M.E. Manufacturing Engineering
Choice Based Credit System
(Full – Time & Part - Time)

2019
DEPARTMENT OF MANUFACTURING ENGINEERING

VISION

To prepare students to be life-long learners and global citizens with successful careers in design, research, development, and management of systems in manufacturing and service organizations

MISSION

- A curriculum and educational experience designed and continuously improved through involvement and contribution of students, faculty, administrators, staff, and industry
- A well-focused research program funded at the local, regional, and national level
- A demonstrated competence and expertise in addressing the needs of industry and community at large

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

1. The graduates acquire ability to create model, design, synthesize and analyze essential production operational skills, mechanism and automation system.

2. The graduates use their talent, self-confidence, knowledge and engineering practice which facilitate them to presume position of scientific and/or managerial leadership in their career paths.

3. The graduates will adopt ethical attitude and exhibit effective skills in communication management team work and leader qualities.

4. The graduates apply their consciousness of moral, professional responsibilities and motivation to practice life-long learning in a team work environment.
M.E. MANUFACTURING ENGINEERING

PROGRAM OUTCOMES (PO)

Upon Completion of the two years of the Master of Manufacturing Engineering Degree,

PO1: INTEGRATION OF KNOWLEDGE
Acquire and apply fundamental knowledge and understanding of Science and Technology of Production and Industrial Engineering.

PO2: PROBLEM ANALYSIS
Acquire abilities and capabilities to solve problems in the areas of advanced manufacturing methods, quality assurance and shop floor management.

PO3: DESIGN AND DEVELOPMENT OF SOLUTIONS
Demonstrate the ability to improve a production process or system that meets desired specifications and requirements by following professional and intellectual integrity, professional code of conduct, ethics on professional practices, understanding responsibilities and norms for sustainable development of society.

PO4: USE OF MODERN TOOLS AND TECHNIQUES
Formulate relevant research problems; conduct experimental and/or analytical work and analyzing results using modern mathematical and scientific methods.

PO5: COLLABORATIVE AND MULTIDISCIPLINARY APPROACH
Design and validate technological solutions to defined problems and write clearly and effectively for the practical utilization of their work by interacting with the engineering community and with society at large, regarding intricate engineering activities on technical perspectives and emerge as an efficient motivator.

PO6: PROJECT MANAGEMENT
Design and develop innovative / manufacturable / marketable/ environmental friendly products useful to the society and nation at large. Graduate will be able to manage any organization well and will be able to emerge as a successful entrepreneur

PO7: COMMUNICATION SKILLS
Interact with engineering community and with society at large, regarding intricate engineering activities on technical perspectives and emerge as an efficient motivator. He will be able to communicate effectively both in verbal and non verbal forms.

PO8: SOCIAL RESPONSIBILITY
Understand the nature of profession and be vigilant in order to maximize the chances of a positive contribution to society.

PO9: INVESTIGATION OF COMPLEX PROBLEM
Perform investigations, design and conduct experiments, analyze and interpret the results to provide valid conclusion.

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### FACULTY OF ENGINEERING AND TECHNOLOGY
### DEPARTMENT OF MANUFACTURING ENGINEERING

**Program:** M.E  
**Specialization:** Manufacturing Engineering

#### Courses of Study and Scheme of Examination (REGULATION-2019)

##### SEMESTER I

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**Total** 205 495 700 18

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**Total** 205 495 700 19
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MANUFACTURING ENGINEERING

Program: M.E
Specialization: Manufacturing Engineering

Courses of Study and Scheme of Examination (REGULATION-2019)

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# DEPARTMENT OF MANUFACTURING ENGINEERING
## M.E. (MANUFACTURING ENGINEERING) PART TIME - DEGREE PROGRAMME
### Choice Based Credit System (CBCS)

Courses of Study and Scheme of Examination (REGULATION-2019)

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DEPARTMENT OF MANUFACTURING ENGINEERING
M.E. (MANUFACTURING ENGINEERING) PART TIME - DEGREE PROGRAMME
Choice Based Credit System (CBCS)

Courses of Study and Scheme of Examination (REGULATION-2019)

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P - Part-Time
XX - Department Branch Code
YY - PG Specialization
LIST OF PROFESSIONAL ELECTIVES

1. MFMEPEXX Mechanics of Metal Machining
2. MFMEPEXX Manufacturing Management
3. MFMEPEXX Metal Casting Technology
4. MFMEPEXX Machine Tool Drives and Controls
5. MFMEPEXX Maintenance Management
6. MFMEPEXX Computer Integrated Manufacturing Systems
7. MFMEPEXX Plant Layout and Material Handling
8. MFMEPEXX Composite Materials
9. MFMEPEXX Tool Engineering
10. MFMEPEXX Automats and Transfer Machines
11. MFMEPEXX Design for Manufacturing and Assembly
12. MFMEPEXX Impact Engineering
13. MFMEPEXX Precision Engineering and Nano-Technology
14. MFMEPEXX Nano Materials Technology

