SHRI VENKATESHWARA UNIVERSITY

Syllabus

M.TECH
Mechanical Engineering
Ist SEMESTER

(Two Years Post Graduation Programme)

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

Mechanical Engineering

SEMESTER-I

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	MME-101	Advanced Engg. Math	3	0	0	20	10	30		70		100	3
2	MME-102	Operational Management	3	0	0	20	10	30		70		100	3
3	MME-011	Principles of Machining Process	3	0	0	20	10	30		70		100	3
4	MME-021	Hydraulics & Pneumatics	3	0	0	20	10	30		70		100	3
5	MME-111	Machining Technology Lab	0	0	4				25		25	50	2
6	MME-112	CAD/CAM Lab	0	0	4				25		25	50	2
7	MLC-101	Research Methodology and IPR	2	0	0	20	10	30		70		100	2
8	AUD-101	English for Research Paper Writing	2	0	0								0
		Total										600	18

Course:- M.Tech **Year/Semester:-** I/I
Subject:- Advanced Engg. Math **Subject Code:-** MME-101
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. Analyze the skeleton structures using stiffness analysis code.
2. Use direct stiffness method understanding its limitations

Syllabus Contents:

- **Statistics:** Elements of statistics ; frequency distribution ; concept of mean , median, mode ; and different types of distribution ; Standard derivation and variance ; curve fitting by least square method ; Correlation and Regression ; Testing of hypothesis ; Basic types of factorial design and Analyses of Variance.
- **Matrix Operation:** Matrix Operations; Eigen value and Eigen vector by iterative methods; Diagonalisation of a square matrix. Laplace Transform, Fourier Transform; Fourier Integral and Their Applications.
- **Numerical Methods;** Interpolation by Polynomials ; Error Analysis ; Solution of system of linear equation by Gauss – Seidel iterative methods ; Newton Rap son methods ; Numerical integration by Gauss –
- **Quadrature ;** Solution of ordinary differential equation by Rayleigh – Ritz method.

References:

- Applied Abstract Algebra by Rudolf Lid1 and Gunther Pilz, 2nd edition (Springer),
- Discrete Mathematics by Lipschutz (Schaums Series).

Course:- M.Tech **Year/Semester:-** I/I
Subject:- Operational Management **Subject Code:-** MME-102
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. Solve simple problems of Operational Management understanding the basic concepts.
2. Apply numerical methods to solve continuum problems.

Syllabus Contents:

- **Introduction to Operational Management and Processes**: Management perspective and control approach to management, Basic management functions and managerial skills, Operations Strategy, Process and Technologies, HR in Operations Management, Concept of productivity and its analysis, Quality aspects in Production and Services.
- **Facility planning**: Product and process selection, Facilities locations: Factors influencing selection of locations, Quantitative analysis in facility location: Weight method, Weight cum rating method, Composite measure method, Locational break-even analysis, Median model, Gravity model, Bridgeman's Dimensional analysis. Plant layout: Product layout, Process Layout, G.T based layout.
- **Production planning and control:** Different types of production systems: Mass, Batch, Job, Project and continuous.
- **Forecasting:** Need and importance of Forecasting, Forecasting Techniques: Delphi Method, Simple and Moving average, Exponential Smoothing, Correlation and Regression Analysis, Karl Pearson's Correlation, MAD, Tracking Signal.
- **Planning & Scheduling:** Different types of Planning: Long-term, Aggregate, short-term, Master Production Schedule, Rough cut capacity planning, Detail scheduling, Machine loading and sequencing: Johnson's rule and GANTT chart, Assembly line balancing: Line efficiency, balance delay, smoothing index, Different techniques of balancing,
- **Materials Management:** Concept of inventory and its importance, Types of inventory, Saw – Tooth model, Computation of EOQ: Deterministic and Probabilistic models, Selective inventories. MRP –I and MRP – II, JIT.
- **Supply Chains:** Evolution of Supply chain and its definition, Push pull view of supply chain, Cycle View of supply chain, Supply chain drivers, Factors affecting the supply chain performance, Efficient supply chain and responsive supply chain and its strategic fit, Bullwhip effect of supply chain, Merits and demerits of supply chain.
- **Project Management:** Concept of project and network analysis and network diagram, Computation of project completion time (Forward pass and backward pass), CPM, Computation of float, Difference between PERT and CPM, Probabilistic time estimates, probability of project completion by a target date, Project crushing.
- **Queuing Model:** Waiting line problem and its application, Characteristic of the Queue and the service facilities, Poisson arrival and Exponential service distribution, Traffic intensity, Computation of Waiting time, number of customers in the system, decision problems in queuing.

