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**SYLLABUS**

**1. Dual Degree Mechanical +MIE**

**GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** |
| **Department Of Mechanical Engineering B.Tech Syllabus 7th Sem Session 2014-2018 (Onwards)****To be implemented in session 2017­18** |
|  |  |  |  |  |  |  |  |  |  |
| S.NO | Course Code | Course Name | Credit | Contact Hours/Week | Exam Hours | Weightage (%) |
| L | T  | P | CE | ESE |
|  |  | **UNIVERSITY CORE** |  |  |  |  |  |  |  |
| 1 |  | Employability Skills 6 | 1 | 1 |  |  |  |  |  |
| 2 |  | Practical Training Seminar II | 1 | - | - | 2 |  |  |  |
| 3 | ME 455 | Project Stage­II  | 4 |  - | - | 8 | 3 | 60 | 40 |
| 4 |  | Proficiency in Co-Curricular Activities(PCA) | 2 |  |  |  |  |  |  |
|  |  | **PROGRAME CORE** |  |  |  |  |  |  |  |
| 5 | ME 401 | Refrigeration & Air-conditioning | 4 | 3 |  1 |  - | 3 | 30 | 70 |
| 6 | ME 403 | Power Plant Technologies | 3 | 3 | -  | - | 3 | 30 | 70 |
| 7 | ME 405 | Operation Research | 4 | 3 | 1  |  - | 3 | 30 | 70 |
| 8 | ME 451 | R.A.C Lab | 1 |  - | - | 2 | 3 | 60 | 40 |
| 9 | \*\*\*\*\* | MATLAB/ANSYS-II | 1 | - | - | 2 | 3 | 60 | 40 |
| 10 | ME511 | Advanced Manufacturing Process | 1 | - | - | 2 |  |  |  |
|  |  | **PROGRAME ELECTIVE** |  |  |  |  |  |  |  |
| 10. | \*\*\*\*\* | Solar Energy  | 3 | 3 | - | - | 3 | 30 | 70 |
| 11 | \*\*\*\* | Finite Element Method | 3 | 3 | - | - | 3 | 30 | 70 |
| 12 | \*\*\*\* | Computational Fluid Dynamics | 4 | 3 | 1 | - | 3 | 30 | 70 |
|  |  | **UNIVERSITY ELECTIVE** |  |  |  |  |  |  |  |
| 13 | CE315 | Solid Waste Management | 2 | 2 | - | - | 3 | 30 | 70 |
| 14 | CE406 | Project Planning & Construction Management | 2 | 2 | - | - | 3 | 30 | 70 |
| 15 | CE217 | E-Commerce | 2 | 2 | - | - | 3 | 30 | 70 |
|   |   | TOTAL | 23 | 15 | 2 | 14 |   |   |   |
|   |   | GRAND TOTAL |   | 26 |   |   |   |   |   |

