Scheme of Instruction & Syllabi
Of
Master of Technology
In
Mechanical Engineering

(Specialization in Production Engineering)

I and II Year

(Effective from 2015-16)

INVERTIS UNIVERSITY, BAREILLY
M. TECH (MECHANICAL ENGINEERING)
(SPECIALIZATION IN PRODUCTION ENGINEERING)
EFFECTIVE FROM (2015-16)

INVERTIS UNIVERSITY, BAREILLY

YEAR I, SEMESTER-I

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				SUBJECT TOTAL	Credits
						SESSIONAL EXAM.			E-SEM		
			L	T	P	CT	TA	TOTAL			
1	**MPE-101**	Modern welding Techniques	3	1	0	20	10	30	70	100	**4**
2	**MPE-102**	Foundry Technology /Fire Technology	3	1	0	20	10	30	70	100	**4**
3	**MPE-103**	Modern methods of manufacturing	3	1	0	20	10	30	70	100	**4**
4	**MPE-104**	Metal Forming Technology	3	1	0	20	10	30	70	100	**4**
5	**MPE-105**	Design of Technology	3	1	0	20	10	30	70	100	**4**
6	**MPE-151**	Seminar 1	0	4	0		-	50	-	50	**2**
Total			15	9	0	-	-	-	-	550	22

YEAR I, SEMESTER-II

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				SUBJECT TOTAL	Credits
						SESSIONAL EXAM.			E-SEM		
			L	T	P	CT	TA	TOTAL			
1	**MPE-201**	Mathematical Modeling and Optimization	3	1	0	20	10	30	70	100	**4**
2	**MPE-202**	Production Planning and Control	3	1	0	20	10	30	70	100	**4**
3	**MPE-203**	Advanced Machine Tool Design	3	1	0	20	10	30	70	100	**4**
4	**MDE-20?**	Department Elective	3	1	0	20	10	30	70	100	**4**
5	**MOE-20?**	Open Elective I	3	1	0	20	10	30	70	100	**4**
6	**MPE-251**	Seminar 2	0	4	0		-	50	-	50	**2**
Total			15	9	0	-	-	-	-	550	**22**

YEAR II, SEMESTER-III

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				SUBJECT TOTAL	Credits
						SESSIONAL EXAM.			E-SEM		
			L	T	P	CT	TA	TOTAL			
1	**MOE-30?**	Open Elective II	3	1	0	20	10	30	70	100	**4**
2	**MOE-33?**	Open Elective III	3	1	0	20	10	30	70	100	**4**
3	**MPE -351**	Seminar 3	0	4	0	-	-	50	-	50	**2**
4	**MPE-352**	Preliminary Thesis	0	16	0	-	-	200	-	200	**8**
Total			6	22	0	-	-	-	-	450	18

YEAR II, SEMESTER-IV

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				SUBJECT TOTAL	Credits
						SESSIONAL EXAM.			E-SEM		
			L	T	P	CT	TA	TOTAL			
1	**MPE-451**	THESIS	0	16	0	-	-	100	300	400	**16**
Total			0	16	0	-	-	-	-	400	16

List of Department Electives-I (MDE-20?)

1. MDE 201 Advanced Finite Element Analysis
2. MDE 202 Nano Technology
3. MDE 203 Optimization Techniques & Design of Experiments
4. MDE 204 Experimental Techniques in Fluid Flow & Heat Transfer
5. MDE 205 Refrigeration & air conditioning
6. MDE 206 Convective Heat Transfer
7. MDE 207 Product Design and Development
8. MDE208 Rapid Prototyping

List of Open Electives-I (MOE-20?)

1. MOE 201 Materials management
2. MOE202 Quality Engineering
3. MOE203 Renewable Energy Systems
4. MOE204 Modeling Simulation & Optimization
5. MOE205 Advanced composite materials
6. MOE206 Theory of vibration
7. MOE207 Advanced Fluid Mechanics
8. MOE208 Gas Dynamics
9. MOE209 Solar Energy & technology
10. MOE210 Advanced Casting & Welding Technology
11. MOE211 Hydraulic and pneumatics for production

List of Open Electives-II (MOE-30?)

