SIR PADAMPAT SINGHANIA UNIVERSITY

Course Structure & Detailed Syllabus

Master of Technology

in

MECHANICAL ENGINEERING

Specialization

in

PRODUCTION ENGINEERING

(With Effect from Batch of 2021-2023)

OVERVIEW

This syllabus is designed under CBCS framework. Students will have good number of choices of courses through electives to hone their skills in their specialization field. The courses in the structure are classified by their level of learning by using an extension of Bloom's taxonomy as given under

Level 0: Remember and understand level of course
Level 1: Apply level of course
Level 2: Analysis level of course
Level 3: Evaluate level of Course
Level 4: Create level of course

The first numerical digit of the subject code in the course structure shows the level of course. Some of the courses which falls on the higher level of Bloom's taxonomy are assigned a component of supervised learning (represented by 'S' component in the structure) by involving the student in the project work.

DEPARTMENT VISION

To be known globally as a premier department offering quality education in Mechanical Engineering inculcating the spirit of interdisciplinary research and innovation.

DEPARTMENT MISSION

M1: Create a strong foundation on fundamentals in the areas of Mechanical Engineering through outcome based teaching learning process.

M2: Establish state-of-the-art facilities for computer aided design and simulation.

M3: To set up advanced labs in collaboration with industries to provide avenues to faculty and students to get involved in interdisciplinary research and provide solutions to Engineering problems.

M4: Involve the students in group activities, including those of professional bodies to develop leadership and communication skills.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1 – Accomplishment: Graduates will lead successful professional life by applying their domain specific knowledge demonstrating leadership skills with ethical attitudes in broad societal context while working in a multi/inter disciplinary setting.

PEO2 – Competence: Graduates will excel in providing ethical solutions as an individual or a member or a leader of a team by investigating, analysing, formulating and solving complex engineering problems for the sustainable development of society.

PEO3 – Expertise: Graduates will exhibit professionalism while communicating with local, national and foreign peers bound with regulations and leading life- long learning.

PROGRAM OUTCOMES (POs):

PO1: Core Knowledge: Graduates will demonstrate an ability to identify, formulate and solve complex engineering problems in the area of specialization and evaluate them to select optimal feasible solution considering safety, environment and other realistic constraints.

PO2: Modern and Advanced Tools: Graduates will demonstrate skills to use modern engineering tools, software and equipment to analyze and solve complex engineering problems using multidisciplinary approach.

PO3: Research Aptitude: Graduates will demonstrate skill of good researcher to work on a problem, starting from scratch, to research into literatures, methodologies, techniques, tools, and conduct experiments and interpret data to develop methodologies, techniques, modern tools and products for the betterment of society.

PO4: Report Writing: Graduates will be able to present their work unequivocally before scientific community through reports and presentations to give and take clear instructions.

PO5: Ethics and Sustainable Development: Graduates will exhibit the traits of professional integrity and ethics and demonstrate the responsibility to implement the research outcome for sustainable development of the society.

Program Specific Outcomes (PSOs):

PSO1: Professional Excellence (Mastery): Graduates will demonstrate research skills to critically analyze complex Design and Production problem for synthesizing new and existing information for their solutions

PSO2: Research problem solving skills: Graduates will be able to take up real life and/or research related problems and to create optimal solutions of these problems through comprehensive analysis and prototyping

CREDIT DISTRIBUTION

MECHANICAL ENGINEERING (PRODUCTION ENGINEERING)

Semester wise Credit Distribution

Semester	Credits	Contact Hrs/Week
I	18	15
II	21	20
III	17	11
IV	12	0
Total Credits	**68**	46

Category wise Credit Distribution

Sr. No	Category	Credit(s)	% of Total Credits
1	Basic Science courses (BSC)	3	4.47
2	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc. (ESC)	4	5.97
3	Professional core courses (PCC)	28	41.79
4	Professional Elective courses relevant to chosen specialization/branch (PEC)/APCC	15	22.38
5	Project work, seminar and internship in industry or elsewhere (PRJ)	17	25.37

COURSE STRUCTURE

MECHANICAL ENGINEERING (Production Engineering)

Course Structure: M.Tech. 2021-23

Semester - I

S. No.	Course Code	Category	Course Title	L	T	P	S	Credit(s)	Contact Hrs/ week
1	ME-3401	PCC	Production Planning & Control-I	3	0	0	1	4	3
2	ME-3402	PCC	Quality Control & Assurance	3	0	0	1	4	3
3	ME-3403	PCC	Mechanics of Machining	3	0	0	1	4	3
4	ME-2301	PCC	Advanced Machining Processes	3	0	0	0	3	3
5	MA-3006	BSC	Advanced Engineering Mathematics	3	0	0	0	3	3
							Total Credits	18	
								Total Contact Hours/week	15

Semester – II

S. No.	Course Code	Categor	Course Title	L	T	P	S	Credit(s)	Contact Hrs./ week
1	ME-3404	PCC	Production Planning & Control-II	3	0	1	1	5	5
2	ME-3405	PCC	Optimization Methods in Engineering	3	0	0	0	3	3
3	ME-4301	ESC	Research Methodology in Science & Engineering	3	0	0	1	4	3
4	ME-XXXX	PEC	Departmental Elective – I	3	0	0	0	3	3
5	ME-XXXX	PEC	Departmental Elective – II	3	0	0	0	3	3
6	ME-XXXX	PEC	Departmental Elective – III	3	0	0	0	3	3
Total Credits								21	
Total Contact Hours/week									20

Semester - III

S.No.	Course Code	Category	Course Title	L	T	P	S	Credit(s)	Contact Hrs./Week
1	ME-3406	PCC	Total Quality Management	3	0	0	1	4	3
2	ME-4401	PCC	Manufacturing Lab	0	0	1	1	2	2
3	ME-4500	PRJ	Dissertation – I	0	0	0	5	5	0
4	ME-XXXX	PEC	Departmental Elective - IV	3	0	0	0	3	3
5	ME-XXXX	PEC	Departmental Elective - V	3	0	0	0	3	3
			Total Credits					17	
			Total Contact Hours/week						11

Semester – IV

S. No.	Course Code	Category	Course Title	L	T	P	S	Credit(s)	Contact Hrs/week
1	ME-4550	PRJ	Dissertation – II	0	0	0	9	9	0
2	ME-3400	PRJ	Dissertation Viva Voce	-	-	-	3	3	0
Total Credits								12	
Total Contact Hours/week									0