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| **SURESH GYAN VIHAR UNIVERSITY, JAGATPURA JAIPUR.** |
| **Department Of Mechanical Engineering B.Tech Syllabus 8th Sem Session 2014-2018 (Onwards)****To be implemented in session 2017­18** |
|  |  |  |  |  |  |  |  |  |  |
| S.NO | Course Code | Course Name | Credit | Contact Hours/Week | Exam Hours | Weightage (%) |
| L | T  | P | CE | ESE |
|  |  | **UNIVERSITY CORE** |  |  |  |  |  |  |  |
| 1 |  | Intellectual Property Right  | 2 | 2 | - | - |  |  |  |
| 2 |  | B.Tech seminar | 1 | - | - | 2 |  |  |  |
|  |  | **PROGRAME CORE** |  |  |  |  |  |  |  |
| 3 | ME 406 | Computer Aided Mechanical Design | 4 | 3 | 1  |   | 3 | 30 | 70 |
| 4 | ME 404 | CNC Machines & Programming | 4 | 3 |  1 |   | 3 | 30 | 70 |
| 5 | \*\*\*\* | CAD/CAM lab | 1 | - | - | 2 |  |  |  |
| 6 | \*\*\*\* | Project Management Lab(Primevera,Msproject) | 1 | - | - | 2 |  |  |  |
| 7 | ME512 | Engineering Economics & Accounting | 3 | 3 | 0 | 0 |  |  |  |
|  |  | **PROGRAME ELECTIVE** |  |  |  |  |  |  |  |
| 3 | ME 402 | Robotics Engineering | 4 | 3 |  1 |   | 3 | 30 | 70 |
| 4 | ME407 | Metrology | 3 | 3 |  |  | 3 | 30 | 70 |
| 5 | \*\*\*\*\* | Reliability & Maintenance Engg | 3 | 3 |  |  | 3 | 30 | 70 |
| 6 | \*\*\*\*\* | Product Design & Development | 3 | 3 |  |  | 3 | 30 | 70 |
| 7 | \*\*\*\* | Solar Lab | 1 | - | - | 2 | 3 | 60 | 40 |
|  |  | **UNIVERSITY ELECTIVE** |  |  |  |  |  |  |  |
| 7 | \*\*\*\* |  SAP lab(ERP/MM) | 1 | - | - | 2 |  |  |  |
| 8 | \*\*\*\* | Actuarial Science | 1 | - | - | 2 |  |  |  |
|   |   | TOTAL | 17 | 12 | 2 | 8 |   |   |   |
|   |   | GRAND TOTAL |   | 17 |   |   |   |   |   |

**ME 511 Advance Manufacturing Processes C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Principles of Casting**Principles of Casting – metals, alloys, eutectics and plastics; Mechanism of melting and solidification, grain growth and structure, shrinkage defects. Mold filling – fluidity and turbulence, filling under gravity and pressure; filling defects; gating design, Injection Molding, Simulation of Mold filling and Solidification. | 8 |
| **II** | **Fundamentals of Fusion Welding**Fundamentals of fusion welding processes – analysis of heat source, types of metal transfer, weld pool characteristics, solidification mechanisms in fusion zone, heat affected zone characteristics, types of weld joint, distortion and residual stresses, weld defects, destructive and non-destructive testing of welds. | 8 |
| **III** | **Non Conventional Machining Processes**Introduction and need of Non-conventional machining processes, Principle, Theory of material removal, Process parameters, Advantages, limitations and applications of Ultrasonic machining, Electro discharge machining, Laser beam machining and Electrochemical machining.**Special processes:** Micro machining, Nano-technology, molecular dynamic analysis, dry electro discharge machining, electro discharge chemical machining, vacuum coating, Ballistic machining, unit head machining, hot machining. | 8 |
| **IV** | **Advances in Material Forming**Macroscopic plasticity and yield criteria, plastic instability, strain rate and temperature ,slab analysis, upper bound analysis, slip line field theory, plastic anisotropy, numerical analysis of material forming processes | 8 |
| **V** | **Unconventional forming processes**High energy rate forming, electromagnetic forming, explosive forming, high speed hot forging, high velocity extrusion, high speed forming machines, peen forming, study of various process parameters. | 8 |

**Reference Books:**

1.B.H. Amsteal, Philip F. Ostwald and Myron L. Begeman, Manufacturing Processes",

 John Wiley & Sons, eighth edition.

2. G.F. Benidict "Advanced Manufacturing processes", Marcel Deker Publisher

3. Lancaster,J. F., Metallurgy of welding, brazing and soldering, George Allen & Unwin,

 London, 1985

4. Degarmo, “Materials and Processes in Manufacturing”, 9th edition, Wiley Students

 Edition.

5. P. N. Rao, “Manufacturing Technology”, Tata McGraw Hill.

6. Regis Blondeau, “Metallurgy and Mechatronics of Welding”, ISTE.

7. American Soc. For Metals, Metals Handbook, 10th Edition, Vol 15, on Metal Forming,

 ASM, Metals Park, Ohio, 1989.

