DEPARTMENT OF MECHANICAL ENGINEERING

(Choice Based Credit System)

R18

POST GRADUATION PROGRAM

MASTER OF TECHNOLOGY

in

INDUSTRIAL ENGINEERING

Scheme of Instructions and Evaluation

*(With effect from the Academic Year **2016-17**)*

SRI VENKATESWARA UNIVERSITY

COLLEGE OF ENGINEERING: TIRUPATI -517502

(AUTONOMOUS)

VISION AND MISSION OF MECHANICAL ENGINEERING DEPARTMENT

VISION:

To be a globally renowned center for quality education and innovative research in Mechanical Engineering

MISSION:

M1	Prepare effective and responsible graduate engineers for global requirements.
M2	Continuously strive to improve pedagogical methods employed in delivering the academic programs.
M3	Respond dynamically to the changing requirements of the industry.
M4	Conduct basic and applied research to contribute to intellectual human capital.
M5	Inculcate the spirit of entrepreneurship and social responsibility.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and

understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

MECHANICAL ENGINEERING

M.Tech (Mechanical Engineering) Specialization: Industrial Engineering

SEMESTER – I

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
IEPC 01	Operations Planning and Control	3	-	-	3	3	40	60	100
IEPC 02	Work System Design	3	-	-	3	3	40	60	100
Professional Elective- I Any One from the Following		3	-	-	3	3	40	60	100
IEPE 11	Applied Probability and Statistics								
IEPE 12	Financial Management & Control								
IEPE 13	Human Resource Management								
Professional Elective- II Any One from the Following		3	-	-	3	3	40	60	100
IEPE 21	Design for Manufacturing								
IEPE 22	Marketing Management								
IEPE 23	Facilities Planning								
IECP 01	Industrial Engineering Lab-I	-	-	2	2	2	40	60	100
IECP 02	Simulation Lab - I	-	-	2	2	2	40	60	100
PGMC 01	Research Methodology and IPR	2	-	-	-	2	40	60	100
PGPA 01	Audit Course-I								
	Total	16	-	8	20	15	280	420	700

SEMESTER – II

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
IEPC 03	Advanced Operation Research	3	-	-	3	3	40	60	100
IEPC 04	Quality Control and Reliability Engineering	3	-	-	3	3	40	60	100
Professional Elective- III Any One from the Following		3	-	-	3	3	40	60	100
IEPE 31	Supply Chain Management								
IEPE 32	Project Management								
IEPE 33	Discrete Event System Simulation								
Professional Elective- IV Any One from the Following		3	-	-	3	3	40	60	100
IEPE 41	Productivity Engineering & Management								
IEPE 42	Logistics Engineering & Management								
IEPE 43	Service Engineering & Management								
IECP 03	Industrial Engineering Lab-II	-	-	2	4	2	40	60	100
IECP 04	Simulation Lab - II	-	-	2	4	2	40	60	100
PGPA 02	Audit Course-II	2	-	--	-	-	-	-	-
IEMP 01	Mini Project	-	--	4	4	2	100		100
	Total	14	-	8	20	18	340	360	700

SEMESTER – III

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
Professional Elective- V Any One from the Following		3	-	-	3	3	40	60	100
IEPE 51	Design and Analysis of Experiments								
IEPE 52	System Dynamics								
Open Elective- I Any One from the Following		3	-	-	3	3	40	60	100
PGOP 11	Business Analytics								
PGOP 12	Industrial Safety								
PGOP 13	Operation Research								
PGOP 14	Cost Management of Engineering Projects								
PGOP 15	Composite Materials								
PGOP 16	Waste to Energy								
IEPD 01	Major Project: Phase-I Dissertation	-	-	20	20	10	100	-	100
	Total	6	-	20	26	16	180	120	300

SEMESTER – IV

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
IEPD 01	Major Project: Phase-I Dissertation	-	-	32	32	16	40	60	100
Total		-	-	32	32	16	40	60	100

Audit Course 1 & 2

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

IEPC 01 OPERATIONS PLANNING AND CONTROL

M.Tech I Semester
Common to Industrial Engineering & Production Engineering

Lectures / Week: 3 periods

Course Objectives:

1. To understanding the production processes involved in the manufacturing of a product
2. To forecast the production demand and estimate and plan the schedule activities.
3. To plan the loading of work stations and scheduling for line balancing and LOB.