Departmental Elective(s) - I, II & III Mechanical Engineering (Production Engineering)

S. No.	Course Code	Course Title	L	T	P	S	Credit(s)
1	ME-3407	Mechanical Behavior of Materials	3	0	0	0	3
2	ME-3408	Computer Aided Design- Computer Aided Manufacturing	3	0	0	0	3
3	ME-3409	Advance Manufacturing Processes	3	0	0	0	3
4	ME-3410	Operation Research	3	0	0	0	3
5	ME-3411	Metal Casting	3	0	0	0	3

Departmental Elective(s) - IV & V Mechanical Engineering (Production Engineering)

S. No.	Course Code	Course Title	L	T	P	S	Credit(s)
1	ME-4402	Flexible Manufacturing System	3	0	0	0	3
2	ME-3412	Supply Chain Management	3	0	0	0	3
3	ME-4403	Machine Tool Design	3	0	0	0	3

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - I

(Professional Core Courses)

ME-3401 Production Planning & Control-I	L-T-P-S-C 3-0-0-1-4
Pre-requisite	Nil

Objectives: *To acquaint students to gauge the mechanisms to handle production planning to cater the advanced production controls to manage operations.*

Course Outcomes:

1. *Describe the various components that make up the manufacturing planning and control system and the interaction among them*.
2. *Develop the mechanisms to handle production planning to cater the advanced production controls to manage operations.*
3. *Recognize aggregate production planning, scheduling and production order creation and execution*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01:

Tasks in Industrial Operations: Role and Impact of Production Planning and Control, Production Planning and Control process, Costs and Benefits of Production Planning and Control Systems, Framework for Production Decision Making, Modelling the Behaviour of Managers.

Module 02 :

Integrated Manufacturing Framework: Sales and Operations planning, Enterprise Resource Planning, Master production Scheduling, Material requirement planning, Capacity requirement planning,

Module 03:

Production planning. Control Decisions: Demand Management and Forecasting, Master production Schedule, MRP I, MRP II, Resource Requirement planning and allocation, Manufacturing Models, Service Models.

Module 04 :

Master Production Scheduling: Scheduling in Job Shop production, Scheduling in Batch Production, Scheduling in Line Flow production, Scheduling in Assembly Line production, Economic Lot Scheduling.

Module 05 :

Production Order Creation and Execution: Process Overview, Production Order and Scheduling, Planning for Adjustments Recognizing Uncertainty, Confirmation, Settlement and Completion, Production Activity Control.

Text/Reference books

1. Jacobs, F. R., Berry, W., Whybark, D. C., and Vollmann, T. (2011), *Manufacturing Planning and Control for Supply Chain Management*, The McGraw Hill.
2. Onwubolu, G. C. (2012), *Emerging Optimization Techniques in Production Planning and Control. World Scientific Publishing,*, Imperial College Press.

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Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - I

(Professional Core Courses)

ME-3402 L-T-P-S-C
Quality Control & Assurance 3-0-0-1-4

Pre-requisite Nil

Objectives : *To understand the complexity of the quality assurance and quality control aspects with emphasis on an industrial organizational environment.*

Course Outcomes: *Students will be able to*

1. *Develop conceptual understanding of quality of product and process and its Management.*
2. *Illustrate the concept of quality assurance, quality control, and applications of probability distribution in predicting behavior of the process.*
3. *Develop Control charts for process control and process capability.*
4. *Develop understanding of sampling plans for acceptance of materials.*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 1: Basic concepts of quality: definition and need of quality, aspects of quality, quality of design, quality of conformance, quality characteristic, quality

control & inspection, quality policy, inspection and its objectives and types, inspection versus quality control, statistical quality control.
Quality assurance- Quality assurance manual, quality survey or audit, inspection planning, stages, methods, Vendor quality rating.

Module 2: Probability & probability distribution: definition, laws, probability distributions (normal binomial, poisson, exponential weibull probability distribution). measures of central tendency & dispersion, concept of variation, variable and attribute data, frequency distribution.

Module 3 : Statistical process control : control charts, concept of variability, assignable & chance causes, concept of specifications and tolerances, definition and objectives of control charts, control charts for variables and attributes.

Module 4 : Process capability : concepts and its methods of determination. Process capability–meaning, significance and measurement – Six sigma- DMAIC/ DMADV approach, concepts of process capability. process capability index, product life characteristics curve. description of TPM, concept of quality circles, JIT System, zero defect. concept.
Module 5: Acceptance sampling : definition, advantages over 100% inspection, methods of taking samples, operating characteristics curve. producer's risk and consumer risk, quality indices for the acceptance sampling plans, average outgoing quality limit. single, double and multiple sampling sequential sampling plan & related problems.

Text/Reference Books

1. Statistical Quality Control by M.Mahajan, Dhanpat Rai & Co.
2. Total Quality Management by S.Rajaram and M.Sivakumar,Indian text edition
3. Total Quality Management by Dale H. Besterfield ,PHI

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http://www.nptel.ac.in/courses/110104080, Lecture by Prof.R.N.Sen Gupta IIT Kanpur

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - I

(Professional Core Courses)

ME-3403 L-T-P-S-C
Mechanics of Machining 3-0-0-1-3

Pre-requisite Nil

Objective: *This course is designed to discuss analysis of machining process and tool failure.*

Course Outcome: *Students will be able to:*

1. Understand the design of single and multipoint cutting tools and to understand the concept about the heat generation during machining process and their cooling aspects.

2. Illustrate the relationship between cutting parameters and various parameters involved like power requirement, cutting time, tool life and surface finish and grinding: mechanics

3. Demonstrate about the properties of different cutting tool materials and their selection with respect to their application.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Principles of metal cutting; Mechanics of chip formation; Geometry of cutting tools and tool signatures; Orthogonal and oblique cutting;

Module 02: Metal cutting models: Merchant model, Lee- Shaffer model, Oxley model; Forces in metal cutting; Tribology in metal cutting;

Module 03: Surface roughness in machining; Thermal aspects of machining; Tool wear, tool life, tool materials, tool coatings and coating techniques; Economics of machining; Machinability

Module 04: Cutting fluids: properties, types, application techniques, emissions and its adverse effects; Recent advances in machining: hard turning, high seed machining, diamond turning, machining of advanced materials, machining with minimum quantity cutting fluids and cryogenic fluids

Module 05: Grinding: mechanics, forces, specific energy, temperature, wheel wear and surface finish; Other conventional finishing processes: honing, lapping, super finishing; Applications of FEM and optimization to machining as well as finishing

Text/Reference Books

1. M. C. Shaw, Metal Cutting, Tata McGraw Hill, New Delhi, 2004.
2. M. C. Shaw, Principles of Abrasive Processing, Oxford University Press, 1996.
3. G. K. Lal, Introduction to Machining Science, New Age International Publishers, 2007.
4. G. Boothroyd and W. A. Knight, Fundamentals of Machining and Machine Tools, CRC-Taylor and Francis, 2006.
5. Ghosh and A. K. Malik, Manufacturing Science, East West Press, 2010.
6. R. A. Lindberg, Processes and Materials of Manufacture, PHI Learning, 2013.
7. P. H. Black, Metal Cutting Theory, McGraw Hill, 1961.

