic Dual circuit Breaker system
5	Wheel Alignment Trainer
6	Petrol Engine Test Bed System
7	Hydraulic Engine Dynamometer
8	Gas Turbine

REFERENCE BOOKS:

S.NO	TITLE	Author, Publisher, Edition and Year of publication	ISBN
1	Automobile Engineering	Kirpal Singh	81-86308-01-6,978-81-8014-196-6
2	Automobile Engineering	Khurmi, R. S	

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	1	2	2
CO2	3	3	2	3	3	3	3	3	2	3
CO3	3	3	1	3	3	3	3	1	3	2
CO4	3	3	3	3	3	3	3	1	3	2
CO5	3	3	1	3	3	3	1	3	2	3

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SYLLABUS (CBCS)-2023

COURSE (CAD Lab)

PROGRAMME: DIPLOMA							
COURSE CODE: DME 406			Course Title: Computer Aided Design lab				
COMPULSARY / OPTIONAL: COMPULSARY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	60	40	100

Course Objectives: Students will be able to understand about

1.	To understand the fundamentals and use of CAD.
2.	To conceptualize the concept of Drafting and Modeling in CAD.
3.	To interpret the various features solid modeling technique.
4.	To synthesize the various parts or components in an assembly.
5.	To make output as well as export format of model with respect to different software.

Course Outcome: After the completion of this course Students will be able to understand about

CO1	Able to understand the concept and features of a CAD.
CO2	Able to understand graphical formation of simple geometrical objects.
CO3	Able to do 2D and 3D transformation of simple geometrical objects
CO4	Able to do synthesize the various parts or components in an assembly.
CO5	Able To make output as well as export format of model with respect to different software.

COURSE CONTENT DETAILS:LIST OF EXPERIMENTS

Sl. No.	Experiments	CO
1	Practice on the following commands Units, limits, grid, line, poly-line, donut, polygon, chamfer, fillet, offset, text, de-text.	CO1
2	Practice on the following commands: Osnap, Extension, undo, redo, oops, colour, line-type, layer, save, quit, end. Hints: use layers, colour, line-types)	
3	Practice on the following commands: Erase, Copy, move, array, break, trim, mirror, pEdit, pan, divide, zoom	CO2
4	Practice on the following commands: Hatch, batch, Hatch, edit, boundary	

	and dimensioning.	
5	Draw the details of the foot step bearing and also draw plan and elevation (full sectional).	CO3 & Co4
6	Draw the details of connecting Rod, Crankpin, cylinder block and also draw plan and Elevation	
7	Draw all the Automobile components by using the CAD Tools	CO5
8	Take output on plotter, file and export in different format of CAD Models.	

REFERENCE BOOKS

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	CAD/CAM–	Ibrahim Zeid, Tata McGraw Hill Publishing Comp. Ltd., New Delhi	
2.	CAD/CAM	P. N.Rao	
3.	Practice on Auto CAD		

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	3	1	1	2
CO2	2	2	2	1	2	2	2	1	2	3
CO3	2	2	2	1	2	1	2	1	1	3
CO4	2	2	2	1	2	1	2	1	3	3
CO5	2	3	2	2	2	2	3	1	3	3

UNIVERSITY POLYTECHNIC

B.I.T., MESRA – 835215 (RANCHI)

SYLLABUS (CBCS)-2023

COURSE: Automotive Garage and Equipment

PROGRAMME: DIPLOMA							
COURSE CODE: DPE 411			Course Title: Automotive Garage and Equipment				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	Final	Total
3	0	0	3	3	50	50	100

COURSE OBJECTIVE: students will be able to understand about

1	Understand the terminology of the Automobile components and their function
2	Know about inspection and engineering performance.
3	Constructional and Design details of the Automobile transmission and drive systems.
4	Focusing of head lamp and maintenance of electrical accessories
5	Trouble-shooting, and fault diagnosis of the Various Automobile systems

CORSE OUTCOME: After the completion of this course students will be able to understand about