1. MOE 301 CNC system and programming
2. MOE 302 Production Technology
3. MOE 303 Hydraulics and pneumatics for production
4. MOE 304 Thermal and Nuclear Power Plants
5. MOE 305 Thermal Measurements and Process Controls
6. MOE 306 Combustion Technology
7. MOE 307 Optimization Techniques
8. MOE 308 Environmental Pollution & Its Control
9. MOE 309 Advanced Power Plant Engineering

10. MOE 310 Robotics
11. MOE311 Mechatronics

List of Open Electives-III (MOE-33?)

1. MOE330 soft computing and Techniques
2. MOE331 cryogenic Engineering
3. MOE332 Turbo Machines
4. MOE333 Integrated Production Control & System
5. MOE334 Applied Operations Research
6. MOE335 Hybrid Manufacturing
7. MOE336 Additive Manufacturing And Tooling
8. MOE337 Advanced Internal Combustion Engineering

MPE -101 MODERN WELDING TECHNIQUES

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70
L T P-3 1 0

MODULE 1

Classification of welding processes; Gas welding; Arc welding; arc physics, power source characteristics, Manual metal arc welding: Concepts, types of electrodes and their applications, Gas tungsten arc welding: Concepts, processes and applications ; gas metal arc welding, Concepts, processes and applications ,types of metal transfer, CO2 welding.

MODULE 2

Submerged arc welding, advantages and limitations, process variables and their effects, significance of flux-metal combination, modern developments, narrow gap submerged arc welding, applications; electro slag and electro gas welding

MODULE 3

Plasma welding; Concepts, processes and applications, keyhole and puddle-in mode of operation, low current and high current plasma arc welding and their applications; Resistance welding, Concepts, types and applications, Flash butt welding, Stud welding and under water welding

Reference Books:

1. Parmer R. S., 'Welding Engineering and Technology', Khanna Publishers, 1997

2. Cary, Howard, "Modern Welding Technology', prentice Hall, 1998

MPE-102 FOUNDRY TECHNOLOGY

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70
L T P-3 1 0

MODULE-1

Critical review of some foundry operations: Various casting processes, mould reinforcements, mould factors in metal Flow, molding factors in casting design, limitations in controlling some molding factors in casting design, Effect of process variables on property of core and mould making sand. Properties of liquid metals: Thermal properties, viscosity, surface tension and density of liquid metals and their role in foundry technology. Gases in liquid metals: Simple gases in metals, complex gases in metals, gas defects and their control.

MODULE-2

Solidification of metals and alloys: Structure of casting as influenced by alloy constituents, thermal conditions, inherent nucleation and growth condition in the liquid like temperature gradient, liquids temperature profile and G/R ratio. Control of structure; principles of gating and rise ring, Directionality in solidification, Characteristics of different alloys, Design of gating system, Wlodawer system of determining the feeder head requirements. Feeder head efficiency, concept of feeding range,use of supplementary techniques and introduction of design modifications.

MODULE-3

Special casting processes: Investment casting, Die casting, centrifugal casting, full mould casting, vacuum shield casting etc. Industrial melting practices: Aim of melting and melting practices as adopted in case of Cast Irons, Steel, Cu, Al and its alloys. Casting defects & their remedies: Shaping faults arising in pouring, Inclusions and sand defects, gas defects, shrinkage defects during solidification in liquid phase. Contraction defects, Dimensional errors, compositional errors and segregation.

Reference Books:

1. Beeley, P.R., Foundry Technology, Butterworth and Co.

2. Webster, P.D., Fundamentals of Foundry Technology,

3. Mukherjee, P.C, Fundamentals of Metal casting Technology

MPE-103 MODERN METHODS OF MANUFACTURING

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70

L T P-3 1 0

MODULE 1

Introduction to machining: Classification of machining processes, comparison between conventional and non-conventional machining processes, requirements of tool materials, Developments in tool materials, ISO specifications for inserts and tool holders, Tool life, Optimization of tool lie parameters for machining.Laser beam machining: Introduction to laser beam machining, process parameters, machining applications of laser, advantages and limitations of laser beam machining. Electron beam machining: Introduction to laser beam machining, equipment and process parameters used in machining, advantages and disadvantages of laser beam machining.