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Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - I

(Professional Core Courses)

ME-2301 L-T-P-S-C
Advanced Machining Processes 3-0-0-0-3

Pre-requisite Nil

Objective: *The aim of this course is to impart knowledge of various modern manufacturing processes, their characteristics & process parameters.*

Course Outcome: *After completion of this course, students will be able to:*

1. *Understand the applied aspects of advanced machining processes.*
2. *Understand modeling and simulation of non traditional machining processes.*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: General classification of unconventional machining processes; Abrasive jet machining, water jet and abrasive water jet machining, ultrasonic machining.

Module 02: Electric discharge machining and allied processes, laser beam machining, ion beam machining, plasma arc machining;

Module 03: Electro chemical machining (ECM) and allied processes, ECM tool design, chemical machining, photochemical machining; Elastic emission machining

Module 04: Advanced finishing processes, abrasive flow finishing, magnetic abrasive finishing, magnetorheological finishing, chemomechanical polishing; Comparative evaluation of different unconventional machining processes

Module 05: Analytical modeling of mechanical, thermal and electrochemical type nontraditional machining processes; Numerical modeling and simulation of unconventional machining processes; Computer aided process planning of non-traditional machining processes

Text/Reference Books

1. Jain V. K., Advanced Machining Processes, Allied Publishers,2009.
2. Gary F. Benedict, Nontraditional Manufacturing Processes, Taylor & Francis, 1987.
3. McGeough J. A. , Advanced Methods of Machining, Springer, 1988.
4. Mishra P. K., Non Conventional Machining, Narosa India Publication, 1997.
5. Hassan El-Hofy, Advanced Machining Processes: Nontraditional and Hybrid Machining Processes, McGraw-Hill Prof Med/Tech, 2005.
6. Pandey P. C. and Shan H. S., Modern Machining Processes, Tata McGraw-Hill Education, 1980.
7. Brown J. A., Modern Manufacturing Processes, Industrial Press, 1991.
8. Jain V. K., Introduction to Micromachining, Alpha Science International Limited, 2010.

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https://www.youtube.com/watch?v=tTnXn498F90

https://www.youtube.com/watch?v=kh4DSOtef4k

https://m.youtube.com/watch?v=Jg6YXvTO5FE

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - I

(Basic Science courses)

MA-3006 L-T-P-S-C
Advanced Engineering Mathematics 3-0-0-0-3

Pre-requisites: Vector-Tensor Analysis in Cartesian system, effect of rotation of coordinate systems, ODEs; Laplace & Fourier methods, series solutions, and orthogonal polynomials. Sturm-Liouville problem. 1st and 2nd order PDEs will be discussed with the relevant topics during the course.

Objective: *In this course certain advanced numerical techniques with probability and statistics will be discussed. These concepts play a very important role in all the fields of engineering.*

Course Outcomes: *After completion of this course, students will be able to:*

CO1: Acquire Fundamental knowledge in

(a) Solution of System of Linear and Non-linear algebraic equations
(b) Numerical solution of ODEs & PDEs
(c) Probability and Statistics

CO2: Develop skills in analyzing the
(a) ill conditioned systems
(b) properties of functions through numerical integration
(c) properties of numerical solutions of differential equations
(d) Error estimates
(e) Stability of Solutions

CO3: Develop skills in designing mathematical models for
(a) ODEs & PDEs
(b) Linear & Non-linear systems of algebraic equations

CO4: Develop numerical skills in solving the problems involving
(a) Linear systems of algebraic equations
(b) Systems of nonlinear algebraic equations
(c) ODEs
(d) PDEs

CO5: Apply the statistical techniques for various engineering problems

PO1	PO2	PO5	PSO1	PSO2
1	1	1	1	1

Course Content

Module 01: **Solution of linear systems of algebraic equations**

Linear system of algebraic equations. Gauss elimination, LU decomposition etc., Matrix inversion, ill-conditioned systems. Numerical eigen solution techniques (Power, Householder, QR methods etc.).

Module 02: Numerical solution of systems of nonlinear algebraic equations

Numerical solution of systems of nonlinear algebraic equations; Newton-Raphson method. Numerical integration: Newton-Cotes methods, error estimates, Gaussian quadrature.

Module 3: Numerical solution of ODEs

Numerical solution of ODEs: Euler, Adams, Runge-Kutta methods, and predictor-corrector procedures;

Module 4: Solution of PDEs

Stability of solutions; solution of stiff equations. Solution of PDEs: finite difference techniques.

Module 5: Probability and Statistics

Probability and Statistics – Probability Distribution, Bays Theorem, Parameter Estimation, Testing of Hypothesis, Goodness of Fit.

Text/Reference Books

1. Advanced Engineering Mathematics. Kreyszig E. 10th Ed., Wiley Eastern 2012.
2. Numerical Methods for Scientific and Engineering Computation. Jain M. K.,Iyengar S. R. K. and Jain R. K.3rd Ed., New Age International 1993.
3. Computational Methods for Partial Differential Equations, Jain M.K., Iyenger S.R.K. and R. Jain, R.K. New Age International, 1994
4. Methods of Mathematical Physics Courant R. and Hilbert D. Wiley, 1989.
5. Mathematical Methods for Physicists. Arfken G. B., Weber H. J. and Harris F. 5th Ed., Academic Press.

