SHRI VENKATESHWARA UNIVERSITY

Syllabus

Diploma

Mechanical Engineering

(Repair & Maintenance)
V semester

(THREE Years Programme)

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

Mechanical Engineering (Repair & Maintenance)

SEMESTER- V

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	PRM – 501	Tool Engineering	3	0	0	20	10	30		70		100	3
2	PRM -502	Vehicle Testing	3	0	0	20	10	30		70		100	3
3	PAE- 504	Earth Moving Equipments & Farm Machinery	3	0	0	20	10	30		70		100	3
4	PAE -505	Mechatronics	3	0	0	20	10	30		70		100	3
5	PAE-501	Automobile Component Design	3	0	0	20	10	30		70		100	3
6	PRM -511	Tool Engineering Lab	0	0	2				10		15	25	1
7	PAE -511	Automobile Component Design Lab	0	0	2				10		15	25	1
8	PRM -513	Summer Internship-II	0	0	0				50			50	3
9	PRE -514	Project Phase -I	0	0	4				50		50	100	2
												700	22

Summer Internship-II (6 weeks) after IV Sem

Course Code	***:***	***PRM-501***
Course Title	***:***	***TOOL ENGINEERING***
Number of Credits	***:***	***3 (L: 3, T: 0, P: 0)***
Prerequisites	***:***	***NIL***
Course Category	***:***	***PE***

Course Objectives:

- To understand metal cutting and forming process and factors affecting machinability.
- To develop knowledge of tools, dies and tool materials.
- To understand processes for increased productivity and quality.

Course Content:

UNIT-I: Metal Cutting: Mechanics of Metal cutting; requirements of tools; cutting forces; types of chips; chip thickness ratio; shear angle ; simple numericals only; types of metal cutting process; orthogonal; oblique and form cutting;

Cutting fluids: types; characteristics and applications.

Tool wear: Types of wear; Tool life; Tool life equations.

Unit-II: Machinability: definition; factors affecting machinability; machinability index.

Tool materials: Types; characteristics; applications; Heat treatment of tool steels; Specification of carbide tips; Types of ceramic coatings.

Cutting Tool Geometry: Single point cutting tool; drills; reamers; milling; cutters.

Unit-III: Types of dies and construction: Simple Die; Compound Die; Progressive Die; Combination Die.

Punch & Die mountings: pilots; strippers; misfeed detectors; Pressure Pads; Knock outs; stock guide; Feed-Stop; guide bush; guide pins.

Unit-IV: Die Design Fundamentals: Die Operations; blanking; piercing; shearing; cropping; notch-

ing; lancing; coining; embossing; stamping; curling; drawing; bending; forming; Die set; Die shoe; Die area; Calculation of clearances on die and punch for blanking and piercing dies; Strip layout; Calculation of material utilization factor.

Unit-V: Forming Dies: Bending methods; Bending Dies; bend allowance; spring back; spanking; bending pressure; pressure pads; development of blank length.

Drawing: operations; Metal flow during drawing; Calculation of Drawing blank size; variables affecting metal flow during drawing; single action and double action dies; combination dies.

Fundamentals of other Tools: Constructional features of - Pressure Die casting dies; metal extrusion dies; injection molding dies; forging dies; plastic extrusion dies.

Reference Books:

1. Tool Design - Donaldson Anglin, Tata McGraw Hill.
2. Production Technology- H.M.T.Jain, Tata McGraw Hill.
3. A Text Book of Production engineering – P.C. Sharma, S.Chand & Co.
4. Production Technology, R.K.Jain, Khanna Publishers.

Course outcomes:

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

CO1	Understand concepts, principles and procedures of tool engineering
CO2	Classify and explain various tools and tool operations
CO3	Select proper tool and a die for a given manufacturing operation to achieve highest productivity
CO4	Estimate tool wear and tool life

Course Code	:	PRM-505
Course Title	:	MECHATRONICS
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites (Course code)	:	NIL
Course Category	:	PE

Course Objectives:

- To understand the basic concepts and characteristics of measurement systems.
- To learn various types of sensors and transducers various mechanical, electrical and pneumatic actuation systems.
- To learn various mechanical, electrical and pneumatic actuation systems.
- To learn the concepts of digital communications and develop PLC programs.
- To evaluate the performance of mechatronic systems.

