SHRI VENKATESHWARA UNIVERSITY

Syllabus

M.TECH - PART TIME
Mechanical Engineering
IIIrd SEMESTER

(Three Years Post Graduation Programme)

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

Mechanical Engineering

PART TIME

SEMESTER-III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	WME-301	Numerical Control of Machine Tools	3	0	0	20	10	30		70		100	3
2	WME-031	Reverse Engineering And Rapid Prototyping	3	0	0	20	10	30		70		100	3
3	MLC-101	Research Methodology and IPR	2	0	0	20	10	30		70		100	2
4	WME-311	Robotics & Mechatronics Lab	0	0	4				25		25	50	2
		Total										250	9

Course:- M.Tech **Year/Semester:-** II/III
Subject:- Numerical Control of Machine Tools **Subject Code:-** WME-301
Max. Marks: a) Internal/Practical- 30
b) External- 70

Credit Hours		
L	T	P
3	0	0

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

1. Use Finite Element Method for structural analysis.
2. Execute the Finite Element Program/ Software.
3. Solve continuum problems using finite element analysis.

Syllabus Contents:

Fundamentals of Numerical Control: Introduction to numerical control, Classification of NC/CNC machines and axis nomenclature, PTP and Continuous Contouring, Absolute and Incremental Programming, Difference between NC and CNC, Different types of software's in CNC. **Control system fundamentals:** feedback, transfer function, system stability. Open Loop and Closed Loop control: Servo Mechanism, Position and Velocity feedback.

Engineering Analysis of NC/CNC systems: Computations of total number of pulses and pulse frequency in Open Loop and Closed Loop control, Precision in NC/CNC: Resolution, Accuracy and Repeatability. Interpolation in NC and CNC: Linear and Circular, Tolerance Analysis: Inward, Outward and Secantial.

System components: Machine Control Unit (MCU), Transducers, Actuators.

Design considerations of NC/CNC machine tools: Re-circulating ball screw, lost motions in NC systems, Turning Centers and Machining Centers.

Part Programming: Manual programming: Different G codes and M codes, Stock Removal Cycle, Canned Cycles. Computer assisted Part Programming. Tool path generation from CAD models, CNC Toolings.

Process optimization: Online condition monitoring in CNC, Adaptive control: ACC, ACO & GA.

DNC: Direct and Distributed Numerical Control, Merits of DNC, Concept of BTR, Data Multiplexing.

Economic analysis of NC/CNC: Various cost elements of CNC, Break-Even analysis, ROI andother techniques.

Reference Books:

1. Computer Control of Manufacturing Systems by Y. Koren, McGraw-Hill
2. Numerical Control and Computer Aided manufacturing by R. S. Pressman & J. E. Williams, John Wiley & Sons
3. Computational Geometry for Design and Manufacture, by I. D. Faux and M. J. Pratt, EllisHorwood, Chichester, 1979.
4. Numerical Control in Manufacturing by F. W. Wilson, McGraw-Hill Book Company New York.

Course:- M.Tech **Year/Semester:-** II/III
Subject:- Reverse Engineering And Rapid Prototyping **Subject Code:-** WME-031
Max. Marks: a) Internal/Practical- 30
b) External- 70

Credit Hours		
L	T	P
3	0	0

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

1. Design steel structures/ components by different design processes.
2. Analyze and design beams and columns for stability and strength, and drift.
3. Design welded and bolted connections.

Syllabus Contents:

Prerequisite: Classification of manufacturing processes, Different Manufacturing Systems, Introduction to Rapid Prototyping (RP), Need of RP in context of batch production, FMS and CIM and its application; Basic Principles of Generative Manufacturing Processes.

Reverse Engineering: Need & Techniques, Data collection, Point-Cloud of data.

Steps in RP: Process chain in RP in integrated CAD-CAM environment, Advantages of RP; Utility of Rapid Prototyping in Reverse Engineering. Classifications of different RP techniques – based on raw material, layering technique (2D or 3D) and energy sources; Comparative study of: - Stereo-lithography(SL) with photo-polymerization, SL with liquid thermal polymerization,

Process Technology: Solid foil polymerization, Selective laser sintering, Selective powder binding, Ballastic particle manufacturing – both 2D and 3D, Fused Deposition Modelling, Shape Melting, Laminated Object Manufacturing, Solid Ground Curing, Repetitive Masking and deposition.

Reference Books:

1. Reverse Engineering 101 Speaker Presentation
2. Reverse Engineering 101 - NYU: Poly 2010: Intro to Reverse Engineering given at NYU:Poly on October 4th, 2010 by Aaron Portnoy and Peter Silberman.
3. Reverse Engineering 102 - NYU: Poly 2010: Intro to Reverse Engineering (Day 2) given at NYU:Poly on October 11th, 2010 by Aaron Portnoy and Peter Silberman.
4. CTF Field Guide

Course:- M.Tech **Year/Semester:-** II/III
Subject:- Research Methodology and IPR **Subject Code:-** MLC-301
Max. Marks: a) Internal/Practical- 30
b) External- 70

Credit Hours		
L	T	P
2	0	0

Course Outcomes:

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, buttomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Syllabus Contents:

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis,interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysisPlagiarism, Research ethics,

Unit 3: Effective technical writing, how to write report, Paper

Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patentinformation and databases. Geographical Indications.

Unit 6: New Developments in IPR: Administration of Patent System. New developments inIPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide forbeginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.

- Mayall , “Industrial Design”, McGraw Hill, 1992.
- Niebel , “Product Design”, McGraw Hill, 1974.
- Asimov , “Introduction to Design”, Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
- T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

Course:- M.Tech **Year/Semester:-** II/III
Subject:- Robotics & Mechatronics Lab **Subject Code:-** WME-311
Max. Marks: a) Internal/Practical- 25
b) External- 25

Credit Hours		
L	T	P
0	0	4

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

1. To synergies the combination of mechanical, electronics, control engineering and computer.
2. Providing a focused laboratory environment to the engineering students to apply and absorb Mechatronics concepts.
3. To provide a common ground where students could perform experimental study regarding fundamental sequence control by utilizing various sensors and actuators.
4. The laboratory is designed to assist the students in the development of "handson" skills with an emphasis on hardware architecture and multidisciplinary systems.
5. To introduce basic concepts in electrical measurements.
6. To introduce the principles of signal conditioning and displaying.

Syllabus Content:

1. Identification and familiarization of the following components: resistors, inductors, capacitors, diodes, transistors, LED's.
2. Familiarization with the following components: CRO, transformer, function generator, multimeter , power supply.
3. Familiarization with the following electrical machines: Induction motors, DC motors, synchronous motors, single phase motors.
4. Familiarization with the following mechanical components: gears, gear train, bearings, couplings, tachometer
5. To study and design the PN junction diode and its use as half wave and full wave rectifier.
6. To design a voltage regulator using zener diode. Discuss the behavior of the regulator for various loads.
7. To verify truth tables of various logic gates and flip flops.
8. To study various sensors and transducers and compare with ideal characteristics.
9. To measure the characteristics of LVDT using linear displacement trainer kit.