Digital Material

1. Power Point Slides covering the course lectures shall be uploaded on the local server connected through Intranet
2. Course content, video demonstration, problem sets etc. shall be made available on the course page of the Moodle site developed by the course teacher

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - I

(Professional core courses)

ME-3404 L-T-P-S-C
Production Planning & Control-II 3-0-1-1-5

Pre-requisite Nil

Objective : *To understand various types of production systems and their associated planning and control problems.*

Course outcome : *After completion of this course, students will be able to:*

1. *Understand the concept of manufacturing planning and control assembly line balancing.*
2. *Explain the group technology and its applications in manufacturing systems.*
3. *Determine problems related with planning and control in FMS and CIMS.*
4. *Illustrate the aggregate production planning, scheduling and sequencing.*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course content:

Module 1 : Manufacturing Planning And Control :

Material flow characteristics in manufacturing systems, Types of manufacturing systems and their associated planning and control problems, product life cycle concepts.

Module 2 : Product selection and design:

Product selection and design, facility, location and layouts. Line Balancing & G.T. :Material handling, balancing of fabrication and assembly lines, modular assembly concepts, group technology and cellular manufacturing systems.

Module 3 : CIMS & FMS:

Problem of planning and control in CIMS and FMS. Aggregate production planning, Operations scheduling, MRP. Machine assignment and allocation of jobs. Sequencing problems. Flow shops scheduling and sequencing. Simulation of job shop priority rules. Gantt charts, production control with LOB.

Module 4 : Variant process planning:

Variant process planning – preparatory stage – production stage – family formation – data base structure – search procedure – plan editing – parameter selection. Generative approach – forward and backward planning – input format – CAD modes – decision logic – decision tree.

Text/References Books

1. K.C. Jain & LN Agrawal , Production, Planning And Control & Industrial Management, khanna publishers 1999.
2. Tien-Chien Chang and Richard A.Wysk, 'Introdution to automated process planning system', Prentice – Hall, 2005.
3 . Mikell, P. Groover, 'CAD/CAM', Prentice – Hall, 2007.
4. Khabal Taraman, 'CAD/CAM integrates and innovation', Computer and Automated systems association of SME, 2001

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Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - II

(Professional core courses)

ME-3405 L-T-P-S-C
Optimization Methods in Engineering 3-0-0-0-3

Pre-requisite Nil

Objective: To describe the techniques & applications of engineering optimization to the students, so they are able to design & produce products both economically & efficiently

Course Outcome: Students will be able to

1. Explain the fundamental knowledge of optimization & Linear Programming, Non linear programming and use classical optimization techniques and numerical methods of optimization.
2. Enumerate fundamentals of Geometric Programming, Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Introduction to Optimization

Engineering Applications of Optimization, Statement of an Optimization Problem, Design Vector, Design Constraints, Constraint Surface, Objective Function, Objective Function Surfaces, Classification of Optimization Problems.

Module 02: Classical Optimization Techniques

Introduction, Single-Variable Optimization, Multivariable Optimization with No Constraints, Semi definite Case, Saddle Point, Multivariable Optimization with Equality Constraints, Solution by Direct Substitution, Solution by the Method of Constrained Variation, Solution by the Method of Lagrange Multipliers, Multivariable Optimization with Inequality Constraints , Kuhn-Tucker Conditions.

Module 03: Linear Programming

Introduction, Applications of Linear Programming, Standard Form of Linear Programming Problem, Geometry of Linear Programming Problems, Solution of a System of Linear Simultaneous Equations, Two Phases of the Simplex Method.

Module 04: Nonlinear Programming

Introduction, Unimodal Function, ELIMINATION METHODS: Unrestricted Search, Search with Fixed Step Size, Search with Accelerated Step Size, Exhaustive Search, Dichotomous Search, Interval Halving Method, Fibonacci Method, Golden Section Method, Comparison of Elimination Methods, INTERPOLATION METHODS, Direct Root Methods, Newton Method, Quasi-Newton Method.

Module 05: Geometric Programming

Introduction, Posynomial, Unconstrained Minimization Problem, Solution of an Unconstrained Geometric Programming Program Using Differential Calculus, Solution of an Unconstrained Geometric Programming Problem Using, Arithmetic–Geometric Inequality, Primal–Dual Relationship and Sufficiency Conditions in the Unconstrained Case, Constrained Minimization , Solution of a Constrained Geometric Programming Problem.

Module 06: Integer Programming & Modern Methods of Optimization

Integer linear programming: Introduction, Graphical Representation, Gomory's Cutting Plane Method, Concept of a Cutting Plane Gomory's Method for All-Integer Programming Problems, Gomory's Method for Mixed-Integer Programming Problems, Branch-and-Bound Method. Modern Methods of Optimization: Introduction, Genetic Algorithms, Representation of Design Variables, Representation of Objective Function and Constraints, Genetic Operators.

Text/Reference Books

1. Optimization: Theory & Applications. Rao S. S.2nd Ed. Wiley Eastern.1984.
2. Optimization for Engineering Design-Algorithms & Examples. Deb K. PHI. 1995.
3. Introduction to Optimum Design. Arora J. S. McGraw-Hill. 1989.
4. Engineering Optimization- Methods & Applications. Reklaitis G. V., Ravindran A. & Ragsdell K. M. Wiley. 1983.
5. Optimization Methods for Engineering Design. Fox R. L. Addison Wesley. 1971.

***Digital Material:**

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Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - II

(Professional core courses)

ME-4301 L-T-P-S-C
Research Methodology in Science & Engineering 3-0-0-1-4

Pre-requisite Nil

Objective: *The objectives of this course are to understand Research and Research Process, acquaint students with identifying problems for research and develop research strategies, familiarize students with the techniques of data collection, analysis of data and interpretation.*

Course Outcome: *The students will be able to*

1. *To get introduced to research philosophy and processes in general.*
2. *To formulate the research problem and prepare a research plan.*
3. *To communicate the research findings effectively.*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Introduction and Basic Research Concepts

Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, principle Research methods vs Methodology, Need of Research in Business and Social Sciences, Objectives of Research Issues and Problems in Research, Characteristics of Research: Systematic, Valid, Verifiable, Empirical and Critical

Module 02: Types of Research

Basic Research, Applied Research, Descriptive Research, Analytical Research, Empirical Research, Qualitative and Quantitative Approaches

Module 03: Research Design and Sample Design

Research Design – Meaning, Types and Significance, Sample Design – Meaning and Significance Essentials of a good sampling Stages in Sample Design Sampling methods/techniques Sampling Errors

Module 04: Research Methodology

Meaning of Research Methodology, Stages in Scientific Research Process: Identification and Selection of Research Problem, Formulation of Research Problem, Review of Literature, Formulation of Hypothesis, Formulation of research Design, Sample Design, Data Collection, Data Analysis, Hypothesis testing and Interpretation of Data, Preparation of Research Report

Module 05: Formulating Research Problem

Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis

Module 06: Outcome of Research

Preparation of the report on conclusion reached, Validity Testing & Ethical Issues, Suggestions and Recommendation

Text/Reference Books

1. Dawson C, “Practical Research Methods”, UBS Publishers Distributors.
2. Kothari C. R., “Research Methodology: Methods and Techniques”, Wiley Eastern Limited.
3. Kumar R., “Research Methodology: A Step-by-Step Guide for Beginners”, Pearson Education.