LIST OF OPEN ELECTIVES

1. MFMEOEXX Engineering Economics
2. MFMEOEXX Total Quality Management
3. MFMEOEXX Supply Chain Management

LIST OF AUDIT COURSES

1. MFMEACXX English for Research Paper Writing
2. MFMEACXX Disaster Management
3. MFMEACXX Sanskrit for Technical Knowledge
4. MFMEACXX Value Education
5. MFMEACXX Constitution of India
6. MFMEACXX Pedagogy Studies
7. MFMEACXX Stress Management by Yoga
8. MFMEACXX Personality Development through Life Enlightenment Skills
FIRST SEMESTER

MFMEPC11  APPLIED PROBABILITY & STATISTICAL INFERENCES  L  T  P  C
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COURSE OBJECTIVES

- To introduce the basic concepts of one dimensional and two dimensional Random Variables.
- To introduce probability theory and statistics from a computational perspective
- To enable the students to use the concepts of Testing of hypothesis, regression, correlation & Design of experiment
- To understand the role and importance of non parametric test in manufacturing

No derivation, only application in problem solving

Introduction to Probability Theory: Classical, empirical and subjective probabilities. Introduction to Statistics and Data – Types of Data - Quantitative Data, Qualitative Data, Logical Data, Multivariate Data etc. - nominal, ordinal, interval and ratio data. Features of Data distributions - Center, Spread, Shape, Symmetry, Skewness and Kurtosis (Definitions only), Frequency Distributions and Histogram, Stem and Leaf Diagrams, Measures of Center - Mean, Median, Mode, Measures of Spread - Range, Variance, Standard Deviation, Measures of Relative Position: Quartiles, Percentiles, Inter quartile range.

Continuous Random Variables, Probability Distributions and Probability Density Functions, Mean and Variance of a Continuous Random Variable, Continuous Uniform Distribution, Mean and Variance, Normal Distribution, Mean and Variance (Proof not required).

Inference: Statistical Inference, Types of sampling and sampling error, Random Sample & Statistic, Sampling Distribution, Central Limit Theorem (Statement Only), Distribution of sample mean and sample variance, t, chi-square and F distributions (derivation not required), Confidence Interval on the Mean, Confidence Interval on the Variance, Confidence Interval for a Population Proportion, Confidence Interval on the Difference in Means, Confidence Interval on the Ratio of two Variances.

Testing of Hypothesis & Non Parametric Test: Introduces hypothesis testing methodology, one and two sample z and t tests, Type I and Type II errors - testing of mean, difference in mean and proportions – Tests for Independence of attributes, Goodness of fit and simple linear regression and correlation. Non parametric test: run test, sign test, U test & H test.

Design of Experiment: Experimental design – Analysis of variance – Methods for one, two factor models, completely randomized blocks - concepts of factorial design, fractional factorial design, response surface methods and central composite design.
REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, student should be able to:
1. Acquire basic knowledge in statistics
2. Understand the basic concepts of Probability and Statistical techniques for solving real life problems and Engineering problems.
3. Formulate the hypothesis and carry out testing.
4. Differentiate various probability distributions
5. Develop experimental design and analyze.

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COURSE OBJECTIVES
- To impart a sound understanding of the tensile, hardness and toughness behaviour of materials.
- To understand the factors affecting the fatigue and fracture behaviour of materials.
- To study the time dependant mechanical behaviour of materials.

Tensile behaviour: Engineering stress-strain curve: Derivation of tensile strength, yield strength, ductility, modulus of elasticity, resilience and toughness from stress strain curves, comparison of stress-strain curves for different materials - True Stress - Strain Curve: true stress at maximum load, true fracture strain, true uniform strain, Necking strain - necking Criteria - Effect of strain rate, temperature and testing machine on flow properties - Notch
tensile test - Tensile properties of steel - strengthening mechanisms - Strain hardening - Strain aging - Yield point phenomena - Solid solution strengthening - Martensite Strengthening - Grain refinement, Hall-Petch relation.


Time dependent mechanical behaviour: Creep curve - Stress rupture Test - Structural changes during creep - Mechanisms of creep deformation - Deformation mechanisms maps - Activation energy for steady state creep - Fracture at elevated temperature - Introduction to high temperature alloys - Prediction of long time properties - Creep under combined stresses - Creep- Fatigue Interaction.

REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, student should be able to:
1. Understand the mechanical behaviour of metals;
2. Protect the metals from fatigue damage.
3. Understand the environmental factors affecting the mechanical behaviour of materials
4. Evaluate the high temperature properties of metals.
5. Design the metals for specific applications;

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To formulate research problems
To understand the importance of research ethics
To educate the effects of Computer and Information Technology
To impart an understanding of growth of individuals & nation

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

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee


REFERENCES
COURSE OUTCOMES
Upon successful completion of the course, student should be able to:
1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today’s world is controlled by Computer and Information Technology
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

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COURSE OBJECTIVES
- To provide hands on experience on different materials processing techniques and to study the effect of process parameters on difference characteristics in material processing

LIST OF EXPERIMENTS:
1. Formability of sheet metals by water hammer technique
2. Rolling of metal strips
3. Temperature measurement in arc welding process
4. Influence of multi-pass welding on microstructure and hardness
5. Estimation of cutting forces by Merchant’s theory
6. Power measurement in a lathe
7. Electric Discharge Machining
8. Abrasive Jet Machining
9. Estimation of flow stress by disc compression test
10. Phase diagram of a two-component system
11. Characteristic of moulding sand
12. Process capability

COURSE OUTCOMES
Upon completing this course, students should be able to correlate the theoretical knowledge with the practical knowledge in the following areas,
1. Forming processes and its metallurgy
2. Welding processes and its metallurgy
3. Forces involved and power consumption during metal machining
4. Non-traditional machining processes
5. Casting processes and its metallurgy
Mapping of COs with POs

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**COURSE OBJECTIVES**

- To impart hands on experience to students in Geometric Modeling, Assembly and Engineering Drafting.
- To introduce the concepts of CNC programming and simulation on CNC turning, CNC Milling trainer machines
- To train the students to make use of software for finite element analysis for various applications in the field of manufacturing engineering.