Course Content:

UNIT-I

OPC a system approach. Types of production and OPC functions.

Forecasting: Forecasting Methods — Qualitative Methods — Quantitative methods — moving average and exponential smoothing methods for different data patterns. Forecast errors, Tracking signal.

UNIT-II

Mass Production Management Principles of flow lines, Assembly line balancing; approach to line balancing — RPW, COMSOAL, Integer and Dynamic programming formulations. Introduction to transfer lines.

Production Planning Linear programming formulations for static demand case, Product Mix Decisions. Chance constrained programming models.

UNIT-III

Aggregate Production Planning Production planning under dynamic conditions strategies, costs involved; Heuristic methods, linear production and inventory programmes. Aggregate production planning — HMMS model, search decision, parametric production planning, management coefficient models. Disaggregation — hierarchical planning, mathematical programming formulations. Master Production Schedule.

UNIT-IV

Operations Scheduling Flow shop sequencing and job scheduling.

Periodic review models. Continuous review models, lot size models with dynamic demand, inventory models of spare parts.

UNIT-V

Materials Requirement Planning (MRP) Introduction. Inventory in a manufacturing environment. Principles of MRP, MRP processing logic. MRP systems, and MRP — II, Jut-In-Time manufacturing: set-up reduction, stable MPS and Kanban control.

Course Outcomes:

At the end of the course student will be able to learn the-

1. Forecasting principles and techniques for short range and long range planning
2. Production requirements for each product and plan the shop floor activities
3. Work station loading and scheduling of paths to avoid bottle necks for smooth production
4. Solution for product mix decision using OR techniques.
5. Optimal job sequences to achieve the minimum make span with maximum production output

REFERENCES

1. Montgomery, Operations Research in Production Planning, Scheduling and Inventory Control — Prentice Hall, N.J
2. Buffa, E.S., Operations Management — John Wiley & Sons.
3. Elsyod and Boucher Analysis of Production Systems, Prentice Hall, N.J,ISE Series
4. Burbridge, Production Planning — Heinemann Publishers, 1971.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3			2							
CO2		3		1	2							
CO3			3	2								
CO4	1	3	2									
CO5	1		3	2								

IEPC02 WORK SYSTEM DESIGN

M.Tech I Semester
Industrial Engineering

Lectures / Week: 3 periods

Course Objectives:

1. To study the existing work place layout and time for each operation.
2. To study the existing working methods and hand and body motion leading to work measurement
3. To learn and design PMTS, MTS systems and man / machine method for implementation of ergonomics.

Course Content:

Unit-I

Method study: Purpose of work-study-Objectives, applications, Method study definition & basic procedure selection of job, Various recording techniques like outline process charts, flow charts, Man machine charts, Two handed process charts, sting diagram, flow diagram, Multiple activity chart, Simo, Cycle-graphs and chrono-cycle graphs, Critical examination, development and maintenance of improved methods.

Unit-II

Micro motion studies: Use of fundamental hand motions- principles of motion economy and work place layout, Process planning and design of jigs and fixtures. Applications of method study in office and other diverse functional areas for development and implementation of work systems.

Unit-III

Ergonomics-Introduction to ergonomics and human engineering, physical basis of mans Perception of his environment. Anthropometry and work design, studies on human psycho sensorial processes for design of work systems.

UNIT-IV

Work Measurement-Work measurement objectives and techniques, time study and rating systems, allowances, standard and allowed time, production norms, production study, activity sampling development of synthetic and standard data, application of work study in non — traditional areas like hospitals, public utilities, etc.

UNIT-V

Principles of predetermined motion time systems (PMTS). The MTM system, its history and development, basic motions and their control characteristics, simultaneous and combined motions, limiting motions, learning curve concepts, application of PMTS & MTM.

Course Outcomes:

At the end of the course student will be able to learn the-

1. Work study principle and design effective work layout for minimal hand and body motions.
2. Design process for improvement and design the method study.
3. Estimation of time for each operation through micro motion study so as to eliminate unnecessary movements.
4. Design the ergonomics for effective usage of hand and body motions.