8. Eary, D. F., and Reed, E. A., Techniques of Press working Sheet metal and Engineering,

9. Willium F. Hosfford and Robert Caddell, Metal forming: Mechanics and Metallurgy,

10. Raj, Shankar, Bhandari, “Welding Technology for Engineers”, Narosa Publication House

 Pvt. Limited.

**ME 512 ENGINEERING ECONOMICS & ACCOUNTING C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** |  **Introduction:** Definition, nature and scope of Managerial Economics, Managerial Economics and Microeconomics – Managerial, Economics and Macro-economics - Applications of Economics. **Demand Analysis:** Determinants of Market Demand – Law of Demand - Elasticity of Demand - Measurement and its use - Demand Forecasting – Techniques of Demand Forecasting. | 8 |
| **II** |  **Pricing and output determination**Pricing decisions under different market forms like perfect competition, monopoly, oligopoly -Pricing Methods - Pricing in Public Sector, Pricing Methods - Pricing in Public Sector undertakings and co-operative societies. | 8 |
| **III** | **Cost Benefit Analysis**Steps in cost benefit analysis - Justification for the use of cost benefit analysis, Private Vs. Public Goods - Government investment, Overall resource allocation. | 8 |
| **IV** | **Cost management**Classification of cost, type of costing, absorption and marginal costing, break even analysis, standard cost accounting, cost-volume profit analysis. | 8 |
| **V** | **Investment appraisal methods**Types of investment proposals, project report, methods of appraisal, discounted cash flow, net present value method, internal rate of return, profitability index, depreciation, limitation of appraisal method, forecasting business changes, use of index number and growth analysis. | 8 |

**Reference Books:**

1. D.Salvatore , “Managerial Economics in a global economy” Tata McGraw Hill

2. Reckie and Crooke., “ Managerial Economics” Prentice Hall; 4 edition.

3. Khan M.Y., Jain P.K , “Management Accounting”, Tata Mc Graw Hill, 1995.

4. Horngren C.T., Datar S.M., Foster G.M., “Cost Accounting : a managerial emphasis”,Pearson Education, 2002.

**ME 513 METAL FORMING ANALYSIS & TECHNOLOGY C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Introduction:** Stress-strain relations in elastic and plastic deformations, yield criteria for ductile metals, work hardening and anisotropy in yielding. Flow curves, elements of theory of plasticity, application of theory of plasticity for solving metal forming problems using slab method, upper and lower bound methods, slip line field theory, extremism principles, and effect of temperature and strain rate in metal working. | 8 |
| **II** | **Tube making:** Tube making and deep drawing: introduction, plug drawing with a conical die, load determination, tandem drawing of tubes on a mandrel, tube sinking, concept of tube production by rolling and extrusion methods.**Exclusion:** Extrusion: round bar extrusion through a conical die, flat strip extrusion through dies of constant angles, impact extrusion, and hot extrusion of steels. | 8 |
| **III** | **Rolling:** Rolling of flat slabs and strip: Cold rolling and hot rolling, roll-pressure determination, rolling with no external tensions, rolling with front and back tensions.**Forging:** Forging: Introduction, determination of plain strain compression load, weight friction condition, inclined platen, thin strip, load evaluation for forging a flat circular disc. | 8 |
| **IV** | **Frictions lubrication:** Friction and lubrication in metal working, introduction, influences of friction in metalworking processes, lubricants used for different metalworking processes.**Unconventional Forming:** Introduction to unconventional forming processes like hydrostatic extrusion, hydro-forming of sheets and tubes, powder forming. | 8 |
| **V** | **Drawing:** Drawing of a flat strip and round bar, determination of drawing load, drawing with wedge shaped dies, cylindrical dies, cylindrical rod drawing with a conical die analysis of the processes and maximum possible reduction. | 8 |

**Reference Books:**

1. Principles of Industrial Metal working Processes ,G. B. Rowe, CBS.
2. Manufacturing Science, Ghosh & Malik, East West.
3. Foundry, forming and welding, P.N. Rao, TMH.