***Digital Material:**

https://nptel.ac.in/courses/110/105/110105091/

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - II

(Professional Elective courses- I, II & III)

ME-3407 Mechanical Behavior of Materials	L-T-P-S-C 3-0-0-0-3
Pre-requisite	Nil

Objective: *This course aims to cover the mechanical behavior of materials, by giving an emphasis to the introduction of the concepts of defect, in particular the linear ones, and set its effects on physical and mechanical properties of materials; and the different mechanisms of material failures (fracture, fatigue and creep) and their relationship with the different types of stress. The engineering knowledge acquired in this course unit will be integrated in the planning and development of laboratory assignments.*

Course Outcome: *Students will be able to*

1. Develop a fundamental understanding of the mechanical behavior of engineering materials.

2. Apply knowledge of mathematics, physics and materials science to solve engineering problems

3. Design and conduct experiments, as well as analyze and interpret data.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Introduction: Review of elastic and plastic behavior and crystal structure of materials; Isotropic and anisotropic properties of cubic and noncubic crystals.

Module 02: Crystal plasticity: Dislocation geometry and energy, dislocation mechanics, slip system, hardening; yield surface, micro-to-macro plasticity; Strain-rate and temperature dependence of flow stress.

Module 03: Superplasticity: Mechanical Twining, Martensitic transformation, Shape memory and superelasticity; Hardening mechanisms in metals; Concept of fatigue, fracture, creeps and stress rupture.

Module 04: Rheological behavior: Viscoelasticity; Residual stress; Flow and deformation behavior of polymer, ceramics and glasses; Deformation behavior of metal sandwich plate and metal-matrix composite material

***Text/Reference Books**

1. William F. Hosford, Mechanical Behaviour of Materials, Cambridge University Press, New York, USA, 2005.
2. Marc A. Meyers and Krishan Kumar Chawla, Mechanical Behaviour of Materials, 2nd revised eds, Cambridge University Press, New York, USA, 2008.
3. D.W.A. Rees, Basic Engineering Plasticity, Elsevier India, New Delhi, 2008.
4. C Lakshmana Rao and Abhijit P Deshpande, Modelling of Engineering Materials, Ane Books Pvt. Ltd., New Delhi, India, 2010.
5. John D. Verhoeven, Fundamentals of Physical Metallurgy, Wiley, 1975.
6. TH Courtney, Mechanical Behaviour of Materials, 2nd eds, McGraw-Hill International eds, 2000.
7. G E Dieter, Mechanical metallurgy, 3rd revised eds, Mgh, 1989.
8. Donald R. Askeland and Pradeep P. Phule, The Science and Engineering of Materials, 4th Eds, Thomson, Singapore, 2003.
9. J. Chakrabarty, Theory of plasticity, 3rd Eds, Elsevier India, 2009.

***Digital Material**

https://nptel.ac.in/courses/113/102/113102080/

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Machine Design Engineering)

Semester – II

(Professional Elective courses- I, II & III)

ME-3407 L-T-P-S-C
Computer Aided Design- Computer Aided Manufacturing 3-0-0-0-3

Pre-requisite Nil

Objective: *To introduce the student to the basic tools of computer-aided design (CAD) and computer-aided manufacturing (CAM). To expose the student to contemporary computer design tools for aerospace and mechanical engineers. To prepare the student to be an effective user of a CAD/CAM system and to provide an overview of how computers are being used in mechanical component design.*

Course Outcome: *Students will be able to*

1. Create a detailed drawing. Be able to assemble a manufacturing environment.

2. Create basic NC sequences necessary for material removal.

3. Use a commercial CAD/CAM software package as an engineering tool.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Introduction and components of Computer aided design (CAD)/Computer aided manufacturing (CAM)/Computer aided engineering (CAE) systems.

Module 02: Basic concepts of graphics programming; Transformation matrix; Rendering; Graphical user interface; Computer aided drafting systems.

Module 03: Geometric modeling systems – wireframe, surface and solid modeling systems; Nonmanifold systems; Assembly and web-based modeling systems; Representation and manipulation of conic sections; Hermite, Bezier, and B- spline curves and surfaces.

Module 04: Introduction to optimization; CAD/CAM integration; Numerical control – Concepts for manual and computer assisted part programming.

Module 05: Virtual engineering – components and applications.

***Text/Reference Books**

1. Kunwoo Lee, *Principles of CAD/CAM/CAE systems*, Addison Wesley, 1999.
2. Mark E. Coticchia, George W. Crawford, and Edward J. Preston, *CAD/CAM/CAE systems: justification, implementation and productivity measurement*, 2nd edition, New York, Marcel Dekker, 1993.
3. Chris Macmahon and Jimmie Browne *CADCAM: principles, practice and manufacturing management*, 2nd edition, Addison Wesley, 1998.
4. Mikell P. Groover and Emory W. Zimmers *,CAD/CAM: Computer aided design manufacturing*, Prentice Hall, 1996.
5. P. Radhakrishnan, S. Subramanyan, and V. Raju*, CAD/CAM/CIM* , 2nd edition, New Age, 2000.