REFERENCES:

1. Mundel, Motion and Time Study, PHI,1973
2. Niebel, Motion and Time Study. USA Edition
3. Barnes, Motion and Time Study — Design and Measurement of Work.
4. Mc Cormic, Human Factors in Engineering Design
5. Work Study by ILO
6. Hank Book of industrial Engineers by H.B Maynard
7. Work study and Ergonomics - S.K. Sharma and Savita Sharma
8. Workstudy - Suresh Dalela

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2			3				1			2
CO2		3		2			1					1
CO3		3		2	1							
CO4	1	3	2	2								1

IEPE11 APPLIED PROBABILITY AND STATISTICS

M.Tech I Semester
Common to Industrial Engineering & Production Engineering

Lectures / Week: 3 periods

Course Objectives:

1. To identify suitable random variables for discrete and continuous probability estimation.
2. To understand the suitability of the mathematical distributions for the industrial applications
3. To study the sampling theory and apply in prediction of the event and analyze the statistical distributions by process of matrices.

Course Content:

UNIT-I

Introduction to probability: Probability, sample space — axioms of probability, Random variables — Discrete and Continuous — Expectations — Moment Generating functions. Conditional probability — Bayer's theorem — Independent Events.

UNIT-II

Discrete distributions: Binomial, Hyper geometric, Gama, Students t, Chisquare, Weibell distributions.

Bivariate random variables and their distributions (with specific reference to bivariate normal distributions only). Conditional distributions — Covariance, Correlation coefficient — Regression of the mean.

UNIT-III

Functions of random variables: Probability distribution of functions of random variables their joint probability distribution.

Sampling: Sampling Distribution — Law of Large Numbers — Central Limit theorem.

UNIT-IV

Estimation: Point Estimation, Interval Estimation and Confidence Intervals. (Maximum Likelihood Estimation), Bayesians Estimation.

Testing of Hypothesis: Simple hypothesis and the Neyman — Pearson lemma — Composite hypothesis — goodness of fit tests.

UNIT-V

Analysis of variance: One way classification — Randomized, complete block designs.

Course Outcomes:

At the end of the course student will be able to learn the-

1. Basic concepts of sampling applied in population enumeration.
2. Regression techniques for application and forecast the demand and related variables
3. Testing of hypothesis using statistical distributions.
4. Correlation between the observed values and experimental values for analysis of variance.

REFERENCES

1. Ian F. Blake, An introduction to Applied Probability — John Wiley & Sons (1979)
2. Milton, J.S., Arnold, Jee C., Probability and Statistics in the Engineering and Computing Sciences — Mc Grawhill, 2003.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2				3						
CO2	2	3	1									
CO3		3	1									
CO4	2	3										

IEPE12 FINANCIAL MANAGEMENT AND CONTROL

Industrial Engineering
Elective

Lectures / Week: 3 periods

Course Objectives:

1. Able to understand Goals and functions of Finance, risk concepts
2. Able to know the concept of working capital management and evaluation of alternative ways of financing on the liquidity of firms
3. Able to understand the methods of cost accounting and tools of financial analysis

Course Content:

UNIT-I

Goals and functions of Finance; Concepts in Valuation, Time Value of Money. Principles of Capital budgeting generating of cash flows. Evaluation of investment proposals — Capital rationing and mathematical programming of Capital Budgeting.

UNIT-II

Cost of capital for specific sources of financing and weighted average cost of capital. Evaluation of Risky investments — Generation of information needed to evaluate risky investments when cash flows are independent, sequential decisions and decision trees. Abandonment problems evaluation of projects under firm risk concepts.

UNIT-III

Working capital management — factor, principles short term Vs. long term financing, liquidity of assets and evaluation of alternative ways of financing on the liquidity of firms. Management of Cash and marketable securities management of cash, lock box and concentration banking cash management, models of Bumol, Miller and Off, Management of accounts receivable credit collection policies, Evaluating credit applicant, inventory control and financial manager.

UNIT-IV

Cost accounting — Elements of cost, types of methods of costing. Overhead charges and allocation, standard costing and budgetary control/marginal costing. Cost variances — methods of calculating variances. Material, Labour, Expenses and indirect expenses preparation of cost sheets and their usages.

UNIT-V

Tools of financial analysis — financial ratio analysis, Funds flow analysis and financial forecasting, analysis of operating and financial leverage.