**CAD**

- SKETCHER- Introduction- Basic sketch, Constraints – Geometry & Dimensional.
- SOLID MODELING - Extrude, Revolve, Sweep, Loft, Datum plane creation etc
- SURFACE MODELING - Extrude & Revolve surfacing, Advance surfacing technique – Ruled & Loft surfacing, Mesh of curves, Free form surfaces, Surface operations – trim, merge, intersect, etc.
- FEATURE MANIPULATION - Copy, Edit, Pattern, Suppress, History operations etc
- ASSEMBLY - Constraints, Patterns, Exploded views, Interference check, creating components from assembly, mass property calculations, and assembly cut sections.
- DRAFTING - Standard view, Sectional views and Detailing.

**CAM**

Study of different control systems and CNC codes, Programming and simulation for turning, taper turning, circular interpolation, thread, Cutting and facing operation, Programming and simu

- lation using Do-Loop and Sub-routine for CNC turning centre, machining of internal surfaces in CNC turning centre,
- Programming and simulation of profile milling operation, circular interpolation, circular and rectangular pocket milling, Programming using canned cycles.
- CNC code generation using CAM software packages – Turning, Milling

**FEA**

Study on Basics of FEA, Nodes, Elements, Boundary Conditions
One Dimensional FEA Problem - Truss structure analysis, Cantilever analysis.
Two Dimensional FEA Problems - Plane stress analysis, Temperature distribution analysis, Axisymmetric analysis, Contact element analysis.
Nonlinear FEA Problem - Nonlinear Beam analysis, Geometrical nonlinear analysis, Material nonlinear analysis.
Three Dimensional FEA Problems - 3D Shell Analysis, 3D Analysis.
FEA Application in metal forming, metal cutting, fluid flow process etc.

**COURSE OUTCOMES**
Upon successful completion of the course, the students are able to:

1. Gain practical experience in handling 2D drafting and 3D modeling using modeling software systems.
2. Acquire hands on experience on the finite element modeling
3. Understand the effective input parameters of FEA
4. Understand and apply the concepts G and M codes and manual part programming of turning and milling processes
5. Perform finite element modeling analysis of solid mechanics, heat transfer problems, shell and contact problems in 2D and 3D.

**SECOND SEMESTER**

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**COURSE OBJECTIVES**

- To familiarize response of materials under plastic deformation
- To study the stress for various metal working processes
- To Determine the working load for various forming process
- To familiarize the slip line field theory and upper bound analysis
- To introduce Recent developments in high speed forming


Determination of load by stress evaluation method: Determination of forging load-plane strain forging of a thin strip and a flat circular disc. Determination of extrusion load for round bar and flat strip. Slip line field theory - Plane strain indentation of punch and Plane strain extrusion process. Upper bound analysis – Plane strain indentation with frictionless interface and Plain strain frictionless extrusion

Explosive forming - Explosives - characteristics - standoff and contact operations, stress waves and their effects - requirements for standoff operations - process variables - properties of formed components - applications. Electro hydraulic forming - principles, requirements and characteristics - process variables, Water hammer forming - principle and parameters governing the process.

REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, the students are able to
1. Understand the state of stress in various dimensions
2. Understand the importance of flow curve in metal forming process
3. Calculate the working load in various forming processes
4. Determine the basic mechanical properties.
5. Differentiate various high speed energy forming process

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MFMEPC22 METAL JOINING TECHNOLOGY

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COURSE OBJECTIVES
- To provide the fundamental knowledge on basic physical metallurgy and welding metallurgy.
- To study about the weldability aspects of ferrous metals and non-ferrous metals.
- To know the details of various welding defects.
- To study about the weldability tests, Service tests and Corrosion test

Basic characteristics of fusion welds: Brief introduction to fusion welding process - Heat flow in welding: temperature distribution in welding, heat flow equations, simple problems, metallurgical effects of heat flow in welding, TTT diagrams, CCT diagrams - Metallurgy of fusion Weld: different zones of steel weldments and their properties,
microstructure products in weldments.

Weldability of ferrous metals: Weldability of Carbon Steels, HSLA steels, Q&T steels, Cr-Mo steels, Significance of carbon equivalent, important problems encountered in welding of above steels and remedial steps - Weldability of Stainless Steels: stainless steel classification, Schaffler diagram, Delong diagram, WRC diagram problems associated with welding of austenitic stainless steel, ferritic stainless steel, martensitic stainless steel and duplex stainless steels.