**ME 514 TOOL AND CUTTER DESIGN C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Classification of cutting tools:** Various machining operations and the tools required to carry out these operations: principle elements of various cutting tools; single point cutting tool geometry in ASA, ORS & NRS systems.**Tool Materials:** Properties of cutting tool materials, development of cutting tool materials, composition, production process and application of different cutting tool materials viz. High carbon steel, HSS, carbides, Ceramics, CBN, UCON, diamond, etc. | 8 |
| **II** | **Design of Single point cutting tools:** Cutting parameters of a lathe, different turning operations and cutting tools used for these operations. Classification of single point cutting tools: solid, carbide tipped tools, geometrical parameters of a single point cutting tool, design procedure of single point cutting tool, re-sharpening of single point cutting tools.**Form Tools:** Purpose and types, design procedure and their sharpening. | 8 |
| **III** | **Drill design:** Drilling operations, Cutting parameters of drilling operations, different drilling operations and cutting tools used for these operations, Types of drills, solid, carbide tipped drills, geometrical parameters of a twist drill, design procedure of a twist drill, resharpening of the twist drill. | 8 |
| **IV** | **Milling Cutter Design:** Milling operations, milling cutting parameters, different milling operations and cutting tools for these operations, Types of milling cutters, solid, and carbide tipped cutter; geometrical parameters of a milling cutter, design procedure of a disc type milling cutter, re-sharpening of the cutters. | 8 |
| **V** | **Broach design:** Broaching operation and its advantages, broaching cutting parameters,types of broaches, solid, and carbide tipped broaches; design procedure of a broach, resharpening of the broach. **Hob design:** Gear nomenclature, construction of involutes profile, hobbing operation and its advantages, geometrical parameters of a hob, design procedure of a hob. | 8 |

**Reference Books:**

1. Tool Design, Donaldson, McGraw Hill
2. Cutting tools, Prakash Joshi, Wheeler Publishing
3. Metal Cutting theory & practice, Arschinow & Alearoev, Mir publication

**ME 515 QUALITY ENGINEERING AND MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | Statistical concepts in quality control, Graphical representation of ground data, Continuous & discrete probability distributions, central limit theorem, Chi-square test, Introduction to quality control, process control and product control, chance and assignable causes of quality variation, advantages of Shewart control charts. | 8 |
| **II** | Process control charts for variables, Fixation of control limits, Type I and Type II errors Theory of runs, interpretation of out of control points, Probability limits, initiation of control charts, trial control limits, determination of aimed-at value of process setting, rational Method of sub grouping, control chart parameters, control limits and specifications limits, natural tolerance limits, relationship of process in control to upper and lower specifications limits, process capability studies. | 8 |
| **III** | Control charts:Special control charts for variables, Group control charts, Arithmetic moving X ad R charts, Geometric Moving charts, X control charts with reject limits, Steady trend in process average with cost dispersion, trend chart with sloping limits, variable subgroup size CUSUM or cumulative sum control chart. | 8 |
| **IV** | Sampling plans:Probability theory, hyper-geometric, Binomial and Poisson distributions, Acceptance inspection 100% inspection, no Inspection and sampling inspection, Operating characteristic curve, effect of sample size and acceptance number. Type a and Type B ,O.C curves, single, Double and multiple sampling plans, Sequential sampling plans, Acceptance/rejection ad acceptance/rectification plans, procedure’s risk ad consumer’s risk, difference quality level, Average outgoing quality curve, average outgoing quality limit,quality protection offered by a sampling plan. average sample number, Design of single, double and sequential plans. | 8 |
| **V** | Quality systems:Economics of product inspection. real point, selection of economic sampling plans, Product quality ad reliability, failure data analysis ad life testing, elements of total quality control quality assurance, ISO9000 quality system. | 8 |