CO1	To know the terminology of the Automobile components and their measurements.
CO2	Know about inspection different components and their engineering performance.
CO3	Constructional and Design details of the Automobile transmission and drive systems.
CO4	Focusing of head lamp and maintenance of electrical accessories, Frame repairs and alignments, and maintenance.
CO5	To know different Trouble-shooting, and fault diagnosis of the Various Automobile systems

COURSE CONTENT DETAILS:

MODULE	TOPICS / SUBTOPICS
1	Inspection of Cylinder 1.1 Inspection of cylinder wears Changing of ring set 1.2 Measurement of Quality & temperedness 1.3 Cylinder boring, 1.4 Honing process, changing of liners Course Outcome: CO1 Teaching Hours: 8 hrs.
2	Inspection of Crankshaft 2.1 Inspections of Crankshaft for wear ovality & taper 2.2 Crankshaft grinding procedure corresponding under sized bearing. 2.3 Bearing effect of crankshaft & bearing wear on engineering performance. Course Outcome: CO2 Teaching Hours: 8 hrs
3	Transmission Maintenance 3.1 Transmission system maintenance 3.2 adjustment of clutch, causes & remedies of gear box faults 3.3 causes & remedies of propeller shaft 3.4 causes & remedies of differential & Rear axle, inspection & adjustment of brakes

	3.5 hydraulic brake system & brake bleeding, air assisted hydraulic brakes, 3.6 air brakes and their adjustment. Course Outcome: CO3 Teaching Hours: 8 hrs
4	Body Maintenance 4.1 Adjustment of doors and Locks 4.2 Frame repairs and alignments, Front wheel alignment procedures & steering linkage 4.3 care of wheels & tyres, reclaiming & re-treading of tyres, vulcanizing, focusing of head lamp and maintenance of electrical accessories. Course Outcome: CO4 Teaching Hours: 8 hrs
5	Fuel System 5.1 Tuning of carburettors, adjustment of idle speed, 5.2 winter & summer adjustment, float level adjustment, 5.3 metering pin adjustment. Theories & Maintenance of MPFI System, 5.4 trouble shooting, and fault diagnosis of MPFI engines, 5.5 Testing & replacing of sensors and injectors. Course Outcome: CO5 Teaching Hours: 8 hrs

Books Recommended

1. Automotive mechanics by Williams H Course and Donald
2. Car maintenance and repair by A W Judge Vol.IV
3. Maintenance of high-speed diesel engine by A W Judge
4. Automotive Engineering by G B SNarang
5. Automotive Engineering by Kripal Singh
6. Service manual – Maruti, Indicia, Santro, Accent etc.

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	3	3	1	3	3
CO2	2	3	1	2	2	3	3	1	3	3
CO3	1	2	1	1	2	3	3	1	3	3
CO4	2	3	1	2	3	3	3	1	3	3
CO5	3	3	1	3	3	3	3	1	3	3

UNIVERSITY POLYTECHNIC
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SYLLABUS (CBCS)-2023
COURSE: Mechatronics

PROGRAMME: DIPLOMA							
COURSE CODE: DPE 412			Course Title: Mechatronics				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

COURSE OBJECTIVE: Students will be able to understand about

1.	Discuss the importance of mechatronics systems and know the usage of Sensors and Transducers for automation applications
2.	Acquire the knowledge of combinational and sequential logic circuits
3.	Know the various electro and mechanical systems available for automation
4.	Design the Building blocks of Mechanical, Electrical, Fluid and Thermal Systems
5.	Describe the significance of PLC for automation

COURSE OUTCOMES: After the completion of this course Students will be able to understand about

CO1	To expose the students in the interdisciplinary applications of Electronics, Electrical.
CO2	Mechanical and Computer Systems for the Control of Mechanical and Electronic Systems.
CO3	Know the importance of communication systems and its interface and Design the Mechatronics System.
CO4	Implementing electronics control in a mechanical system
CO5	Replacing mechanical component with an electronic solution. This course will cover all aspects related with mechatronics such as sensors and transducers, actuators and mechanisms, signal conditioning, microprocessors and microcontrollers,