REFERENCES
4. The Metallurgy of Welding, Saferian, D, Pergamon Press, 1985

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the basics of Physical Metallurgy, Welding Metallurgy and heat flow equations;
2. Studied about the Weldability of ferrous metals like Carbon Steels and High Strength Low Alloy Steels (HSLA);
3. Studied about the Weldability of Non-ferrous metals like aluminium, nickel and titanium
4. Understand and Inspect welding defects using Non-destructive testing methods;
5. Understand the Weldability testing, Weldability Service tests and Corrosion tests.

### Mapping of COs with POs

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### MFMECP25 - COMPUTING AND SIMULATION LABORATORY

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### COURSE OBJECTIVES

- To provide hands on experience in some mathematical and simple statistical analysis using mathematical software.

### TOPICS

Simulation: dealing with matrices, Graphing- Functions of one variable and two variables, Response of under damped single degree of freedom systems to initial excitations, Response of single degree freedom to harmonic and pulse excitations, Random number generation.

- 2D, 3D plots, Control Charts, Frequency response plots, Solving of Linear Algebraic Equations, Quadratic Function, Discrete Function.

- Manufacturing Design Calculations and Process simulation.

- DOE - Response Surface Methodology, T-test, ANOVA, Correlation and Regression Analysis, Cluster Analysis, Factor Analysis.

### COURSE OUTCOMES

Upon successful completion of the course, the students are able to

1. Perform mathematical calculation such a matrix, graphing and random generations using computer software
2. Perform some statistical analysis using Design of Experiment
3. Carryout ANOVA, Regression and correlation analysis using software
4. Carryout process simulations
5. Generate Random numbers
COURSE OBJECTIVES

- To train the students in the field work related the Manufacturing Engineering and to have a practical knowledge in carrying out Structural field related works.
- To train and develop skills in solving problems during execution of certain works related to Manufacturing Engineering.

The students individually undergo a training program in reputed concerns in the field of Manufacturing Engineering during the summer vacation (at the end of second semester for full – time / fourth semester for part – time) for a minimum stipulated period of four weeks. At the end of the training, the student has to submit a detailed report on the training he had, within ten days from the commencement of the third semester for Full-time / fifth semester for part-time.

The students will be evaluated by a team of staff members nominated by head of the department through a viva-voce examination.

* - Four weeks during the summer vacation at the end of II Semester.

COURSE OUTCOMES

1. The students can face the challenges in the practice with confidence.
2. The student will be benefited by the training with managing the situation arises during the execution of works related to Manufacturing Engineering.

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THIRD SEMESTER

COURSE OBJECTIVES

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.

COURSE OUTCOMES

Upon completing this course, students should be able to:
1. Take up any challenging practical problems and find solution by formulating proper methodology.
2. Students will acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.

3. Students will acquire collaborative skills through working in a team to achieve common goals.

4. Students will be able to learn on their own, reflect on their learning and take appropriate actions to improve it.

5. Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.

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FOURTH SEMESTER

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COURSE OBJECTIVES

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.

COURSE OUTCOMES

Upon completing this course, students should be able to:

1. Take up any challenging practical problems and find solution by formulating proper methodology.
2. Students will acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
3. Students will acquire collaborative skills through working in a team to achieve common goals.
4. Students will be able to learn on their own, reflect on their learning and take appropriate actions to improve it.
5. Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
### PROFESSIONAL ELECTIVE COURSES

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**COURSE OBJECTIVES**

- To impart fundamental knowledge on mechanics of chip formation
- To impart knowledge about tool failure analysis, and thermodynamics involved in metal cutting.
- To impart knowledge about wear-mechanisms of cutting tools and wear-chatter in machining.
- To provide an understanding of the mechanics of chip formation, tool failure analysis, and thermodynamics involved in metal cutting and the evolution of tool materials.

Need for rational approach to the problem of cutting materials-observation made in the cutting of metals-basic mechanism of chip formation-thin and thick zone modes-types of chips-chip breaker-orthogonal Vs oblique cutting-force velocity relationship for shear plane angle in orthogonal cutting-energy consideration in machining-review of Merchant, Lee and Shafter theories-critical comparison.

Nomenclature of single point cutting tool-System of tool nomenclature and conversion of rake angles-nomenclature of multi point tools like drills, milling-conventional Vs climb milling, mean cross sectional area of chip in milling-specific cutting pressure

Heat distribution in machining - effects of various parameters on temperature - methods of temperature measurement in machining - hot machining - cutting fluids.


Processing and Machining – Measuring Techniques – Reasons for failure of cutting tools and forms of wear-mechanisms of wear-chatter in machining-factors effecting chatter in machining-types of chatter-mechanism of chatter

**REFERENCES**

5. The machining of metals, Armargeo, E.J.A. and Brown R.H. prentice Hall, 1969

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Understand the basic structures of concept of tools and tool materials.
2. Acquire fundamental knowledge about forces and chips formed during the metal machining process.
3. Distinguish between orthogonal and oblique cutting.
4. Understand the Heat distribution during machining.
5. Differentiate various types of wear

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COURSE OBJECTIVES
- To introduce the operations management principles, and the related quantitative approaches, that helps in achieving the organizational goals.