Course Outcomes:

1. Clearly understand the cost management discipline and process
2. Recognise potential pitfalls and understand avoidance strategies
3. Use a cost management estimation and control plan
4. Understand the process and importance of Cost Estimation, Cost Budgeting and Cost Control

REFERENCES

1. Vanhorne, James. C. Financial Management and Policy — Pearson Education.
2. Pandey, I. M., Financial Management
3. Humpton, Financial Decision Making(Concepts, problems and cases) — PHI.
4. Humpton, Hand book offinancial decisions — PHI.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	2	3								
CO3		2	3	1								
CO4	1	2	3									

IEPE13 HUMAN RESOURCE MANAGEMENT

Industrial Engineering

Lectures / Week: 3 periods

Course Objectives:

1. Effectively manage and plan key human resource functions within organizations
2. Contribute to employee performance management and organizational effectiveness
3. Develop effective written and oral communication skills

Course Content:

UNIT-I

Introduction: Definition of personnel management, concept of labour, organisation and function of the personnel department, personnel policies.

Organisational objectives, functions, relationships, organisational structure of formal and organisations, job design.

UNIT-II

Manpower planning: Man power forecasting, mobility and promotion problems, job analysis and job description.

Selection: Developing sources, methods of recruitment, alternative selection policies, application blanks and qualification card, interviews, psychological testing.

UNIT-III

Training: The nature of training, objectives in training, types of training, requirements of effective training conventional training techniques, group training, organisation development, evaluating training effectiveness.

Performance appraisal: Traditional performance appraisal systems, appraisal programs.

UNIT-IV

Wage and Salary Administration: Factors affecting compensation policy - equity and compensation - comparable value, job evaluation, job evaluating systems - simple ranking - job grading - point systems – factor comparison system, effects of job evaluation on human relations, Expectancy theory and compensation, variable compensation, supplementary compensations.

UNIT-V

Human Factor Management: Human factors in management behavioural models, motivation, Maslow's hierarchy of needs theory - hygiene approach to motivation, expectancy theory, reinforcement theory Mcclleland's needs theory, motivational techniques.

Leadership: Definition, trait approaches to leadership, leadership behaviour and styles, situational approach to leadership.

Communication and Counseling: Nature and importance of communications, channels and structure, communication process, Management by objectives, counselling.

Course Outcomes:

1. Critically evaluate and apply theories and models of HRM that explain the nature and significance of key HRM practices and HRM outcomes as they relate to diverse organisational contexts.
2. Critically analyse and apply the emerging strategic role that HRM plays in a changing business environment and workplace to maintain current policies and procedures
3. Analyse and align HR systems and processes to leadership strategies and objectives in contemporary organisations to promote best practice in HR performance.
4. Identify and evaluate key organisational approaches to improving HR outcomes for both the organisation and its employees
5. Critically analyse employee-employer issues using relevant ethical and legal processes and approaches to solve problems.

REFERENCES:

1. Scott, Clothier, Springel, Personnel Management, McGraw Hill
2. Strauss and Sayles Personnel, The Human Problems of Management, Prentice Hall.
3. Edwon, B. Fillipo, Personnel Management
4. Koontz, O. Donnel, Weihreich, Essentials of Managemnt, McGraw Hill.
5. Kapoor, N.D., Introduction to Commercial & Industrial Law, Sultan Chand & Sons.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	1	3								
CO3	1	2	1	3								
CO4		2	1	3	1							
CO5		2		3	2							

EPE 21 DESIGN FOR MANUFACTURING

Common to Industrial Engineering & Production Engineering
Elective

Lectures / Week: 3periods

Course Objectives:

1. Understand the design rules and considerations with reference to various manufacturing processes
2. To discusses capabilities and limitations of each manufacturing process in relation to part design and cost
3. To examine DFM principles including how the design affects manufacturing cost, lean manufacturing, six sigma, etc.

Course Content:

UNIT-I

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production-creativity in design.