Course Content:

UNIT-I: Introduction to Mechatronics: Mechatronics; Importance of Mechatronics; Systems: Mea-

surement systems; Control systems and their types; Closed-loop control System; Automatic water level controller; Sequential controllers-washing machine

Measurement System terminology: Displacement, Position & Proximity Sensors; Velocity and Motion Sensors; Force Sensors; Fluid Pressure Sensors; Flow Sensors; Liquid Level Sensors; Temperature Sensors; Light Sensors; Selection of Sensors.

Unit-II:Mechanical Actuation Systems: Types of motion; Freedom and constraints; Loading; Gear Trains; Pawl & Ratchet; Belt & Chain drives; Bearings: Selection, Ball & Roller bearings; Mechanical aspects of motor selection.

Electrical Actuation Systems: Switches & Relays; Solenoids; D.C Motors; A.C.Motors; Stepper Motors: Specifications and Control of stepper motors; Servomotors: D.C Servomotor and A.C Servomotor.

Pneumatic & Hydraulic Systems: Power supplies; DCV; PCV; Cylinders; Rotary actuators.

Unit-III:Mathematical Model: Introduction to Mathematical model; Mechanical System building blocks; Electrical System building blocks; Fluid System building blocks; Thermal System building blocks.

System Model: Engineering.Systems: Rotational, Translational Systems; Electro-Mechanical System; Hydro-Mechanical System.

Input/Output Systems: Interfacing; Input/output ports; Interface requirements: Buffers, Handshaking, Polling and interrupts, Serial interfacing; Introduction to PIA; Serial communications interface; Example of interfacing of a seven-segment display with a decoder.

Unit-IV: Programmable Logic Controller (PLC): Definition; Basic block diagram and structure of PLC; Input/Output processing; PLC Programming: Ladder diagram, its logic functions, Latching and Sequencing; PLC mnemonics; Timers; Internal relays and Counters; Shift registers; Master and Jump Controls; Data handling; Analog input/output; Selection of PLC.

Unit-V: Design Examples & Advanced Applications in Mechatronics: Design process stages;

Traditional Vs Mechatronics designs; Possible design solutions: Timed switch, Wind-screen wiper motion, Bath room scale; Case studies of Mechatronics systems: A pick-and-place robot, Car park barrier, Car engine management system, Automatic Camera and Automatic Washing Machine only.

Sensors for Condition Monitoring Systems of Production Systems: Examples of Monitoring methods: Vibration monitoring, Temperature monitoring, Wear behavior monitoring; Mechatronics control in automated manufacturing: Monitoring of Manufacturing processes, On-line quality moni- toring, Model based systems, Hardware in-the-loop simulation, Supervisory control in manufactur- ing inspection, Integration of heterogeneous systems.

Reference Books:

1. Mechatronics – W. Bolton, Pearson Education India.
2. A Text Book on Mechatronics – R.K.Rajput, S.Chand& Co, New Delhi.
3. Mechatronics – M.D.Singh & Joshi, Prentice Hall of India.
4. Mechatronics – HMT, Tata McGraw Hill, New Delhi.
5. Mechatronics System – Devadas Shetty, PWS Publishing
6. Exploring Programmable Logic Controllers with applications – Pradeep Kumar Srivatsava, BPB Publications.

Course outcomes

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

CO1	Describe about various types of sensors and transducers.
CO2	Explain the various mechanical, electrical and pneumatic actuation systems.
CO3	Explain the basic mathematical building blocks for mechanical, electrical, thermal and fluid actuation system and its interfacing of input/output requirements.
CO4	Explain the basic PLC architecture and PLC programming concepts.
CO5	Describe the design examples of mechatronics system. Explain the condition monitoring of production systems using sensors.