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Mechatronics, Sensors, Transducers 1.1 Introduction to Mechatronics Systems, Measurement Systems, Control Systems 1.2 Sensors and Transducers, Performance Terminology, 1.3 Sensors for-Displacement, Velocity, Force, 1.4 Fluid Pressure, Liquid Flow, Liquid Level, 1.5 Temperature, Light Sensors, Selection of Sensors. Course Outcome: CO1 Teaching Hours: 8 hrs
2	Digital Logic and Data Presentation 2.1 Digital Signals-Introduction, Analog and digital signals, 2.2 Digital to Analog conversion. -Logic. Gates- 2.3 AND-OR-NOT-NAND-NOR-XOR,

	2.4 Applications-Coder-Encoder, Decoder with seven segment display -LCD- (Traffic Light), 2.5 Sequential logic, Flip Flops elements, Laser printer, 2.6 Data acquisition system, Selection criteria. Course Outcome: CO2 Teaching Hours:8hrs
3	Actuation System 3.1 Electrical Actuation Systems, Mechanical Switches, Solid State Switches. 3.2 Types –Diode Power MOSFETs, Solenoids, D.C Motors-Basic working 3.3 principle-Types- A.C Motors Basic working principle, 3.4 Types - Stepper Motors- Basic working principle - List Types - Stepper motor specifications 3.5 Mechanical Actuation Systems - Ratchet and Pawl - Bearings. Course Outcome: CO3 Teaching Hours:8 hrs
4	System Models and Controller 4.1 Building blocks of Mechanical, Electrical, Fluid and Thermal systems 4.2 Rotational - Translational Systems, -Electromechanical Systems, Hydraulic, Mechanical Systems 4.3 Continuous and discrete process Controllers, Control Mode - Digital Controllers - Velocity Control - Adaptive Control. Course Outcome: CO4 Teaching Hours:8 hrs
5	Communication Design System 5.1 Digital Communication Systems-Centralized, Hierarchical and Distributed 5.2 Control Networks-Protocols-Open Systems Interconnection communication model, 5.3 Communication Interfaces-Possible Design Solutions Case Studies of Mechatronics Systems, 5.4 Car Park barrier Systems - Engine Management Systems- Hard disc drive. Course Outcome: CO5 Teaching Hours:8hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Mechatronics	W.Bolton, Pearson education	
2.	Mechatronics	HMT	
3.	Digital Electronics	Flyod	

E-REFERENCES:

1. <https://nptel.ac.in/courses/112103019/>
2. <https://elearn.nptel.ac.in/shop/nptel/mechatronics/?v=c86ee0d9d7ed>

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	3	1	1	3
CO2	2	2	2	1	2	2	2	1	2	3
CO3	2	2	2	1	2	1	2	1	1	3
CO4	2	2	2	1	2	1	2	1	1	3
CO5	2	3	2	2	2	2	3	1	3	3

UNIVERSITY POLYTECHNIC

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SYLLABUS (CBCS)-2023

COURSE: Automotive Chassis and Transmission

PROGRAMME: DIPLOMA							
COURSE CODE: DPE 413			Course Title: chassis body transmission				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURE/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

COURSE OBJECTIVES: students will be able to understand about

1	To understand the different types of motor vehicles and their components.
2	To know the arrangements of chassis.
3	To know the engine and their constructional details.
4	To know the components of transmission system
5	To know the controlling units of automotive vehicles.