Inventory planning and control: Need, inventory costs, Determination of EOQ, EPQ/ELS (without shortages) - Effect of quantity discounts. Determination of ROL, Safety Stocks – Service level - Methods of calculating safety stock using Normal distribution – unit service level - single period inventory model- Inventory control systems - P, Q, and S-s System – Selective inventory control techniques - Simple problems


REFERENCES
2. Production and Operation Management, Paneerselvam R. PHI, 1999

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Develop an understanding of various types of production systems
2. Differentiate Production and services
3. Gain an understanding and appreciation of the principles and applications relevant to the planning, design, and operations of manufacturing/service firms
4. Develop the ability to identify operational methodologies to assess and improve an organizations performance
5. Gain ability to recognize situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making in the areas such as Aggregate planning, Inventory control, forecasting MRP and scheduling

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COURSE OBJECTIVES
- To provide the knowledge on modern casting techniques,
- To impart an understanding of the design of runners, risers, gating and casting defects, design considerations and modernization of foundries.

Modern casting techniques: Shaw process, slush casting, continuous casting, squeeze casting, Rheo casting, Thixo casting, Electro slag casting, Full mould process, Low pressure die casting, High pressure die casting.


Casting design consideration: Design problems involving thin sections: Alloy selection, feeding through thin sections, non-uniform wall thickness, chilling effect of the mould. Design problems involving junctions - Design problems involving unequal sections: Padding, feed paths in permanent and investment castings.

REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the basic features and terminologies in casting process,
2. Design gating, reserving system
3. Understand the mechanics of solidification in the casting process.
4. Obtain knowledge in the advanced casting process
5. Study the types of defects occurred in casting and provide remedial solutions.
### COURSE OBJECTIVES

- This course will give an appreciation of the fundamental principles, use of hydraulic and pneumatic components and systems for the control of various parts of machine tools.
- To understand the working principle of hydraulic components and its selection.
- To explore the use of different sensors, control valves, controllers and actuators for hydraulic circuits.
- To provide a knowledge of trouble shooting and design of hydraulic circuits for different applications.
- To impart knowledge on the design aspects of circuits for Machine Tool Control, the drive systems used for Machine Tools and N.C. systems and their programming languages.


### REFERENCES

2. Industrial Hydraulics, John Pippenger and Tyler Hicks, McGraw Hill Co.

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Understand machine tool drives and their types
2. Identify hydraulic components and circuits
3. Ability to design simple logic circuits
4. Understand the benefits and applications of Numerical control machines.
5. Get the knowledge on the design aspects of circuits for Machine Tool Control, the drive systems used for Machine Tools and N.C. systems
6. Ability to develop N.C machines programming

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COURSE OBJECTIVES
- To impart a better understanding of the fundamental philosophies of Maintenance Management, and the different techniques that enable the selection of the optimum maintenance strategy. It also discuss the concepts of reliability engineering and spare parts management


Maintenance facilities planning: Planning of Maintenance Function – Long range planning – Short range planning – Man power allocation - Planning techniques – Planning steps - Optimal number of machines / crew size - Use of waiting line and Simulation model.
Replacement strategies and Policies: Basic concepts of replacement analysis, economic service life, opportunity costs - cash flow approaches to replacement analysis - Replacement analysis using specified time period - probabilistic replacement models – simple problems


REFERENCES
5. Introduction to Total Productive Maintenance, Seiichi Nakeiima, Productivity Press (India) Pvt Ltd., Madras, 1988

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Develop a maintenance plan for a technical system
2. Have a working knowledge of the techniques of reliability engineering
3. Apply learned concepts to improve the maintenance, the maintainability, hazard risk and the safety of the plant
4. Apply problem solving models to maintenance
5. Analyze different failure of a component/equipment

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COURSE OBJECTIVES

- To familiarize the basic concepts of CIM
- To introduce the fundamentals of robotics and its applications in manufacturing industries
- To introduce the concept of FMS and the materials handling and storage system used
- To familiarize the group technology concept and the clustering algorithms associated with it.
- To introduce the concepts of CAPP and CAQC


REFERENCES

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Become familiar on the basic concepts of CIM and its importance in the global competitive market
2. Understand the anatomy of industrial robots and their application in various areas of manufacturing
3. Understand the concepts of FMS and materials handling and storage systems used
4. Understand the usage of group technology concept and clustering algorithms in modern manufacturing systems
5. Get familiarize with the concepts of CAPP, CAQC and the usage of CMM.

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COURSE OBJECTIVES
- To introduce the concepts of layout planning and the various algorithms used in and also to introduce the design of material handling systems, mechanized assembly, hoppers and feeders and transfer systems.


Apples plant layout procedure – Reed’s plant layout procedure - Computer Aided Plant Layout Planning: CORELAP, PLANET, MAT, ALDAP, CRAFT - Plant Layout Algorithms: Modified spanning tree algorithm – Graph based method – BLOCPLAN Algorithm


Mechanized Assembly: Principles and Operating characteristics of Part Feeders such as Vibratory Bowl Feeder, Reciprocating Tube Hopper, Centrifugal Hopper Feeder and Center Board hopper feeder – Orientation of Parts – In-bowl and Out-of-bowl tooling – Different Types of Escapements Transfer Systems and Indexing Mechanisms.

REFERENCES
9. Mechanised Assembly, Boothroyd & Redford

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the different layout planning techniques
2. Apply layout planning techniques for solving layout problems
3. Balance the production/assembly line for minimum cycle time
4. Acquire knowledge about the various material handling systems
5. Carryout economics analysis of material handling equipments

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COURSE OBJECTIVES

- To impart an in-depth knowledge on composite materials, types, production processing and the structural development in composite materials.