References:

- Essentials of Management by Koontz & Weihrich, TMH.
- Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley & Sons. Quantitative techniques in Management by N. D. Vohra, Tata McGraw Hill.
- Production Planning and Inventory Control by Narasimhan, McLeavey, Billington, PHI.
- Production and Operation Management by Muhlemann, Oakland and Lockyer, Mcmillian India Ltd.
- An Introduction to Management science by Anderson, Sweeny and Williams, Thomson South west.
- Logistic and supply chain management by Martin Chirstopher, Pearson Education.
- Supply Chain Management by Chopra and Meindl, Pearson Education, 3rd Ed.,. 2007

Course:- M.Tech **Year/Semester:-** I/I
Subject:- Principles of Machining Process **Subject Code:-** MME-011
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 analytical methods for the solution of Principles of Machining Process
2. Use analytical methods for the solution of Principles of Machining Process
3. Apply the numerical techniques and tools for the Mechanics of chip formation.
4. Apply the numerical techniques and tools for the Cutting fluid and surface roughness.

Syllabus Contents:

- **Classification of Manufacturing Process:** Importance and perspective of machining process, Schematic Representation of machining system, Different types of motions to generate different shapes.
- **Mechanics of chip formation:** Orthogonal and oblique cutting**,** shear plane and shear strain, , Computation of chip reduction coefficient, Velocity triangle, different process variables, actual feed and actual depth of cut, Different types of chips, computation of MRR for different processes.
- **Cutting tool geometry:** ASA, ORS and NRS systems, conversion from one system to others, Cutting tool nomenclature.
- **Cutting force:** Theoretical **a**nalysis of cutting force, Merchant circle diagram, Theory of Ernstand Merchant 1st and 2nd Model, Theory of Lee and Shaffer model, Ploughing force and size effect, Dynamometry, Friction in metal cutting, Cutting energy and power in metal cutting.
- **Cutting tool materials:** Properties, different types of cutting tool materials e.g. HSS, Carbides, Coated carbides, ceramics, Cermets, PCBN and Diamonds and other advanced cutting tool materials, ISO specification of modern throw away inserts.
- **Temperatures in metal cutting:** Heat generation and temperature distribution in metal cutting (Primary and secondary zone), Measurement of cutting temperature, Effect of process variablesand tool geometry in temperature rise.
- **Cutting fluid and surface roughness:** Need for cutting fluid, characteristics of an efficient lubricant, Different applications: flood, jet, mist and Z-Z cooling, Cutting fluid maintenance andits disposal, Concept of dry cutting.
- **Surface roughness:** Theoretical computation of surface roughness, Measurement of surface roughness, Modification of tool geometries for improved surface finish, Effect of process variables on surface roughness.
- **Tool wear, Tool life and machinability:** Causes and mechanism of wear, Types of wear: Crater wear and flank wear, Tool life criteria, Effect of built-up-edges and tool geometries on wear, Concept of tool life, Taylor's tool life equation, Effect of process variables on tool life, Concept of machinability and machinability rating, Variables affecting machinability.
- **Abrasive processes:** Grinding, Chip removal in grinding, Cutting force in grinding, Types of abrasive and specification of grinding wheel, Effect of variables on grinding performance. Typesof abrasive machining and finishing processes: honing, lapping, super finishing and buffing.

References:

- Metal Cutting Theory & Practice by A. Bhattacharya, New Central Book Agency Pvt. Ltd.
- Fundamentals of machining and machine tools by Boothroyd, G. and Knight, W. A. (2006), 3rd Edition, CRC Press, Taylor and Francis Group.
- Metal Cutting Principles, Shaw by M. C. (2005), 2nd Edition, New York: Oxford University Press.
- Principles of Engineering Manufacture, Black, S. C., Chiles, V., Lissaman A. J. and Martin, S.J.
- (2004) 3rd Edition, New Delhi: Viva Books Pvt. Ltd.
- Fundamentals of Machining Processes, H. El-Hofy (2007), CRC Press, Taylor and Francis Group.
- Production Technology by HMT, McGraw-Hill, India.