COURSE OUTCOME: After the completion of this course, students will be able to

CO1	To understand the different types of motor vehicles components and their performance.
CO2	To know the arrangements of chassis.
CO3	To know the different types of engines and their constructional details.
CO4	To know the components of transmission system
CO5	To know the controlling units of automotive vehicles.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Introduction: 1.1 General classification of motor vehicles, 1.2 Layout and main components, Specification of an automobile. 1.3 Performance of an automobile, 1.4 Calculation of total loads, tructive effort and propulsive power. Course Outcome CO1 Teaching Hour: 8hr
2	Chassis: 2.1Frame and body, 2.2 Suspension system, 2.3Springs, 2.4 Wheels and tires. Course Outcome CO2 Teaching Hour: 8hr
3	Engine: 3.1 Types of engines, comparison, rating and specification,

	3.2 Constructional details of automobile engine, 3.3 Constructional details of automobile engine, engine mounting, 3.4 Exhaust system, emission control. Course Outcome CO3 Teaching Hour: 8hr
4	Transmission: 4.1 Clutch, 4.2 gear box, 4.3 propeller shaft, universal joint, final drive, 4.4 differential, front axle and rear axle, 4.5 over drive and under drive. Course Outcome CO4 Teaching Hour: 8hr
5	Automobile Control System: 5.1 Steering system, 5.2 Brakes and braking system, 5.3 Speed control and governing. 5.5 Automatic control system. Course Outcome CO5 Teaching Hour: 8hr

E-Reference Books

S.No	Title	Author / Publisher	ISBN
1	Automobile engineering vol. -I & II	Dr. Kirpal Singh	978-81-8014-196-6, 81-8014-124-1
2	Automobile engineering	K.K. Jain, R.B. Asthana	0-07-049529-X
3	Automobile engineering	Gupta	

E-Reference

1. <https://nptel.ac.in/courses/112103019/>
2. <https://www.tandfonline.com/>
3. Web links and Video Lectures (e-Resources): E-book
URL: <https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html>

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	P3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	2	2	1	3	2
CO2	2	2	2	2	2	2	2	1	3	3
CO3	2	3	3	2	2	2	1	1	3	3
CO4	3	1	1	2	2	2	2	1	3	3
CO5	3	3	2	2	2	2	2	1	2	3

UNIVERSITY POLYTECHNIC

B.I.T., MESRA – 835215 (RANCHI)

SYLLABUS (CBCS)-2023

COURSE: Industrial Automation & Robotics

PROGRAMME: DIPLOMA							
COURSE CODE: DPE 414			Course Title: Industrial Automation & Robotics				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

COURSE OBJECTIVE: Students will be able to understand about to

1.	To present a comprehensive study of Industrial Automation.
2.	To understand the material handling system and design.
3.	To present a comprehensive study of robot and its types
4.	To develop an understanding on various control techniques
5.	To understand advantages and applications of Industrial Robot

COURSE OUTCOMES: After the completion of this course Students will be able to understand about to

CO1	Principle, strategies and advantages of industrial automation.
CO2	Enumerate material handling and material storage systems for an automated factory.
CO3	Various types of industrial robotic systems.
CO4	Automate the shop floor control.
CO5	Advantages of industrial robot.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Principle and Strategies of Automation 1.1 Power to accomplish the automated process 1.2 Program of instruction, Control system 1.3 Advance Automated Function-Safety monitoring, Maintenance and Repair Diagnostic, Error Detection and Recovery, Level of Automation Course Outcome: CO1 Teaching Hours :8 hrs
2	Material Handling System 2.1 Introduction to Material Handling System, Overview of Material Handling

	Equipment,10 Principles of Material Handling 2.2 Material Transport System-Industrial Trucks, Automated Guided Vehicle System, Conveyor System, Cranes and Hoists 2.3 Storage System-Storage System Location and Strategies, Conventional Storage Method and Equipment. Course Outcome: CO 2 Teaching Hours: 8 hrs
3	Robot Anatomy and Related Attributes 3.1 Joints and Links 3.2 Common Robot Configuration 3.3 Joint Drive System Course Outcome: CO3, Teaching Hours: 8 hrs
4	Control System, End Effectors and Sensors in Robotics 4.1 Grippers, Tools 4.2 Tactile Sensors, Proximity Sensors, Optical Sensors Course Outcome: CO 4, Teaching Hours: 8 hrs
5	Industrial Robot Application 5.1 Material Handling Application 5.2 Process Operation 5.3 Assembly and Inspection Course Outcome: CO5, Teaching Hours: 8 hrs