**Reference Books:**

1. Statistical Quality Control, Grant & Leaveworth, McGraw Hill
2. Quality Control & Industrial Statistics, Duncan, Irwin Press
3. Quality Control Handbook, Juran, McGraw Hill
4. Quality Control, Hansen, Prentice Hall
5. An Introduction to reliability & control, Thomason, Machinery Publishing
6. Total Quality Control, A.V. Taylor, McGraw-Hill
7. Quality Control Systems, J.R. Taylor, McGraw-Hill

**ME 516 MANUFACTURING MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Scope of Manufacturing Management** History and development of Manufacturing Management - Contribution of various pioneers beginning from Division of Labor to Quality Revolution and Environmental Control. Manufacturing Management - Nature, Scope, Importance and Functions**Production Planning & Control** Functions of Production Planning & Control (PPC), Scheduling techniques - Gantt Charts, analytical techniques, Documentation - Production Work Order. Introduction to PERT/CPM, Network Crashing. | 8 |
| **II** | **Advanced Topics in Production Management** Concept of world-class manufacturing, quality management system, manufacturing challenges of information age, lean and agile manufacturing, reconfigurable manufacturing, green production, computerized production management system. | 8 |
| **III** | **Organizational Behaviour**  Definition - Importance - Historical Backgrourud, Fundamental Concepts of OB - 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive, collegial and SOBC Personality & Attitudes - Meaning of personality - Development of personality Nature and dimensions of attitude - Job Satisfaction - Organizational Commitment. | 8 |
| **IV** | **Motivation and Leadership**  Motivation - Motives - Characteristics - Classification of motives - Primary Motive, Secondary motives - Morale - Definition and relationship with productivity – Morale Indicators; Theories of Work Motivation - Maslow's theory of need hierarchy Herzberg's theory of job loading Leadership - Definition -Importance - Leadership Styles - Models and Theories of Leadership Styles. | 8 |
| **V** | **Group Dynamics and Team Working**  Theories of Group Formation - Formal and Informal Groups, their interaction - Importance of teams - Formation of teams - Team Work. Conflict management - Traditional vis-à-vis Modern view of conflict - Stress management, Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict. | 8 |

**Reference Books:**

1. Fred Luthans, Organizational Behaviour

2. Saxena, Principles and Practices of Management

3. Krajewski, Operations Management, 5th Ed.

4. Panneerselvam, Production & Operations Management

5. Adam & Ebert, Production & Operations Management

**ME 517 RELIABILITY AND FAILURE ANALYSIS C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Introduction:** Basic Probability-concept and various distributions, Concept of Reliability and analysis of various configurations of assemblies and sub-assemblies. Series, Parallel and other grouping. System reliability, Set theory, optimal Cut Set and Tie Set, ‘stardelta’ method, matrix method etc. | 8 |
| **II** | **Product Failure Theory:** System reliability through ‘Even Tree’ analysis and Fault Tree Analysis (FTA),Failure Modes and Effects Analysis (FMEA), Failure Modes,Effect and Criticality Analysis (FMECA).R.P.N, Graph theory, etc. | 8 |
| **III** | **Reliability Prediction Models:** Series and parallel systems – RBD approach-Standy systems – m/n configuration – Application of Baye’s theorem – cut and tie set method – method – Markov analysis. Optimal allocation of component reliability to achieve maximum system reliability – various techniques and methods such as Proportional, Conditional, Agree, Arinc, etc. | 8 |
| **IV** | **Reliability evaluation:** Concept of loading roughness, probability in design including evaluation of safety margin. Reliability of Engineering Design; Mean, Median & K statistics for Reliability evaluation (non parametric,Short Sample). | 8 |
| **V** | **Reliability Management:** Reliability testing – Reliability growth monitoring - Non parametric methods – Reliability and life cycle costs – Reliability allocation - Replacement model.**Case Studies:** CDiagnostic maintenance through ferrography, Vibration Signature, SOAP and other programme. Case studies done in Indian perspectives using Short Sample, nonparametric reliability. | 8 |