MODULE 2

Mechanical machining processes: Abrasive jet machining: Introduction, Equipment, variables in abrasive jet machining: carrier gas, type of abrasive, size of abrasive grain, velocity of abrasive jet, Mean abrasive particles per unit volume of carrier gas, work material stand off distance, nozzle design. Process characteristics – material removal rate, accuracy and surface finish, Advantages, disadvantages and applications of abrasive jet machining.

Ultrasonic machining: Introduction, equipment details, tool material and tool size, abrasive slurry, tool cone (concentrator), exponential concentrator of circular cross section and rectangular cross-section, hollow cylindrical concentrator. Effect of various process parameters, applications, advantages and disadvantages of ultrasonic machining. HERF techniques, Super plastic forming techniques, Principles and Process parameters, Advantages, applications and limitations of HERF techniques, Orbital forging, Isothermal forging

MODULE 3

Electrochemical machining: Introduction to Electro-chemical machining, Study of ECM machine, Elements of ECM process: cathode tool, anode work-piece, source of DC power, electrolyte, process characteristics-Material removal rate, Accuracy,

surface finish, Economics of ECM, applications, limitations, advantages and disadvantages of electrochemical machining.

Electric Discharge Machining: Introduction to electric discharge machining, mechanism of metal removal, dielectric fluid, spark generator, tool material (electrodes), electrode feed control, electrode wear, electrode tool design: Choice of matching operation, electrode material selection, under sizing and length of electrode, machining time. Flushing – pressure flushing synchronized with electrode movement, process characteristics: material removal rate, accuracy, surface finish, heat affected zone, travelling wire EDM, applications.

Reference Books:

1. Metal Cutting Principles M.C. Shaw Oxford Clarendon Press
2. Modern Machining Process – Pandey and Shahn, TATA Mc Graw Hill 2000.
3. Fundamentals of Metal Cutting and Machine Tools B.L. Juneja and G.S. Sekhon New Age International
4. Fundamentals of Metal Casting H. Loper and Rosenthal Tata McGraw Hill

MPE-104 METAL FORMING TECHNOLOGY

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70
L T P- 3 1 0

Module I

Introduction:
Definitions and classification of Metal forming processes, Brief description of forming operations Bulk forming processes: Rolling Process, Direct extrusion process, backward extrusion or indirect extrusion, Sheet metal operations: Deep drawing, Bending and shearing. Elastic and plastic deformation of material, Elementary stress analysis, Principal stresses, Yield criteria, Tresca's maximum shear stress criteria, Von Misses maximum distortion energy criteria. Relationship between tensile and shear yield stresses.

Module II

Metal forming Lubrication: - Friction and Lubrication in Metal Forming lubrication mechanisms, boundary and extreme pressure lubricants, mixed lubrication, hydrodynamic lubrication, lubricants used in industrial forming processes
Defects
Causes and remedies of important forming defects

Miscellaneous Forming Processes
Advantages and disadvantages of Hot and Cold Forming

Module III

Mechanics of Forming Processes
Determination of rolling pressure, rolling separating force, forging of strip, forging of disc, Determination of drawing force and power, Determination of maximum allowable reduction,
Deep Drawing, bending determination of work load, Extrusion determination of work load and stress analysis
Reference Books:

1. Manufacturing Science by Gosh and Mallik
2. Manufacturing Engineering and Technology by Kalpakjian & Schmid
3. Technology of metal forming processes by Surender Kumar
4. Manufacturing Processes and Technology Dr.B.Kumar

Subject: Fire Technology

Subject Code: MPE 102

MODULE-1

Unit-I PHYSICS AND CHEMISTRY OF FIRE

Fire properties of solid, liquid and gases - fire spread - toxicity of products of combustion -theory of combustion and explosion – vapour clouds – flash fire – jet fires – pool fires – unconfined vapour cloud explosion, shock waves - auto-ignition – boiling liquid expandingvapour explosion – case studies Flixborough, Mexico disaster, Pasedena Texas, PiperAlpha, Peterborough and Bombay Victoria dock ship explosions.

MODULE-2

Unit -II FIRE PREVENTION AND PROTECTION

Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fireprotection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers –fire stoppers – hydrant pipes – hoses – monitors – fire watchers – layout of stand pipes – firestation-fire alarms and sirens – maintenance of fire trucks – foam generators – escape fromfire rescue operations – fire drills – notice-first aid for burns.