REFERENCE BOOKS:

S.No	Title	Author, Publisher, Edition and Year of publication	ISBN
1	Industrial Robotics	Ganesh S.Hegde,University Science Press,Second,2008	978-81-318-0518-3
2	Robotics Technology and Flexible Automation	S.R.Dev&S.Dev,McGrawHill,Second,2010	978-0-07-007791-1

REFERENCES:

1. https://www.academia.edu/33481321/Automation_Production_Systems_and_CIM_Groover
2. <https://youtu.be/gPaBULgRRuM?si=KQx2k1BJBOJRpjzF>
3. <https://youtu.be/KgQyuCrOKoU?si=iDg0pItHvcFoql36>
4. https://youtu.be/YXP_jNhtDI?si=BdSek6RaGcJIBasd

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	P3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	2	2	1	2	3
CO2	2	2	2	2	2	2	2	1	3	3
CO3	2	3	3	2	2	2	1	1	1	3
CO4	3	1	1	2	2	2	2	1	1	3
CO5	3	3	2	2	2	2	2	1		3

UNIVERSITY POLYTECHNIC
B.I.T., MESRA – 835215 (RANCHI)
SYLLABUS (CBCS)-2023
COURSE: Paint Technology

PROGRAMME: DIPLOMA							
COURSE CODE: DPE 415			Course Title: Paint Technology				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

COURSE OBJECTIVE: students will be able to understand about

1	Understand the terminology of the Automobile paint.
2	To know the different types of tool & equipment's.
3	To know the surface treatments
4	To know the automobile painting process
5	To know the automobile paint defects and their remedies.

CORSE OUTCOME: After the completion of this course students will be able to understand about

CO1	To know the terminology of the Automobile paint.
CO2	To know the different types of tool & equipment's uses in automobile painting
CO3	To understand cleaning defect body and their treatments
CO4	To know the automobile painting process
CO5	To know the automobile paint defects and their remedies.

COURSE DETAILS:

MODULE	TOPICS / SUBTOPICS
1	Introduction 1.1 Definition and importance of painting 1.2 classification and use. Pigment, Binders, Solvent, oil, dryers, additives and primers. 1.3 Types of painting process- Traditional and modern technology. 1.4 Ex.- Brushing, Deeping, barrelling, Aerosol, roller coating, suction spray, vertical spray, pressure vessel, spray airless, electrostatic, powder coating etc. Course Outcome: CO1 Teaching Hours: 8 hrs
2	Tool and Equipment 2.1 Different types of dent remover tools and dent pullers 2.2 Different type of entrusting tools, Putty knife; Scraper knife 2.3 Different types of Brushes with shapes & sizes, spray gun and their types 2.4 Paint booth and their types, oven and their types, Polisher- Types and uses. Course Outcome: CO2 Teaching Hours: 8 hrs
3	Surface Treatment 3.1 Introduction, Different anti-rusting process 3.2 types and selection of sanding paper (polish paper) 3.3 Metal surface cleaning- Mechanical and chemical cleaning. (Dry/ wet Sanding,

	scraping, wire brushing, orbital wire brushing, paint burning, sand and shot-blasting, pickling and phosphating). Course Outcome: CO3 Teaching Hours: 8 hrs
4	Painting process 4.1Automotive painting methods a. Brushing, spray painting, b. manual and robotic 4.2 steps involve in painting: a. Preparation, Primer b. Base Coat, Clear Coat, Polish etc Course Outcome: CO4 Teaching Hours: 8 hrs
5	Paint defects and their remedies 5.1 Types of paint defects & its remedies 5.2 Importance of polishing, removal defects by polishing. Course Outcome: CO5 Teaching Hours: 8 hrs

Books Recommended

S.No	Title	Author, Publisher, Edition and Year of publication	ISBN
1	Outlines of Paint Technology	Publisher Edward Arnold	10 8123904304, 13 978-8123904306
	Introduction To Paint Chemistry	G.P.A.Turner Publisher champan	1489931805, 9781489931801
	Hall Polymer Science	V.R.Gowariker Publisher New Age International	0130181684