**Reference Books:**

1. Gupta AK, Reliability engineering and tero-technology, Macmillan India Ltd, Delhi
2. Srinath LS, Reliability Engineering, Affiliated East-West Press Pvt Ltd.Delhi
3. O’Connor PDT,Practical Reliability Engineering, John Wiley & Sons Ltd, Singapore
4. Modarres, “Reliability and Risk analysis”, Mara Dekker Inc., 1993.
5. John Davidson, The Reliability of Mechanical system, The Institution of Mechanical Engineering, London, 1998.
6. Smith C.O.” Introduction to Reliability in Design” McGraw Hill, London.”Reliability Engineering and Risk Analysis”,2nd edition Taylor & Francis.

**ME 518 INDUSTRIAL AUTOMATION C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Automation of assembly lines**Concept of automation, mechanization and automation, Concept of automation in industry, mechanization and automation, classification, balancing of assembly line using available algorithms. Transfer line-monitoring system (TLMS) using Line Status, Line efficiency. Buffer stock Simulation in assembly line. | 8 |
| **II** | **Automation using hydraulic systems** Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. Selection of hydraulic fluid, practical case studied on hydraulic circuit design and performance analysis. Servo valves, electro hydraulic valves, proportional valves and their applications. | 8 |
| **III** | **Automation using pneumatic systems**Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits -switching circuits - fringe conditions modules and these integration - sequential circuits -cascade methods - mapping methods – step counter method - compound circuit design -combination circuit design. Pneumatic equipments - selection of components – design calculations -application - fault finding – hydro pneumatic circuits - use of microprocessorsfor sequencing - PLC, Low cost automation - Robotic circuits. | 8 |
| **IV** | **Automation using electronic systems**Introduction, various sensors, transducers, signal processing, servo systems, programming of microprocessors using 8085 instruction, programmable logic controllers.**Automated work piece handling**Working principles and techniques, job orienting and feeding devices. Transfer mechanisms-automated feed cut of components, performance analysis. Uses of various types of handling systems including AGV and its various guiding technologies. | 8 |
| **V** | **Introduction to robot technology**Robot physical configuration and basic robot motions, Types of manipulators- constructional features, servo and non servo manipulators. Feedback systems and sensors- encoders and other feed back systems, vision, ranging systems, tactile sensors. Programming languages- description of VAL and other languages. Artificial intelligence- legged locomotion and expert systems. | 8 |