MODULE-3

Unit-III INDUSTRIAL FIRE PROTECTION SYSTEMS

Sprinkler-hydrants-stand pipes – special fire suppression systems like deluge and emulsifier,selection criteria of the above installations, reliability, maintenance, evaluation and standards– alarm and detection systems. Other suppression systems – CO2 system, foam system, drychemical powder (DCP) system, halon system – need for halon replacement – smoke venting.Portable extinguishers –flammable liquids – tank farms – indices of inflammability-firefighting systems.

Unit-IV BUILDING FIRE SAFETY

Objectives of fire safe building design, Fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design - exists – widthcalculations - fire certificates – fire safety requirements for high rise buildings – snookers.

TEXT BOOK

1. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.

REFERENCES

1. Gupta, R.S., "Hand Book of Fire Technology" Orient Longman, Bombay 1977.
2. "Accident Prevention manual for industrial operations" N.S.C., Chicago, 1982.
3. DinkoTuhtar, "Fire and explosion protection"
4. "Davis Daniel et al, "Hand Book of fire technology"
5. Fire fighters hazardous materials reference book Fire Prevention in Factories", an Nostrand Rein Hold, New York, 1991.
6. "Fire Prevention and fire fighting", Loss prevention Association, India.
7. Relevant Indian Acts and rules, Government of India.

MPE-201 MATHEMATICAL MODELING AND OPTIMIZATION

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70
L T P-3 1 0

Module 1

General concepts

Evolution of modern management, functional approach, systems approach, decision making, models and model building, models to solve production problems.

Linear programming

General L. P. Format, formulation of production problems, Methods of Solution: Graphical, Simplex, Modified simplex, Big M and 2 Phase methods, Duality, degeneracy and redundancy in L.P., Sensitivity analysis, Application of L.P. to solve problems of Production systems.

Module 2

Network analysis

CPM and PERT, Shortest path problem, Maximum flow problem, Concept of slack/float and its significance, Project cost analysis, crashing, resource smoothing and leveling, Applications in production systems.

Sequencing problem

Johnson's Rule and its logic, methods of solution, n jobs two machines, n jobs 3 machines, 2 jobs M machines and n jobs M machines problems, Graphical and Heuristic methods, Applications and limitations.

Module 3

Quening Models

Simple queues, Type of queneing models, multiple service channels, Arrival and service characteristics, Optimization of queuing systems, Application to production problems on queuing theory.

Taguchi method

Trial and error approach, Difference between trial and error approach and taguchi optimization approach, design of experiments, Taguchi method, optimization strategies using taguchi method.

Reference Books:

1. Introduction to optimum design—Jasbir S. Arora, -- Elsevier, 2006.
2. Engineering optimization: Methods and Applications – A Ravindran, K.M. Ragsdell, and G.V. Reklaitis , Wiley India Edition, 2006.

MPE-202 PRODUCTION PLANNING AND CONTROL

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70
L T P-3 1 0

MODULE 1

Introduction: Objectives and benefits of planning and control-Functions of production control-Types of production job batch and continuous Product development and design-Marketing aspect, Functional aspects, Operational aspect, Durability and dependability aspect, aesthetic aspect. Profit consideration-Standardization, Simplification & specialization- Break even analysis.

Workstudy: Method study, basic procedure , Selection , Recording of process , Critical analysis, Development Implementation , Micro motion and memo motion study , work measurement , Techniques of work measurement,Time study Production study Work sampling.

MODULE 2

Productplanningandprocessplanning: Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning, batch production.

Production scheduling : Production Control Systems-Loading and scheduling, Scheduling rules, Gantt charts, Basic scheduling problems Line of balance , Flow production scheduling, Batch production scheduling-Product sequencing - Production Control systems-Periodic batch control-Material requirement planning – Dispatching-Progress reporting and expediting-Manufacturing lead time.

MODULE 3

Inventory control and recent trends in ppc: Inventory control- Purpose of holding stock- Effect of demand on inventories - Ordering procedures. Ordering cycle system - Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS-Fundamentals of MRP.