Classification of Polymers - properties and applications of selective engineering polymers - Polymer Matrix Composites: Polymer matrix resins - Thermosetting resins, thermoplastic resins - Reinforcement fibres - Rovings - Woven fabrics - Non Woven random mats - various types of fibres. PMC processes - Hand layup processes - Spray layup processes - Compression moulding - Reinforced reaction injection moulding - Resin transfer moulding Pultrusion - Filament winding - Injection moulding. Fibre reinforced plastics (FRP), (Glass fibre reinforced plastics (GRP)).


REFERENCES

5. Fundamentals of Composite Manufacturing, B. Strong, SME, 1989
7. “Short Term Course on Advances in Composite Materials", Composite Technology Centre, Department of Metallurgy, IIT - Madras, December 2001
8. Hand Book of Plastic processing, Brydson,
COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Obtain knowledge on classification of composite materials used in the modern world
2. Differentiate various polymers
3. Obtain knowledge on different types of production technique of composite materials
4. Acquire knowledge on production of light weight composites that are used in aerospace industries
5. Acquire knowledge about the properties of ceramic matrix composites

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COURSE OBJECTIVES
- To introduce different production tools, including press tools, their design,
- To provide an understanding of design and use of jigs and fixtures.
- To introduce the students, the modern concepts of tool engineering


Elements of Jigs and Fixtures – Locating and clamping principles. Locating method and devices – Clamping devices. Types of Jigs: Plate, Template, Latch, Channel Leaf, Box and Indexing.

REFERENCES
3. Cutting Tool Design, Rodin P., MIR Publisher, Moscow, 1968

COURSE OUTCOMES
Upon completing this course, students should be able to
1. Develop an understanding of the cutting tool nomenclatures
2. Develop and design of progressive and compound dies for simple sheet metal operations
3. Calculate bending force, number of draw for the required cup shape, blank size for forged components.
4. Understand the modern techniques of tool engineering and the various phases in computer aided fixture design
5. Acquire knowledge about the plastic tool materials and development methods

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COURSE OBJECTIVES
- The aim of present course is to introduce the students about the basic automation theory and understanding of its devices. Students can think and get innovative idea in the area of shop floor automation.

Automation introduction: Automated Manufacturing System, Reasons for Automating, strategies for automation and process improvement, automation migration strategies, levels of automations, Types of Automations. Classification of Automatic Machines

Pneumatic System Design: Introduction, pneumatics system components, pneumatics actuators, application of pneumatics system in automation, pneumatics circuit design for automation, limitations of pneumatic system.

Hydraulics System Design: Introduction, Hydraulic system components, hydraulic actuators, application of hydraulic system in automation, hydraulic circuit design for automation, limitations of hydraulic system.
Automated Machinery: Introductions, Automated transfer machine, automated transfer line, Continuous and rotary transfer line, auto-storage and retrieval system, automated guided vehicles, automated material handling system, automated inspection system and CMM.


REFERENCES
2. Hydraulics and Pneumatics Andrew Parr, JAICO Publishing Home, Ahmedabad
4. Programmable Logic Controller Vijay R. Jadhav, Khanna Publishers, New Delhi
7. Assembly automation and product design, Boothroyd . G

COURSE OUTCOMES
Upon completing this course, students should be able to
1. Develop knowledge and skill to design of hydraulic, pneumatic and electro-pneumatic logic circuits for automating processes in manufacturing
2. Demonstrate problem-solving skills in automation and safely use the machines in the industries
3. Explore the use of different sensors, control valves, controllers and actuators for electro-pneumatic & hydraulic circuits
4. Gain an insight into the Industrial Robotics and Mechatronics System
5. Acquire knowledge about the various Automated Machineries

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COURSE OBJECTIVES
• Understand the relationship between customer desires, functional requirements, and product design.
• The aim is to make the student aware of fits and tolerance that are used in the industry.
To make students aware of the necessity to produce best design processes and systems for the best use of material.

To acquaint the students with recent developments in reverse engineering and rapid prototyping.

To aid in efficient in design to minimize material usage on an application perspective

Fits and tolerance - Terminology for limits and fits, general limits of tolerance, limit system, selective assembly - problem. Gauges and gauge design - Plain gauge, design of limit gauges, manufacturing of limit gauges, choice of limit gauges - problem.

Jigs and fixtures - Design principles common to jigs and fixtures, fundamentals of jigs and fixtures design, materials for jigs and fixtures, construction - problem.

Forging - Die design for machine forging, determination of stock design, selection of forging equipment, size of die blocks - problem. Extrusion - Design of parts of extrusion block, analysis of extrusion process, variation of extrusion pressure - problem. Sheet metal drawing - Press selection, cutting forces, methods of reducing cutting forces, blanking die design, piercing die design, pilots, drawing die, bending dies, design procedure for progressive dies.

Welding - Basic consideration, introduction, critical dimensions of weld connections, stress analysis in static loading, tensile load in butt welds, bending load in butt welded joints, fillet welds, concentric and eccentric loading of fillet welds, some typical structural parts, design of spot welds and plug welds - problem.

CMM, reverse engineering, rapid prototyping, 3D printer, design to minimize material usage, design for assembly, design for recyclability.