Machining processes: Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness-Design for machining – ease –redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT-II

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

UNIT-III

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines-pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints. Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

UNIT-IV

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

UNIT-V

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

Course Outcomes:

1. Design components for machining
2. Simulate the casting design and choose the best casting process for a specific product.
3. Evaluate the effect of thermal stresses in weld joints
4. Design components for sheet metal work by understanding in depth the sheet metal processes and their formation mechanisms
5. Design plastic components for machining and joining and selecting a proper processes for different joining cases

REFERENCES:

1. Design for manufacture, John cobert, Adisson Wesley. 1995
2. Design for Manufacture by Boothroyd,
3. Design for manufacture, James Bralla
4. ASM Hand book Vol.20

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3									
CO2	2	2	2	2								
CO3	2		2									
CO4	2		3									
CO5	2		3									

IEPE 22 MARKETING MANAGEMENT

Industrial Engineering
Elective

Lectures / Week: 3 periods

Course Objectives:

1. Able to know the concept of role of scientific marketing analysis, generation of product ideas and product development
2. Able to understand the purchasing decisions, strategic pricing analysis
3. Able to learn the concept of advertising, promotional and distribution decisions

Course Content:

UNIT-I

Introduction: Marketing System, role of scientific marketing analysis. Marketing models, their uses and limitations.

UNIT-II

Product Decisions: How to introduce new product — The generation of product idea, product research, Developing utility measures for product research. Product evaluation (Break — even analysis). Product development(application of PERT/CPM).

Purchasing Decisions: Purchasing under fluctuating prices purchasing with quantity discounts. Pricing

UNIT-III

Decisions: Objectives in setting market price and the policies adopted in setting market price for a certain product. Strategic pricing analysis (Decision trees in pricing analysis).

UNIT-IV

Advertising Decisions: Sales response to advertising, joint optimization of price advertising and quality, Game theory models in advertising. Media advertising allocation model.

UNIT-V

Promotional Decisions: Spatial allocation of selling expenses, salesmen recruitment and selection, application of dynamic programming to promotional effort, Branch — Switching analysis.

Distribution Decisions: Distribution Systems, Warehousing problems.

Course Outcomes:

1. State the role and functions of marketing within a range of organizations.
2. Describe key marketing concepts, theories and techniques for analysing a variety of marketing situations.
3. Use written formats to communicate marketing outcomes.
4. Apply the introduced conceptual frameworks, theory and techniques to various marketing contexts.
5. Synthesise ideas into a marketing plan.

REFERENCES

1. Phillips Kotler, Marketing Management Analysis, Planning & Control.
2. Phillips Kotler, Marketing Management — A Model Building Approach.
3. King, Analytical Methods in Marketing.
4. Station, Fundamentals of Marketing.
5. Montgomery, Management Science applied to Marketing.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									
CO2	2	1			2							
CO3		2	2									2
CO4		1	2	1		1						2
CO5		2	2	1		1						2

IEPE 23 FACILITIES PLANNING

Industrial Engineering
Elective

Lectures / Week: 3 periods

Course Objectives:

1. Able to understand the methodology of facilities planning for manufacturing and service.
2. Able to learn the requirements analysis, design procedures, evaluation and computer aided plant layout.
3. Able to understand the Quantitative Approaches to facilities Planning and probabilistic models

Course Content:

UNIT-I

Facilities Planning: Definition, Significance, Objectives and process of facilities planning — strategic facilities planning; Relationship between product, process and schedule design and facilities planning. Activity relationships and space requirements planning personnel requirements.

UNIT-II

Material Handling: Definition, principles, system design and selection of equipment, unit load concepts. Basic layout types — Immer, Nadler, Muther Apple James and Ree's approaches to plant layout. Modular design concept. Production Line balancing.

UNIT-III

Computer Aided Layout: CRAFT, COFAD, PLANET, CORELAP, ALDEP. Planning for receiving and shipping, storage and ware housing, manufacturing, office planning, facility services and non — manufacturing functions.

UNIT-IV

Quantitative Approaches to facilities Planning: Deterministic models — single and multi — facility location models. Location — Allocation problems — quadratic assignment problem. Warehouse layout models. Plant location problems. Conveyor models. Storage models.

UNIT-V

Probabilistic models: Conveyor models, waiting line models simulation models and Storage models Evaluation, selection, implementation and maintenance of the Facilities plan.

Course Outcomes:

1. Able to know the concept of facilities planning that aid in design of Product, Process and schedule design.
2. Able to design Material handling equipment for industrial and non industrial purpose.
3. Able to design handling, receiving and shipping of goods using computer aided layout software.
4. Able to solve Problems of ware house, conveyor and allocation models using quantitative approach.
5. Able to simulate the waiting line models, storage models and conveyor models using simulation software.