Reference Books:

1. Martand Telsang, “Industrial Engineering and Production Management”, S. Chand and Company, First edition, 2000.
2. James.B.Dilworth ,” Operations management – Design, Planning and Control for manufacturing and services” McGraw Hill International edition 1992.

REFERENCES:

1. Samson Eilon, “Elements of production planning and control”, Universal Book Corpn.1984
2. Elwood S.Buffa, and Rakesh K. Sarin , “Modern Production / Operations Management”, 8th Ed. John Wiley and Sons, 2000.
3. Kanishka Bedi, “Production and Operations management”, Oxford university press, 2nd Edition 2007.
4. Melynk, Denzler, “Operations management – A value driven approach” Irwin McGraw-Hill.
5. Norman Gaither, G. Frazier, “Operations management” Thomson learning 9th edition IE , 2007
6. K.C.Jain & L.N.Aggarwal, “Production Planning Control and Industrial Management”, Khanna Publishers, 1990.
7. S.N.Chary, “Theory and Problems in Production & Operations Management”, Tata

McGraw Hill, 1995.
8. Upendra Kachru, "Production and operations management – Text and cases" Excel books 1st edition 2007

MPE-203 ADVANCED MACHINE TOOL DESIGN

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70
L T P- 3 1 0

MODULE 1

Classification of Machine Tools: General purpose, Special purpose, Automatic, Semi-Automatic machine tools, Transfer lines. Kinematics of Machine Tools: Shaping of geometrical and real surfaces, Developing and designing of kinematics schemes of machine tools, Kinematic structures of lathe, drilling, milling, relieving lathe, grinding, gear shaping and gear hobbling machining. Kinematic design and speed and feed boxes. Productivity loss, stepped and step less regulation.

MODULE 2

General Kinematics – Design of drives and machine tool elements, design of tool changes and turrets. Machine tool dynamics -Thermal aspect in machine tool design machine tool noise and concepts of noise control. Design of slide ways - application of new materials treatment of slide ways. CNC machine tool structures. Static and dynamic testing of machine tools recent trends in machine tool design.

MODULE 3

Automatic machine tools and Transfer machines with control systems: Selection of control systems, Control systems with pre-selection of speeds or feeds, Remote controls, Safety devices in machine tools. Significance of Machine tool automation, working members, Application of CAD/CAM/CIM in Machine tool design, Transfer machines & their controls

Hydraulic & Pneumatic Systems for machine tools: General principles of Hydraulic and Pneumatic drives. Different types control valves for Hydraulic and Pneumatic circuits, Hydraulic & Pneumatic circuit design for machine tools.

Reference Books:

1. M. Weck, "Handbook Of Machine Tools, Vol. 1-4", John Wiley, USA. 1980.
2. Cyrll Donaldson, G.H.LeCain & V.C. Goold, "Tool Design", Tata McGraw Hill, 1973.

3. J. Tlusty & F.Koenigsbeger, “Machine Tool Structure, Vol. I”, Pergamon press, UK, 1970.
4. Pippengar, John J. and Koff Richard M, “Fluid Power Controls”, McGraw Hill, 1959.
5. Pippengar, John J. and Hicks, Tyler G, “Industrial Hydraulics”, McGraw Hill, 1979.
6. Leskiewics H.J. and Zarhmba M., “Pneumatic and Hydraulic components and Instrumentations in Automatic Controls”, International Federation of Automatic controls, 1980.
7. Acherkan N., “Machine Tool Design”, Vol. I – IV , Mir Publications.
8. Mehta, N.K., “Machine Tool Design”, Tata McGraw Hill, 1989.

MOE-201 MATERIALS MANAGEMENT

Maximum Sessional Marks: 30
Maximum End Term Examination Marks: 70
L T P-3 1 0

MODULE-1

Materials Management: Definition and function -Importance of materials management. Objective of Materials management – Materials requirement and planning – Inventory control – Fixed order size, P&Q Inventory System – Deterministic probabilistic models, Static inventory models – Spare parts management – Materials requirement planning – Aggregate inventory management – , ABC Analysis, XYZ Analysis, VED Analysis, FSN Analysis, SDE Analysis.