REFERENCES
2. V.M. Radhakrishnan, “Welding technology and design”, New age international publishers.

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Understand contemporary issues and their impact on design for manufacturing and assembly.
2. Understand the latest design processes in the field of manufacturing technology.
3. Apply a systematic understanding of knowledge in the field of extrusion, sheet metal drawing and forging.
4. Ability to develop a project on design and product development, considering advanced production technologies.
5. Able to gain knowledge in the advanced manufacturing techniques.
COURSE OBJECTIVES

- To impart an in-depth study of impact engineering with a focus on the current status of explosive metal working.
- To familiarize the basic concepts of explosive forming process
- To introduce the fundamentals of explosive welding and cladding of metals
- To introduce the effect of explosive forming processes
- To introduce the concepts of high temperature measurement in compaction techniques

Explosives - Types - Propagation of ideal detonation - reaction zone. Shock waves - general considerations - Pressure, Impulses and energies of shocks generated by explosions in air and water Mechanics of energy transfer - ecometrical method - bubble phenomenon.

Stand-off and contact operations - parameters and applications. Interaction between explosion and work Piece in contact operation - Pressure time relation in metal- explosive system. Stress waves in solids - Microstructural changes - Hugoniot curves for iron and brass - changes in physical properties - fracturing under impulsive loads


Explosive forming - strain energy of deformation - effect of explosive stand off and strain distribution in the explosive forming of flat circular blanks - Simple problems - Multiple shot explosive forming - Use of scale models in explosive Conning -explosive Conning dies- Effect of explosive forming on materials properties

Shock consolidation ceramics and composites - shock waves. The jump-relations- Equation (Hugoniot) – Compaction mechanism static versus shock compaction - different shock compaction techniques - (Cylindrical, Converged, Underwater and high temperature) - Temperature measurements - shock consolidation of bio-compatibles - ceramics - melt - infiltration of shock compacted ceramics - Metallurgy of shock consolidation
REFERENCES
1. Explosive working of metals and its applications, Bernard Crossland, Oxford University Press, 1983
2. Explosive working of metals, Jolm Rineheart and John Pearson, Pergamon, London, 1985
3. Development of High Speed Forming, Davies and Austin, ASTME, 1976

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Understand the processes variables generated by explosions
2. Protect the metals from surface damages.
3. Understand the environmental factors affecting the atmospheric contaminations
4. Evaluate the high temperature explosive properties of metals.
5. Studying the metallurgical properties of explosive cladded process

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<th>PRECISION ENGINEERING AND NANO-TECHNOLOGY</th>
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COURSE OBJECTIVES
- To impart fundamental knowledge on Precision Engineering
- To impart knowledge about Nano Technology


Mode(MFM)- Scanning Capacitance Mode (SCM), Nano-indentation - High Resolution, Drexlerian Nano Technology. Introduction to biological Applications, Quantum Effects & Futures, Quantum Dots, Quantum Computing


REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Understand the basic concepts of Precision Engineering.
2. Impart fundamental knowledge about MEMS.
3. Evaluate the Quantum Effect Futures
4. Design the smart materials for specific applications.
5. Acquire knowledge about the nano instrumentation

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COURSE OBJECTIVES
• This course has been designed to provide in depth knowledge on nano materials fabrication methods, characterization techniques and application of nano materials

Nanopowders and Nanomaterials: Classification of nano materials - Properties of nano materials - characteristics of nano particulate materials; Production Methods: Top down approach - mechanical milling, Chemical Etching, Electro explosion, Sputtering, Laser ablation; Bottom up approach Plasma spraying, Chemical vapour deposition, Sol Gels, Laser pyrolysis, Atomic or molecular condensation.

Characterisation and Detection Techniques: Atomic structure and chemical composition: spectroscopic methods, vibrational spectroscopies, Nuclear magnetic resonance, X-ray and UV spectroscopies, X-ray and neutron diffraction. Determination of size, shape and surface area: Electron microscopes, BET and pycnometry, Ephiphamiometer, Laser granulometries and Zeta potential, Elliptically polarised light scattering; Determination of nanoparticles in aerosols and in biological tissues


REFERENCES
2. Industrial application of nanomaterials - chances and risks, Wulfgang Luther, Future Technologies Division, Germany, 2004

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Understand the basics of nano sized materials
2. Understand the difference between bulk and nano materials
3. Understanding the production methods of nanomaterials
4. Applications of nanomaterials
5. Usage of nanomaterials in biological applications
OPEN ELECTIVE COURSES

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COURSE OBJECTIVES

- To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making towards the design and manufacturing problems.


Cash Flow: Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method - Examples in all the methods.


REFERENCES

COURSE OUTCOMES
Upon successful completion of this course, students will be able to
1. Acquire the knowledge on basics of economics
2. Develop skills to apply cost analysis to engineering and take economically sound decisions.
3. Apply replacement analysis to determine economic life
4. Calculate the depreciation values under various environments
5. Understand the concept of cash flow analysis

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COURSE OBJECTIVES
- To discuss the different views of quality and to appreciate the importance of product quality, to provide a knowledge understand a framework summarizing the philosophical elements and generic tools of TQM to provide an understanding of the role of quality control and Acceptance sampling plans in organizations.