E-REFERENCES:

4. <https://nptel.ac.in/courses/112103019/>
5. <https://www.tandfonline.com/>
6. Web links and Video Lectures (e-Resources): E-book
URL:<https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.htm>

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	3	3	3	3	3
CO2	2	3	1	2	2	3	3	1	2	3
CO3	1	2	1	1	2	3	3	3	3	3
CO4	2	3	1	2	3	3	3	1	1	3
CO5	3	3	1	3	3	3	3	1	3	3

UNIVERSITY POLYTECHNIC

B.I.T., MESRA – 835215 (RANCHI)

SYLLABUS (CBCS)-2023

COURSE: Computer Aided Design and Manufacturing

PROGRAMME: DIPLOMA							
COURSE CODE: DPE 456			Course Title: Computer Aided Design and Manufacturing				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

Course Objectives: will be able to understand about to

1.	To understand the fundamentals and use of CAD.
2.	To conceptualize the concept of graphics for CAD.
3.	To interpret the various features of geometrical transformation and modelling technique.
4.	To understand the concept of Automated machine tool, fundamental of ROBOTS and Flexible manufacturing process.
5.	To understand fundamentals CNC programming and prepare CNC programs for various jobs.

COURSE OUTCOMES: After the completion of this course Students will be able to understand about to

CO1	Able to understand the concept and features of a CAD
CO2	Able to understand graphical formation of simple geometrical objects.
CO3	Able to do 2D and 3D transformation of simple geometrical entities
CO4	Understand the concept and features of CAM and the working of CNC turning and milling machine.
CO5	Able to Develop the part program for CNC Lathe and CNC Milling

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Basic Concept of CAD and CAM 1.1 Introduction of Computer Aided Design, 1.2 The Design Process, Product Cycle, CAD/CAM Developments 1.3 Definition of CAD & CAM Tools 1.4 Hardware and Software requirement of CAD 1.5 Engineering Application of CAD. Course Outcome: CO1 Teaching Hours: 8 hrs
2	Computer Graphics 2.1 Graphic System: Graphics Software configuration 2.2 Raster Scan system and Display process, Random Scan System

	2.3 Line draw algorithm – DDA & Berseem's 2.4 Mid- point circle Algorithm, 2.5 The various surface representation scheme & techniques. Course Outcome: CO2 Teaching Hours: 8 hrs
3	Geometric Transformations and Modling System 3.1 2D & 3D Transformations 3.2 Homogeneous transformation 3.3 windowing & clipping 3.4 Orthographic projection, Isometric projection 3.5 Wire frame, surface & solid modelling. Techniques Course Outcome: CO3 Teaching Hours: 8hrs
4	Introduction to Computer Aided Manufacturing, Robotics & FMS 4.1 Concept of numerical control machine, CNC machine and DNC machine, 4.2 Working principle of NC Machine, Merits of NC, CNC, DNC 4.3 Features, Construction and working principle of CNC Machines 4.4 Concept & Introduction of Robotics, Configuration of Robots, Industrial application of ROBOT 4.5 Introduction to FMS, components of FMS, Layout of FMS, Types of FMS. Course Outcome: CO4 Teaching Hours :10 hrs
5	CAM &Part Programming 5.1 NC coordinate system and motion control system 5.2 conventional programming and APT, Word address format, 5.3 preparatory function and M code 5.4 simple program for lathe and milling linear & circular interpolation. Course Outcome: CO5 Teaching Hours: 6hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Cad & CAM Concept & Applications	P.N. RAO, McGraw Hill Education (India) Pvt. Ltd.	978-0-07-068193-4
2.	CAD 7 CAM Theory & Practice	IBRAHIM ZIED & R, Shiva Subramaniam Mc Graw Hill Education (India) Pvt. Ltd.	978-0-07-05134-5
3.	Computer Aided Design & manufacturing	M. P. Groover & E. Zimmers Pearson	978-81-775-8416-5
4.	CAD/CAM/CIM	P. Radhakrishnan, S. Subramanyam & V. Raju New Age International Publisher	81-224-1248-3
5	Automation, Production System & Computer Integrated Manufacturing	Michell. P. Groover	81-7808-511-9