MODULE-2

Inventory Management:Stages; Selective Control; Demand Forecasting; Lead-time; Safety Stock; MRP and JIT systems; Inventory Valuation-Inventory Control: Relevant Costs, P & Q Systems of Inventory, Basic EOQ Model, and Model with Quantity discount, Economic Batch Quantity. Safety Stock, Concept of Quality Management, Quality of Design, supply, Concept of supply chain management, Statistical Quality Control, X Bar, R and P Charts

MODULE-3

Store management: Store keeping and materials handling - Objectives - Function – Standardization- stores layout, storage systems and equipment, stores preservation, stores procedures- store keeping – stores responsibilities - Location of store house - Centralized store room - Equipment – security measures - Protection and prevention of stores

Purchase management:Purchasing - Procedure - Dynamic purchasing - Principles – import -Purchasing function – Purchasing policies and procedures, legal aspects of purchasing, tax considerations in purchasing, selections and sources of supply and make or buy decisions – Vendor evaluation and rating – vendor development.

Production Technology

MOE- 302 **L T P**

3 0 0

MODULE- 1

UNCONVENTIONAL MACHINING PROCESSES: Need for unconventional processes, Classifications of Unconventional Manufacturing Processes, Construction and working principal of unconventional machining processes such as USM, WJM, AJM, Chemical Machining, Electrolytic Grinding, EDM, LBM, EBM, Plasma Arc Cutting

HIGH SPEED MACHINING: Introduction to high speed machining process, economics of high-speed machining, material properties at high strain rates, influence of increasing speed on chip formation on stainless steel, aerospace aluminum and titanium and process parameter recommendations.

MODULE-2

GENERATIVE MANUFACTURING PROCESSES (GMP) FOR RAPID PROTOTYPING General features and classification, issues related to CAD and GMP software, Overviews of generative manufacturing processes, two-dimensional layer-by-layer techniques and direct three-dimensional techniques for RP.

MODULE-3

GROUP TECHNOLOGY AND FLEXIBLE MANUFACTURING SYSTEM: Group Technology part families, Parts classification and coding, Production flow analysis, Machine cell design, Benefits of group technology, Flexible manufacturing systems- Introduction, FMS workstations, Computer control system, Planning for FMS, Applications and benefits.

COMPUTER INTEGRATED MANUFACTURING: Introduction, Evaluation of CIM, CIM hardware and software, to be used in CIM system, Database requirements. Concurrent engineering-Principles, design and development environment, advance modelling techniques.

Books

1. Metal Cutting Principles, M.C. Shaw, Oxford Clarendon Press
2. Metal Cutting Theory and Practice, Bhattacharya, New Central Book Agency

3. Fundamentals of Metal Cutting and Machine Tools, B.L. Juneja and G.S. Sekhon, New Age International
4. Principles of Metal Cutting, G. Kuppuswamy, Universities Press
5. Fundamentals of Machining and Machine Tools, D.G. Boothroy and W.A. Knight, Marcel Dekker, NY
6. Fundamentals of Metal Casting, H. Loper and Rosenthal, Tata McGraw Hill
7. Metal Forming-Fundamentals and Applications, T Altan, Soo-Ik-Oh and H.L. Gegel, American Society of Metals, Metal Park, 1983

Design of Experiments

MOE-30?

MODULE -1

UNIT – I: Fundamentals of Experimentation: Role of experimentation in rapid scientific progress, historical perspective of experimental approaches, Steps in experimentation, principles of experimentation

UNIT – II: Simple comparative experiments: Basic concepts of probability & statistics, comparison of two means and two variances, comparison of multiple (more than two) means and ANOVA

MODULE -2

UNIT – III: Experimental designs: Factorial designs, fractional factorial designs, orthogonal arrays, standard orthogonal arrays and interaction tables, modifying orthogonal arrays, selection of suitable orthogonal array design, analysis of experimental data

MODULE-3

UNIT – IV: Response surface methodology: Concept, linear model, steepest ascent, second order model, regression.

UNIT – V: Taguchi's Parameter Design: Concept of robustness, noise factor, objective function & S/N ratios, inner array & outer array design, data analysis

REFERENCE BOOKS:

- Montgomery DC, Design and Analysis of Experiments, 7th Edition, John Wiley & Sons, NY, 2008.
- Ross P J , Taguchi techniques for Quality Engineering, McGraw-Hill Book Company, NY, 2008