Concepts of TQM – Dimensions of Quality - Deming, Crosby and Juran’s Philosophies – Barriers to TQM - Quality system – ISO 9000:2000, ISO 14000 Quality system standards - Quality costs, Seven tools for Quality Control, Seven tools for Quality management, Quality Function Deployment (QFD) – Taguchi loss function

Statistical Process Control: Control charts for attributes and count of defects – p chart, np chart, c chart, u chart.
Control charts for variables – $\bar{X}$ chart, R chart, $\sigma$ chart – process capabilities studies ($C_p$ and $C_{pk}$) – Concept of Six sigma. Special control charts – Group control chart, sloping control chart, moving averages and moving ranges control charts, coefficient of variation control chart.


REFERENCES
1. Introduction to Statistical Quality Control, Montgomery D.C., John Wiley, 1994

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the core features of the total quality management in terms of various dimensions of quality.
2. Measure the cost of poor quality and process effectiveness and efficiency to track performance quality and to identify areas for improvement
3. Develop an understanding on quality management philosophies and frameworks
4. Develop the ability to apply the tools of quality control and quality management.
5. Understand proven methodologies to enhance management processes, such as benchmarking and business process reengineering, lean manufacturing.

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COURSE OBJECTIVES
- Discuss the fundamental concepts of supply chain management; impart the knowledge on how to align the management of a supply chain with corporate goals and strategies.

Introduction to Supply Chain Management- Definition- Decision phases in supply chain, Process Vs Push pull view of supply chain-The development chain - Design the right sc-
functional Vs innovative products- product life cycle and SC design – clock speed.


Value of Information- Bullwhip effect- information and supply chain technology- Supply chain integration- Concepts of MTO, MTS, ETO and ATO -demand driven strategies- impact of internet on SCM-


REFERENCES
5. Supply chain management: concepts, techniques and practices, Ling Li, world scientific press, 2011

COURSE OUTCOMES
Upon completing this course, students should be able to:
1. Understand the roles of supply chain among various business functions and their roles in the organizations’ strategic planning and gaining competitive advantage
2. Able to actively employ supply chain management methodologies
3. Able to apply supply chain techniques in both manufacturing and service industries
4. Analyze the principles, concepts and challenges for developing sourcing, manufacturing and distribution strategies in a global market.
5. Describe the role of information technology to improve the performance of the supply chain
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**AUDIT COURSES**

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**COURSE OBJECTIVES**

Students will be able to:

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

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness


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

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

**REFERENCES**

COURSE OBJECTIVES
Students will be able to:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Introduction
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.


Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Disaster Preparedness and Management: Preparedness: monitoring of phenomena triggering a disaster or hazard; evaluation of risk: application of remote sensing, data from meteorological and other agencies, media reports: governmental and community preparedness.


Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation in India.

REFERENCES
2. Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
COURSE OBJECTIVES

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects
  Enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature


REFERENCES

1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbashastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

COURSE OUTCOMES

Upon successful completion of the course, the students are able to:

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

COURSE OBJECTIVES

Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character


REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

COURSE OBJECTIVES
Students will be able to:
• Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
• To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
• To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features


Organs of Governance: Parliament, Composition, Qualifications and Disqualifications Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions


REFERENCES
1. The Constitution of India, 1950 (Bare Act), Government Publication.

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

MFMEACXX PEDAGOGY STUDIES

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COURSE OBJECTIVES
Students will be able to:
- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.


Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers’ attitudes and beliefs and Pedagogic strategies.

Professional development: alignment with classroom practices and follow-up support Peer support Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes

Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.
REFERENCES

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

COURSE OBJECTIVES
- To achieve overall health of body and mind
- To overcome stress

Definitions of Eight parts of yog. (Ashtanga) Yam and Niyam.
Do’s and Don’t’s in life.
(i) Ahinsa, satya, astheya, bramhacharya and aparigraha
(ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Asan and Pranayam
(i) Various yog poses and their benefits for mind & body
(ii) Regularization of breathing techniques and its effects-Types of pranayama

REFERENCES
1. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhayasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

COURSE OUTCOMES
Upon successful completion of the course, the students are able to:
1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency
COURSE OBJECTIVES

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Neetisatakam - Holistic development of personality
- Verses 19, 20, 21, 22 (wisdom)
- Verses 29, 31, 32 (pride & heroism)
- Verses 26, 28, 63, 65 (virtue)
- Verses 52, 53, 59 (dont’s)
- Verses 71, 73, 75, 78 (do’s)

Approach to day to day work and duties.
Shrimad Bhagwad Geeta:
- Chapter 2 - Verses 41, 47, 48
- Chapter 3 - Verses 13, 21, 27, 35
- Chapter 6 - Verses 5, 13, 17, 23, 35
- Chapter 18 - Verses 45, 46, 48

Statements of basic knowledge.
Shrimad Bhagwad Geeta:
- Chapter 2 - Verses 56, 62, 68
- Chapter 12 - Verses 13, 14, 15, 16, 17, 18

Personality of Role model.
Shrimad Bhagwad Geeta:
- Chapter 2 - Verses 17
- Chapter 3 - Verses 36, 37, 42
- Chapter 4 - Verses 18, 38, 39
- Chapter 18 - Verses 37, 38, 63

REFERENCES

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

COURSE OUTCOMES

Upon successful completion of the course, the students are able to:
1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.