***Digital Material**

https://www.youtube.com/watch?v=OkncKzflw8I

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - II

(Professional Elective courses- I,II & III)

ME-3409 L-T-P-S-C
Advanced Machining Processes 3-0-0-0-3

Pre-requisite Nil

Objective: *The aim of this course is to impart knowledge of various modern manufacturing processes, their characteristics & process parameters.*

Course Outcome: *After completion of this course, students will be able to:*

1. *Understand the applied aspects of advanced machining processes.*
2. *Understand modeling and simulation of non traditional machining processes.*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: General classification of unconventional machining processes; Abrasive jet machining, water jet and abrasive water jet machining, ultrasonic machining**.**

Module 02: Electric discharge machining and allied processes, laser beam machining, ion beam machining, plasma arc machining;

Module 03: Electro chemical machining (ECM) and allied processes, ECM tool design, chemical machining, photochemical machining; Elastic emission machining

Module 04: Advanced finishing processes, abrasive flow finishing, magnetic abrasive finishing, magnetorheological finishing, chemomechanical polishing; Comparative evaluation of different unconventional machining processes

Module 05: Analytical modeling of mechanical, thermal and electrochemical type nontraditional machining processes; Numerical modeling and simulation of unconventional machining processes; Computer aided process planning of non-traditional machining processes

Text/Reference Books

1. Jain V. K., Advanced Machining Processes, Allied Publishers,2009.
2. Gary F. Benedict, Nontraditional Manufacturing Processes, Taylor & Francis, 1987.
3. McGeough J. A. , Advanced Methods of Machining, Springer, 1988.
4. Mishra P. K., Non Conventional Machining, Narosa India Publication, 1997.
5. Hassan El-Hofy, Advanced Machining Processes: Nontraditional and Hybrid Machining Processes, McGraw-Hill Prof Med/Tech, 2005.
6. Pandey P. C. and Shan H. S., Modern Machining Processes, Tata McGraw-Hill Education, 1980.
7. Brown J. A., Modern Manufacturing Processes, Industrial Press, 1991.
8. Jain V. K., Introduction to Micromachining, Alpha Science International Limited, 2010.

Digital Material

https://www.youtube.com/watch?v=dmHv42wda9k
https://www.youtube.com/watch?v=tTnXn498F90
https://www.youtube.com/watch?v=kh4DSOtef4k
https://m.youtube.com/watch?v=Jg6YXvTO5FE

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - II

(Professional Elective courses- I, II & III)

ME-3410 L-T-P-S-C
Operation Research 3-0-0-0-3

Pre-requisite Nil

Objective: *This course provides an in-depth knowledge to operations research techniques. The students would understand to model decision problems using operation research.*

Course Outcome: *Students will be able to*

1. Explain Linear Programming Problems, Transportation and Assignment Problems.
2.Understand the usage of game theory and Simulation for Solving Business Problems.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Introduction: Origin and development of operations research, general methodology of OR, applications of OR to industrial problems. Linear Programming

Problems: Different types of models, formulation of linear programming problems (LPPs), product-mix problems, deterministic models, graphical solution.

Module 02: Simplex Method: Simplex algorithm, computational procedure in simplex method, applications of simplex technique to industrial problems. Duality and Sensitivity: Duality and its concept, dual linear programming, application of elementary sensitivity analysis.

Module 03: Linear Optimization Techniques: Integer programming problems (IPPs), assignment models: mathematical formulation, methods of solutions, transportation problems: methods of obtaining optimal solution degeneracy in transportation problems, transshipment problems.

Module 04: Game Problems: Introduction and scope of game problems in business and industry, min-max criterion and optimal strategy, solution of two-person zero-sum game, game problem as a special case of linear programming.

Module 05: Queuing Problems: Queuing systems and concepts, classification of queuing situations; Kendall"s notation, solution of queuing problems, single channel, single stage, finite and infinite queues with Poisson arrival and exponential service time, applications to industrial problems

***Text/Reference Books**

1. H.A. Taha, An Introduction to Operations Research (6th edition), Prentice Hall of India, 2001.
2. F.J. Hillier, G.J. Lieberman, Introduction to Operations Research (7th edition), Holden Day Inc., 2001.
3. H.M. Wagner, Principles of Operations Research, Prentice Hall of India, 1980.
4. D. Gross, and C.M. Harris, Fundamentals of Queuing Theory (2nd edition), John Wiely & sons, New York, 1985.
5.

***Digital Material**

https://www.youtube.com/watch?v=qxls3cYg8to

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - II

(Professional Elective courses- I, II & III)

ME-3411 Metal Casting	L-T-P-S-C 3-0-0-0-3
Pre-requisite	Nil

Objective: *To provides detailed information about the moulding processes. To provide knowledge of various casting processes in manufacturing. To gain theoretical and practical knowledge in material casting processes.*

Course Outcome: *Students will be able to*

1. *Interpret the different areas of foundry practices, gained idea about metal casting, scope and its applications.*
2. *Develops an understanding of the dependent and independent variables which control materials casting in a production process.*
3. *Explain the design of gating system for castings.*
4. *Identify the defect of casting.*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Organization of process preparation, principal conditions for execution of an order and process design, stages of foundry process design, principal rules for design of castings.

Module 02: Bonding action of clays, properties of moulding sands, facing and cushion materials. Additives, pattern layout and construction, colors and storing of patterns. The design and location of feeder heads, feeder head size, shape and location. Design and economics considerations.

Module 03: The Die process, investment casting from permanent patterns, unorthodox shaping techniques, techniques relating to metal structure and quality, Antioch process, continuous casting.

Module 04: Concept of solidification of metals, nucleation and growth. Coring, Fettling and salvaging of castings, heat treatment of castings.

Module 05: Casting Defects. Need for modernization and mechanization. Areas for mechanization, plant lay out for foundries. Aluminum, copper and magnesium foundry practices.

***Text/Reference Books**

1. P. L. Jain, Principles of Foundry Technology, Tata Mc Graw Hill, 2001.
2. Heine, Loper and Rosenthal , Principles of Metal Casting, Tata Mc Graw Hill, 1996
3. O. P. Khanna and M. Lal , Text Book of Foundry Technology, Dhanpat Rai and Sons, 1993.
4. John Campbell, Castings, Elsevier, 2004.
5. A. K. Chakraborti, Casting Technology and Cast Alloys, Prentice hall India, 2005.

***Digital Material**

https://nptel.ac.in/courses/112/107/112107083/

Detailed Syllabus for M.Tech. Degree Programme in

Mechanical Engineering (Production Engineering)

Semester - III

(Professional core courses)

ME-3406 L-T-P-S-C
Total Quality Management 3-0-0-1-4

Pre-requisite Nil

Objective: *This course discusses total quality is a description of the culture, attitude and organization of a company that aims to provide and continue to provide its customers with products and services the satisfy the needs.*

Course Outcome : *Students will be able to*

1. *Comprehend the concept of framework of Quality, process of customer perception, principles, philosophies, concept of quality circle and quality management*
2. *Demonstrate the concept of quality management, reliability and concept of Quality Systems Organizing & Implementation.*

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Quality Concepts: Evolution of Quality control, Definitions – TOM framework, concept change, TQM modern concept, Quality concept in design-

Quality – vision, mission and policy statements, benefits, awareness and obstacles. Quality council, employee involvement.