E-REFERENCES:

1. Website: <http://nptel.ac.in/courses/112103019/>
2. <https://www.tandfonline.com/>
3. Web links and Video Lectures (e-Resources): E-book

URL: <https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html>

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
C01	2	2	2	1	2	1	3	1	1	3
3C02	2	2	2	1	2	2	2	1	3	3
C03	2	2	2	1	2	1	2	1	1	3
C04	2	2	2	1	2	1	2	1	1	3
C05	2	3	2	2	2	2	3	1	1	3

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SYLLABUS (CBCS)-2023

COURSE: BASIC OF AUTOMOBILE ENGINEERING

PROGRAMME: DIPLOMA							
COURSE CODE: DOE 417			Course Title: Basic Of Automobile Engineering				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

COURSE OBJECTIVE: students will be able to understand about

1	To focus on understanding the concept of Engines parameters and performance.
2	Understand constructional details of automotive engine.
3	Concept of combustion phenomenon of SI and CI Engine
4	. Appreciate concept of Ignition, Transmission and Distribution system.
5	Concepts and familiarization of the Control, emission and Norms and regulation of Automobile Systems.

COURSE OUTCOME: After the completion of this course, students will be able to

1	Students will be able to understand the concept of Engines parameters and performance.
2	Good understanding on constructional details and parts of automotive engine'
3	An abstract idea of combustion phenomenon of SI and CI Engine
4	Understand fully the concept of Ignition, Transmission and Distribution system of Two and Four Stroke Engine.
5	Brief idea and introduction of the Control, emission and Norms and regulation of Automobile Systems.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Introduction Automotive Electrical and Electronics System: 1.1 Introduction to electrical system, Battery and Cranking Motor, 1.2 The charging circuit, the starting and ignition system 1.3 Electronically assisted ignition system, 1.4 Distributor-less ignition, Sensors and applications in automobiles, Pressure sensors, temperature sensors, Position sensors, 1.5 Air flow sensors, Knock sensors, Actuators, Solenoids, stepper motors. Course Outcome: CO1 Teaching Hours: 8 hr

2	Frame and Chassis 2.1 Type, frame and frameless construction, 2.2 description of suspension system such as leaf springs coil springs and torsion bar, 2.3 function and working of shock absorber (telescopic), 2.4 types of tyres, tyres specification, 2.5 front axles and stub axles, 2.6 Ackermann's principle of steering, layout of steering system, Function and principle of vehicle's braking, classification of various brakes used in automobiles Course Outcome: CO2 Teaching Hours: 8 hrs
3	I C Engine 3.1 Concept of two stroke and four stroke petrol and diesel engines and their application to automobiles. 3.2 Various terms, specification of automobile engine, 3.3 Differences between engines, Subsystems (i.e. intake, exhaust, fuel, cooling, lubrication systems etc. of engines. Course Outcome: CO3 Teaching Hours: 8 hrs
4	Transmission 4.1 Clutch, type, function and working of single plate and mutilate clutches. 4.2 Clutch pedal free play adjustment function of a gear box, 4.3 types of gear boxes, working of sliding and constant mesh gear boxes, 4.4 Final drive, universal joints, propeller shaft rear-axles final reduction, 4.5 differential and rear axles. Course Outcome: CO4 Teaching Hours: 8 hrs
5	Automobile Electrical Systems 5.1 Working of ignition, 5.2 charging and starting and lighting systems and their types and function of various components used in the circuits. 5.3 Function and working principle of a starter, dynamo and alternators. Course Outcome: CO5 Teaching Hours: 8 hrs

REFERENCE BOOKS:

S.NO	TITLE	Author, Publisher, Edition and Year of publication	ISBN
1	Automobile Engineering Vol. I & II	Kirpal Singh	81-86308-01-6, 978-81-8014-196-6
2	Automobile Engineering	Khurmi, R. S	
3	Automobile Engineering	De, Amitosh	

E-REFERENCES:

1. <https://youtu.be/gPaBULgRRuM?si=KQx2k1BJBOJRpjzF>
2. <https://youtu.be/KgQyuCrOKoU?si=iDg0pItHvcFoql36>
3. https://youtu.be/YXP_jJNhTdl?si=BdSek6RaGcJIBasd

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	1	3	3
CO2	3	3	2	3	3	3	3	1	3	3
CO3	3	3	1	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	2	3
CO5	3	3	1	3	3	3	1	3	3	3

UNIVERSITY POLYTECHNIC
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SYLLABUS (CBCS)-2023
COURSE: ROBOTICS

PROGRAMME: DIPLOMA							
COURSE CODE: DOE 452			Course Title: Robotics				
COMPULSARY / OPTIONAL: OPTIONAL							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

Course Objectives: Students will be able to understand about

1.	Know about robot its classification and specification.
2.	Understand the use of end-effectors and sensors
3.	Perform kinematics analysis of robot systems
4.	Get the knowledge of trajectory planning of robot
5.	Provide robot programming in area of manufacturing automation

COURSE OUTCOMES: After the completion of this course, students will be able to

CO1	Classify the robots based on mechanical structures, operational workspace and Characteristics
CO2	Select the robot end-effectors and sensors
CO3	Solve kinematics of simple robot manipulators
CO4	Analyse the Trajectory Planning of robot
CO5	Programme of simple robot manipulators for manufacturing applications

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	TITLE: Fundamental of Robotics 1.4 Introduction, definition, Anatomy of robot 1.5 Classification of Robot, Robot configuration, Robotic system 1.6 Robot links and joints, Robot specification, Robot drive system, Advantage and Disadvantages. Course Outcome: CO1 Teaching Hours :8 hrs
2	TITLE: Robot end effectors and sensors. 2.1 Introduction to end effectors, Grippers, Gripper design considerations 2.2 Gentle Robot Grippers, Universal Gripper 2.3 Classification of Sensors and their functions, Proximity Sensors, photoelectric Sensors. Use and selection of Sensors. Course Outcome: CO 2 Teaching Hours: 8 hrs

3	TITLE: Robot Motion Analysis. 3.1 Introduction, transformation, Rotation Matrix, Inverse transformation 3.2 Euler representation, Homogenous, Inverse and Composite homogenous transformation, D-H Representations. Course Outcome: CO3 Teaching Hours: 8 hrs
4	TITLE: Trajectory Planning. 4.1 Introduction, Path control modes, General considerations in trajectory planning, 4.2 Joint spaces Vs Cartesian space, General consideration of joint inter-plated trajectory Course Outcome: CO4 Teaching Hours: 8 hrs
5	TITLE: Robot programming and Application of Robot 5.1 Methods of Robot programming, Lead through programming 5.2 Requirement of good programming language, Precaution in the use of robot, Application and Economics of robots. Course Outcome: CO5 Teaching Hours: 8 hrs

REFERENCE BOOKS:

S.No	Title	Author, Publisher, Edition and Year of publication	ISBN
1	Industrial Robotics	Gnash S.Hegde,University Science Press,Second,2008	978-81-318-0518-3
2	Robotics Technology and Flexible Automation	S.R.Dev&S.Dev,McGrawHill,Second,2010	978-0-07-007791-1

E-REFERENCE

1. <https://nptel.ac.in/courses/112103019/>
2. <https://www.tandfonline.com/>
3. Web links and Video Lectures (e-Resources): E-book
URL:<https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html>

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	P3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	3	1	2	3
CO2	2	3	3	2	2	2	3	2	3	2
CO3	2	3	3	2	2	1	2	1	1	3
CO4	2	3	3	2	2	1	3	1	3	3
CO5	2	3	3	2	2	2	3	1	1	3