**Reference Books:**

1. Groover, M.P., CAD/CAM- Prentice Hall

2. Yoram Koren, Robotics for Engineers- McGraw Hill 1992

3. Paul, R.P., Robot Manipulators- MIT Press 1993

4. Pressman R.S, Numerical Control and CAM-. John Wiley 1993 Williams

5. Shearer P., Fluid Power Control John Wiley

6. Antony Espossito, " Fluid power with Applications ", Prentice Hall, 1980.

7. Dudleyt, A.Pease and John J.Pippenger, " Basic Fluid Power ", Prentice Hall, 1987.

8. Andrew Parr, " Hydraulic and Pneumatics ", (HB), Jaico Publishing House, 1999.

9. Bolton. W. " Pneumatic and Hydraulic Systems ", Butterworth - Heineman, 1997.

**ME 519 CAD/CAM/CIM C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Computer aided design:** Geometric modeling, model structure organization, database creation, wire frame modeling, solid modeling, surface modeling, parametric modeling, variational modeling, hybrid modeling. Types and mathematical representation of curves, surfaces and solids.Geometric transformations, visual realism, computer animation, mechanical assembly, mass property calculations. | 8 |
| **II** | **Computer aided manufacturing:** Revision to NC/CNC/DNC and its role in flexible manufacturing systems and CIMS, Elements of CNC systems, CNC part programming, computer assisted part programming, NC program generation from CAD models, tool path generation and verification, recentdevelopments in CNC machine tools. | 8 |
| **III** | **Computer aided engineering analysis:** Introduction to finite element analysis, need for finite element analysis in CAD/CAM system, Steps in finite element analysis, second order differential equation in onedimensionapplications such as discrete systems, heat transfer, fluid mechanics, planetrusses. Introduction to advance topic in finite element analysis such as three-dimensional problems and non-linear problems. Use of engineering analysis software. | 8 |
| **IV** | **Computer aided process planning:**Advantages of CAPP, variant type CAPP system, generative approach, hybrid approach, geometric modeling for process planning, computer programming languages for CAPP.**Computer aided shop floor control:** Computer aided production planning and control, computer aided material requirement planning, factory data collection system, computer process monitoring, computer aidedquality control. | 8 |
| **V** | **Computer Integrated manufacturing****Cellular manufacturing system:** Introduction to GT, benefits, part families, part classification and coding, product flow analysis, cellular manufacturing systems, virtual cell system, quantitative analysis in cellular manufacturing.**Flexible manufacturing system:** Building blocks of FMS, applications, benefits, FMS layout, FMS planning and implementation issues, quantitative analysis of FMS. Computer aided material handling system, computer control system. | 8 |

**Reference Books:**

1. Mikell P. Grover, “Automation, Production Systems and Computer-Integrated Manufacturing”, Pearson Education, New Delhi.
2. P. Radhakrishnan and S. Subramanyan “CAD/CAM/CIM” Willey Eastern Limited, New Delhi.
3. Michael Fitzpatrick, “Machining and CNC Technology”, Tata McGraw Hill.
4. Mikell P. Grover and Enory W. Zimmers Jr. “CAD/CAM”, Pearson Education, New Delhi.
5. Steve Krar, Arthar Gill “CNC Technology and Programming”, McGraw Hill Pub. Company, New Delhi.
6. P.N. Rao N.K. Tewari et al “CAM” Tata Mc Graw Hill Pub. New Delhi.
7. David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi
8. Zeid Ibrahim, “CAD/CAM Theory and Practices”, McGraw Hill International Edition.

**ME 520 SUPPLY CHAIN MANAGEMENT C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Introduction**Objectives of Supply Chain Management (SCM), key components of supply chain i.e.sourcing, distribution strategy, customer service strategy; supply chain. Management as Integrated logistics, generic activities, architecture of supply chain, future potential of SCM. **Supply chain strategies**Evaluation of supply chain strategies, supply chain performance measures, vendor management, JIT, Link to supply chain, evaluation of SCM strategies, customer focus in SCM, inventory and logistic management, vendor management, Just-in- Time (JIT). Supply chain design considerations. | 8 |
| **II** | **Logistic Management**Logistical operation, integration, network design, logistical performance cycle, customer service global logistic, logistical resources, logistic planning. | 8 |
| **III** | **Warehouse and transport management**Concept of strategic storage, warehouse functionality, warehouse operating principles, developing warehouse resources, material handling and packaging in warehouse, transportation management, transport functionality and principles, transport infrastructure, transport economics and pricing, transport decision making.  | 8 |
| **IV** | **Inventory management**Cost associated with inventory decisions, selective control, economic order quantity, safety stock and service level, P and Q system, probabilistic models. Recent Trends in SCM: | 8 |
| **V** | **Recent Trends in SCM**Tierisation of supplies, Reverse logistics, JIT II, Milk Round System (MRS), bar coding, Hub and Spoke Concept and other latest concepts. IT – enabled supply chain: Electronic data interchange, enterprise resource planning (ERP), Application of IT, Scope of emerging distributed cooperative tele-manufacturing over internet. | 8 |

**Reference Books:**

1. Chopra, “Supply Chain Management”, Pearson Education Asia, New Delhi
2. Christopher, “Logistics and Supply Chain Management”, Pearson Education Asia, New Delhi
3. Taylor and Brunt, “Manufacturing Operations and Supply Chain Management (The Lean Approach)”, Business Press Thomson Learning, NY.