Module 02: Procurement & Customer Focus: Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure customer perception of quality, Concept of customer satisfaction, customer retention, cost of quality.

Module 03: Principles And philosophies of quality management: Overview of the contributions of Deming, Juran ,Crosby, Masaaki Imai, Feigenbaum, Ishikawa.
Quality circle, tools & techniques of TQM: Concepts of Quality circle, Japanese 5S principles and 8D Methodology ,Kaizen Gemba, toolkit for TQM, Element of JIT. statistical process control.

Module 04: Quality Management system: Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company .Taguchi techniques – introduction, loss function, parameter and experimental design.

Module 05:. Defects Diagnosis and Prevention: Defect study, identification and analysis of defects, corrective measure, Reliability: factors affecting reliability, MTTF, calculation of reliability, maintainability.
Quality Systems Organizing and Implementation: Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements.

Text/Reference Books

1. Total Quality Management by P.N.Mukherjee ,PHI
2. Total Quality Management by S.Rajaram and M.Sivakumar,Indian text edition
3. Total Quality Management by Dale H. Besterfield ,PHI
4. Statistical Quality Control by M.Mahajan, Dhanpat Rai & Co.

Digital material

http://www.nptel.ac.in/courses/110104080, Lecture by Prof.R.N.Sen Gupta IIT Kanpur)

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - III

(Professional core courses)

ME-4401 L-T-P-S-C
Manufacturing Lab 0-0-1-1-2

Pre-requisite Nil

Objective: *This course is designed to deliver practical knowledge of cutting force measurement and analysis. This course also familiarizes students with the sensors, transducers, PID controller, robots and CNC programming.*

Laboratory Outcome: *Students will be able to*

1. *Analyse cutting forces, tool wear & surface finish.*
2. *Compute microhardness, temperature, and chip thickness ratio.*
3. *Discuss various types of sensors, transducers, robots, PID controller and microprocessors.*
4. *Perform CNC programming and design simple electronic circuits.*

PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
1	1	1	1	0	1	1

List of Experiments

S. No.	Title of the Experiment	Module

1.	Measurement of cutting forces	-
2.	Measurement of surface roughness	-
3.	Study of tool wear, dimensional deviation, and vibrations in machining	-
4.	Measurement of chip thickness ratio and temperature in machining	-
5.	Measurement of microhardness	-
6.	Study of Sensors and transducers	-
7.	Study of PID controller	-
8.	Study of robots	-
9.	Study of microprocessors and PLCs for manufacturing applications	-
10	Perform CNC programming	-
11	Design of simple electronic circuits	-

***Text/Reference Books**

1. Mikell P. Groover, "Automation, Production Systems and Computer-Integrated Manufacturing", Pearson Education.
2. Mikell P. Groover and Emory W. Zimmers, *CAD/CAM: Computer aided design manufacturing*, Prentice Hall.
3. Rao P. N., "Manufacturing Technology" – Volume-2, Mc-Graw Hill Education**.**
4. Adithan M., "CNC Machines", New Age Publication.
5. Mittle R. and Nagrath I., "ROBOTICS AND CONTROL" , Mc-Graw Hill

***Digital Material**

1. https://www.youtube.com/watch?v=OkncKzflw8I
2. https://www.youtube.com/watch?v=eJ432X2dR9A

Detailed Syllabus for M.Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - III

(Project work)

ME-4500 Dissertation -I	L-T-P-S-C 0-0-0-5-5
Pre-requisite	Nil

The Dissertation for M.Tech programme consists of two parts: Dissertation-I and Dissertation-II. Dissertation-I is undertaken during the III Semester.

The Dissertation is by far the most important single piece of work in the post-graduate programme. It provides the opportunity for student to demonstrate independence and originality, to plan and organize a large Dissertation over a long period and to put into practice some of the techniques students have been taught in the course. Students will choose a dissertation, in consultation with a faculty member, who will act as the Supervisor. Dissertation involves a combination of sound background research, a solid implementation, or piece of theoretical work, and a thorough evaluation of the dissertation's output in both absolute and relative terms. The very best dissertations invariably cover some new ground, e.g. by developing a complex application which does not already exit, or by enhancing some existing application or method to improve its functionality, performance etc.

The student will prepare the Dissertation report as per the prescribed format/guidelines and present the same as a seminar at the end of the semester.

The Dissertation will be evaluated continuously over the span of the III Semesters, as per the approved procedure.

PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
1	1	1	1	1	1	1

Detailed Syllabus for M. Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - III

(Professional Elective courses- IV & V)

ME-4402 L-T-P-S-C
Flexible Manufacturing System 3-0-0-0-3

Pre-requisite Nil

Objective: *An advanced course in FMS dealing with optimum use of flexibility, recent advancements in scheduling and loading are also included. This course will highlight the fundamentals of FMS and modelling.*

Course Outcome: *Students will be able to*

1. Execute planning, scheduling, and control of flexible manufacturing systems.

2. Perform simulation on softwares and use of group technology to product classification.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Introduction: Introduction to Manufacturing Systems, Different types of

manufacturing systems, Volume Variety relationships for understanding manufacturing systems.

Module 02: Flexibility and automation: Different types of flexibility in manufacturing, Different types of FMS building blocks. Workstation, Storage retrieved system, material handling systems, computer control system.

Module 03: Machining system of FMS: Horizontal machining Centers, Vertical machining Centers, Integrated Material Handling, Automated Guided Vehicles, Automatic Storage and Retrieved System.

Module 04: Group technology: Part classification and coding, production flow analysis, Machine Cell design, Computer Aided Process Planning. Layout consideration for flexible manufacturing, Scheduling of flexible manufacturing system. FMS simulation.

***Text/Reference Books**

1. Automation, Production Systems and Computer integrated Manufacturing by MP. Groover.
2. Hand-book of Flexible Manufacturing Systems by Nand K. Jha.
3. Flexible manufacturing systems: recent development by Raouf, A. and Ben-Daya, M., Editors, Elsevier Science
4. Manufacturing Engineering and Technology by Kalpakjian, Addison-Wesley Publishsing Co.