Course:- M.Tech
Subject:- Hydraulics & Pneumatics
Max. Marks: a) Internal/Practical- 30
b) External- 70

Year/Semester:- I/I
Subject Code:- MME-021

Credit Hours		
L	T	P
3	0	0

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

1. Solve ordinary and partial differential equations in structural mechanics using numerical methods.
2. Write a program to solve a mathematical problem.

Syllabus Contents:

- **Introduction:** Power hydraulics & its applications, Hydraulic symbols,
- **Positive displacement Pumps:** Gear, Vane, Piston and other special types of pumps.
- **Control valves:** Pressure Control: relief valve, Unloader valve, Pressure reducing valve, Counter balance valve, sequence valve, Flow Control: Meter in Meter out, Bleed off, Pressure and Temperature compensated flow control valve, Direction Control: Check valve, 2/3 position, ¾ position, Open centre, closed centre, Tandem centre and others, Cartridge valves, Flow forces onvalve spools and valve design.
- **Hydraulic actuators:** Linear (S/T, D/T, Cushion) and rotary, Design of Hydraulic actuators, Accessories in hydraulic systems: Accumulator, Air-breathe valve, Pressure switches etc. Hydraulicpower packs.
- **Servo valves:** Torque motor, electro-hydraulic Servo valves: Types and principles of operations
- **Design of Hydraulic circuits and its application:** Regeneration, Pre-fill, Twin Pump and others.
- **Maintenance of hydraulic systems and working fluid:**
- **Pneumatics:** Air Filter, Lubricators and Regulators, Pneumatic control elements: Air Cylinders and their Design, Pneumatic safety circuits, Pneumatic Logic control.

Reference Books:

1. Hydraulic Control Systems by H.E. Merritt, Wiley New York.
2. Fluid Power by Esposito, Peaerson Education
3. Hydraulics and Pneumatics by Andrew Parr, Jaico Publishers.

Course:- M.Tech **Year/Semester:-** I/I
Subject:- Machining Technology Lab **Subject Code:-** MME-111
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. Demonstrate basic knowledge in mathematics, science and engineering.
2. Design, manufacture and analyze a Mechanical system using modern engineering software tools and measurement systems.
3. Cognize concepts involved in thermal and fluid energy systems.
4. Utilize self education to develop lifelong learning to appraise and adapt global and societal contexts to propose Engineering solutions.

Syllabus Content:

1. Performing step turning, taper turning, thread cutting and knurling on lathe
2. Gear cutting in milling machine
3. Working with shaper, planer and slotting machine
4. Working with surface and cylindrical grinding
5. Determination of cutting force using lathe tool and drill tool dynamometers
6. Study of non-conventional machining processes

Course:- M.Tech **Year/Semester:-** I/I
Subject:- CAD/CAM Lab **Subject Code:-** MME-112
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. Apply/develop solutions or to do research in the areas of Design and simulation in Mechanical Engineering.
2. Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
3. Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
4. Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical / scientific methods and use of software tools.
5. Design and validate technological solutions to defined problems and communicate clearly and effectively for the practical application of their work.

List of Experiments/Assignments:

CAD LAB

1. Initiating the Graphics Package; Setting the paper size, space; setting the limits, units; use of snap and grid commands.
2. Drawing of primitives (Line, arc, circle, ellipse, triangle etc.)
3. Drawing a flange.
4. Drawing a bushing assembly.
5. Dimensioning the drawing and adding text.
6. Setting the layers and application of layers.
7. Isometric and Orthographic projections.
8. Viewing in three dimensions.
9. Removal of hidden lines – Shading and Rendering.

CAM LAB

1. Part programming preparation through AutoCAD.
2. Part programming preparation through AutoCAD.
3. APT part programming for 2D – contour.
4. Machining of one job on CNC Machine Tool

Course:- M.Tech **Year/Semester:-** I/I
Subject:- Research Methodology and IPR **Subject Code:-** MLC-101
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:-** I/I

Subject:- ENGLISH FOR RESEARCH PAPER WRITING **Subject Code:-** AUD-101

Max. Marks: a) Internal/Practical- 30

b) External- 70

Credit Hours		
L	T	P
2	0	0

Course objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
   Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Syllabus Contents:

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, AvoidingAmbiguity and Vagueness

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit 4: key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed whenwriting a Review of the Literature,

Unit 5: skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing theConclusions

Unit 6: useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011