4. Arjan J. Van Weele, “Purchasing and Supply Chain Management (Analysis Planning and Practice)”, Engineering, Business Press, Thomson Learning NY.

5. Donald B., “Logistic Management - The Integrated Supply Chain process”, McGraw Hill,

**ME 605 MACHINE TOOL DESIGN C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Design approach:** Design requirements of machine tools, A design approach for machine tools. Identification and quantification of objectives and constraints in machine tool design**Power requirements:** Estimation of power requirements and selection of motor for metal cutting machine tool spindles. | 8 |
| **II** | **Gearbox design:** Design of gearbox, spindle and guide-ways. | 8 |
| **III** | **Structural design:** Principles of design of structural components, namely, head stock, tail stock, carriage, table, knee, column and overarms to achieve desired static & fatigue strength, stiffness, dynamic characteristics and other requirements, Exercises on the design of machine tools using existing CAD software packages. | 8 |
| **IV** | **CNC machine design:** Introduction to computer integrated manufacturing systems and CNC machine tools. | 8 |
| **V** | **Design of CNC systems:** Design/selection of linear motion systems, ball, screws, CNC feedback devices, controllers, feed drives and servomotors for CNC machine tools. Recent developments in CNC and other machine tools. | 8 |

**Reference Books:**

1. Design of Devices and Systems, William H. Middendorf and Richard H. Engelmann,CRC Press
2. Computer numerical control of machine tools,G. E. Thyer Heinemann Prof.,Publishing
3. Machine Design Fundamentals:A Mechanical Designers'Workbook,Joseph Edward Shigley and Charles R. Mischke,McGraw Hill.
4. Numerical Control and Computer aided manufacture Kundra, Rao, Tiwari Tata McGraw Hill.
5. **ME 607 RESEARCH METHODOLOGIES C (L, T, P) = 3(3, 0, 0)**

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| **Unit** | **Course Contents** | **Total****Contact****Hrs. 40** |
| **I** | **Introduction**Nature and objectives of research. Methods of Research: historical, descriptive and experimental, research process, research approaches, criteria for good research.**Research Design**Meaning of research design, need of research design, features of good design, different research designs, and basic principles of experimental designs, design of experiments. | 8 |
| **II** | **Data collection**Types of data, methods and techniques of data collection, primary and secondary data, meta analysis, historical methods, content analysis, devices used in data collection, pilot study and pretest of tools, choice of data collection methods. | 8 |
| **III** | **Processing and analysis of data**Use of statistics for data analysis, measures of central tendency, dispersion, skewness and relationship. Sampling distributions, sampling theory, determination of sample size, chisquare test, analysis of variance, multiple regression analysis. | 8 |
| **IV** | **Decision making techniques**Application of various decision making techniques such as Analytical Hierarchy Process (AHP), TOPSIS, neural networks, graph theory, simulated annealing, genetic algorithms, data envelope analysis (DEA). | 8 |
| **V** | **Interpretation and report writing:**Techniques of interpretation, precautions in interpretation, significance of report writing, different steps in report writing, layout of research report, mechanics of writing research report. | 8 |

1. **Reference Books:**
2. 1. C.R Kothari, Research Methodology, Wishwa Prakashan
3. 2. P.G Triphati, Research Methodology, Sultan Chand & Sons, N.Delhi
4. 3. Fisher, Design of Experiments, Hafner
5. 4. Stoufferetal, Measurement and Prediction, Wiley, N.York
6. 5. J.W Bames, Statistical Analysis for Engineers and Scientists, McGraw Hill, N.York
7. 6. Donald Cooper, Business Research Methods, Tata McGraw Hill, N.Delhi
8. 7. Bhanwar Lal Garg, Renu Kavdia, Sulochana Agrawal and Umesh Kumar Agrawal, An
9. Introduction to Research Methodology. RBSA Publications,
10. 8. Rao S. S., “Optimization”, Wiley Eastern, New Delhi, 1995.
11. 9. Montgomery D.C., “Design and analysis of experiments”, Wiley publications.