***Digital Material**

1. https://www.youtube.com/watch?v=tiarT1YS-IM
2. https://www.youtube.com/watch?v=y3-5ENFtqrQ

Detailed Syllabus for M. Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - III

(Professional Elective Courses- IV & V)

ME-3412 L-T-P-S-C
Supply Chain Management 3-0-0-0-3

Pre-requisite Nil

Objectives: *The objective of this course is to provide basic understanding of logistics and supply chain management, activities performed by the logistics function, provide an insight in to the nature of supply chain, its functions and supply chain systems and understand global trends in supply chain management*

Course Outcomes: *After successful completion of this course, the students should be able to*

1. *Interpret the concept of Logistics, Supply Chain Management and Inventory management*
2. *Demonstrate the elements of* Supply Chain Network Design
3. *Implement the knowledge of* Sourcing and coordination in supply chain.
4. *Execute the* role IT in supply chain.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Role of logistics and supply chain management: scope and importance-evolution of supply chain decision phases in supply chain -competitive and supply chain strategies, drivers of supply chain performance and obstacles. inventory, order processing, purchasing, warehousing, materials handling, packaging.

Module 02: Supply chain network design: role of distribution in supply chain, factors influencing distribution network design, design options for distribution network distribution network in practice-role of network design in supply chain, framework for network decisions.

Module 03: Logistics in supply chain: role of transportation in supply chain, factors affecting transportations decision, design option for transportation network, tailored transportation, routing and scheduling in transportation.

Module 04: Sourcing and coordination in supply chain: Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration sourcing planning and analysis - supply chain co-ordination - Bull whip effect – effect of lack of co-ordination in supply chain and obstacles– Building strategic partnerships and trust within a supply chain.

Module 05: Supply chain and information technology: The role IT in supply chain-The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

Text/ reference Books:

1. Sunil Chopra, Peter Meindl and Kalra, “Supply Chain Management, Strategy, Planning, and Operation”, Pearson Education
2. Jeremy F.Shapiro, “Modeling the Supply Chain”, Thomson Duxbury
3. Srinivasan G.S, “Quantitative models in Operations and Supply Chain Management", PHI,
4. David J.Bloomberg , Stephen Lemay and Joe B.Hanna, “Logistics” PHI
5. James B.Ayers, “Handbook of Supply Chain Management”, St.Lucle press.

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https://www.youtube.com/watch?v=Nrl0CtS1m8Y

https://www.youtube.com/watch?v=qvO5dE0ABng

Detailed Syllabus for M. Tech. Degree Programme

in

Mechanical Engineering (Production Engineering)

Semester - III

(Professional Elective Courses- IV & V)

ME-4403 Machine Tool Design	L-T-P-S-C 3-0-0-0-3
Pre-requisite	Nil

Objective: *The scope of this course is to impart the knowledge of design of different components of machine tool.*

Course Outcome: *Students will be able to*

1. Describe the design consideration of Machine tool elements

2. Design structural element of Machine tool

3. Design the guide-way for Machine tool

4. Select optimum material and other resources.

PO1	PO2	PO3	PO5	PSO1	PSO2
1	1	1	1	1	1

Course Content

Module 01: Introduction to Machine Tools and Mechanisms:

General principles of machine tool design, working and auxiliary motions, machine tool drives, hydraulic and mechanical transmission and its elements, general requirements of machine tool design, layout of machine tools. Regulation of Speed and Feed Rates: Purpose, stepped regulation of speed-design of speed box, machine tool drives using multiple speed motors, developing the gearing diagram, step-less regulation of speed and feed rates.

Module 02: Machine Tool Structure: Functions and requirements, design criteria, materials used and their properties, static and dynamic stiffness, cross-sectional shapes used for machine tool structures and basic design procedure for the design of beds, columns and other structural elements, model techniques used design, introduction to Finite Element Method (FEM).

Module 03: Guideways and Power Screws: Function and types, design considerations & procedure for slideways, design of power screws.

Module 04: Spindles and Spindle Supports: Functions and requirements, materials, effect of machine tool compliance on machining accuracy, design of spindles, bearings design/selection. Control Systems: Functions, requirements and classification, control systems for speeds, feeds & auxiliary motions, manual control systems, automatic control systems, adaptive control systems, criteria and economic selection of machine tools, future trends in development of machine tools.

***Text/Reference Books**

1. Donaldson of al Tool Engineering, Tata Mc-Graw Hill, 1980.
2. Pollack, H.W. Tool Design, Reston Publishing Company, Inc. 1966
3. Kempster, M.H.A. Principles of Jig and Tool Design, English University Press Ltd.
4. Machine Tool Design and Numerical Control by Mehta N.K. TMH

***Digital Material**

1. https://www.youtube.com/watch?v=vGl7nQUbWGM

2. https://www.youtube.com/watch?v=KR74TQesUoQ

Detailed Syllabus for M. Tech. Degree Programme in Mechanical Engineering (Production Engineering)

Semester - IV

(Project work)

ME-4550 L-T-P-S-C
Dissertation -II 0-0-0-9-9

Prerequisite Dissertation - I

After completion of Dissertation-I, students will undertake the Dissertation-II in the IV Semester. The idea conceived and progress made in the Dissertation-I shall be extended as Dissertation-II under the supervision of a faculty member. Students shall complete the theoretical and practical aspect of the project. Thereafter they will prepare a report, as per the prescribed format/ guidelines, incorporating the results, their analysis and interpretation. The report, duly certified by the Supervisor, should be submitted to the Head of the Department. The report should also be presented as a seminar at the end of the semester.

Progress made by the student will be continuously monitored throughout the semester and evaluated as per the approved procedure.

PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
1	1	1	1	1	1	1

Detailed Syllabus for M. Tech. Degree Programme
in
Mechanical Engineering (Production Engineering)

Semester - IV

(Project work)

ME-3400	L-T-P-S-C
Dissertation Viva Voce	-- -- -3-3

Prerequisite: Dissertation - I

Dissertation Viva Voce is the verbal defence of the dissertation carried out by the student in front of a panel of examiners. The objective of Viva Voce examination is to confirm that the piece of work submitted as a dissertation is student's own work, he/she has a sound understanding of the subject of the dissertation, aware of the recent works in the area of dissertation, methodology adopted, and importance/relevance/merits of the output in relation with the existing results in the area.