REFERENCES

1. Tompkins. J.A. and White, J.A., Facilities Planning.John Wiley& Sons,1984.
2. Francies, R.L., and Mc Ginnis White, J.A., Facility Layout and Location — An analytical approach, PHI Publications.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2		3	2	1								
CO3			2		3							
CO4		3	2	1								
CO5		1	3	2								

IECP01 Industrial Engineering LAB-I

List of Experiments:

1. Draw two handed process charts for Bolt, Washer & Nut assembly.
2. Performance rating using playing cards.
3. Standard time calculation.
4. Study of OC curves.
5. Pin board study.
6. Simulation of inventory control system.
7. Normal Distribution.
8. Rectangular Distribution.

Course Outcomes:

At the end of the course student will be able to learn the-

1. To pursue the method adopted in performing the operation.
2. Understanding of reliable and flexible method to accomplish hectic task in minimum possible time.
3. To record the human activities during working conditions using scientific methods.
4. To study the performance rating of individual worker and to cost accordingly
5. Development of new techniques to minimize the bottlenecks

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3									
CO2	1		3									
CO3		2		3								
CO4		2		3								
CO5		2	2	3								

IECP02 SIMULATION LAB-I

List of Experiments:

1. DDA line Algorithm
2. Bresenham's line drawing algorithm
3. Queuing Modelling in C-Language.
4. Inventory Modelling in C-Language.
5. Random variation generates using C.
6. Simplex Method
7. Two Phase Method
8. Big M-Method.

Course Outcomes:

1. Able to understand the basic programming knowledge with respect to domain.
2. Able to develop a program to solve N job 2 machine problem using C software, and to develop a program in C to solve inventory price breaks problem
3. Able to solve inventory control problem for Two Phase Method
4. Able to solve queuing theory problems in Big M-Method.
5. Able to solve linear programming and non-linear programming problems using Simplex Method

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3										
CO2		3										
CO3		3										
CO4		3										
CO5		3										

PGMC 01 Research Methodology and IPR
Teaching Scheme

Lectures: 1hrs/week

OBJECTIVES:

• To give an idea about IPR, registration and its enforcement.

Syllabus Contents:

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.
Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations
Unit 2: Effective literature studies approaches, analysis
Plagiarism, Research ethics,
Unit 3: Effective technical writing, how to write report, Paper
Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants
of patents, Patenting under PCT.
Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies,
IPR and IITs.

Course Outcomes:

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work
and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- Mayall , "Industrial Design", McGraw Hill, 1992.
- Niebel , "Product Design", McGraw Hill, 1974.
- Asimov , "Introduction to Design", Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
- T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1								1
CO2	1	3	2		3							1
CO3		3	2	2		2	3					
CO4		3		2		2						
CO5		3		2	1			3				2
CO6			1		2	1	2					1

IEPC03 ADVANCED OPERATIONS RESEARCH

M.Tech II Semester
Industrial Engineering

Lectures / Week: 3 periods

Course Objectives:

1. Able to learn non-linear, stochastic and dynamic programming
2. Able to understand the concept of multi criteria optimization
3. Able to know the different alogarithms

Course Content:

UNIT-I

Non — linear Programming: Classical Optimisation techniques and Kuhn Tucker theory — One dimensional minimization — Unconstrained and Constrained minimisation methods –Quadratic programming.

UNIT-II

Stochastic programming — Geometric programming problem and applications.

UNIT-III

Dynamic Programming: Characteristics of dynamic programming problems — single and multi — stage models — Practical applications to inventory and Cargo loading problems.

UNIT-IV

Multi — criteria Optimization: Introduction to multicriteria optimization — Methods of solution. Goal programming and applications.

UNIT-V

Meta Hemistich — genetic Algorithms, Simulated Annealing, Tabu search, Ant Colony Optimization algorithms.

Course Outcomes:

1. Able to solve nonlinear problems using Kuhn Tucker conditions.
2. Able to solve Un-constrained and constrained minimization problems using programming methods.
3. Ability to solve multi objective problems using Goal programming.
4. Able to develop meta heuristic algorithms to solve optimization problems.

REFERENCES:

1. Taha, Hamdy. A., Operations Research an Introduction.PHI Edition, 6th Edition.
2. Rao, S.S., Optimisation theory and practice — PHI..
3. Hiller & Liberaman, Operations Research — Tata McGrawhill,7t Edition,2002.

4. Kalyanmoy Deb, Optimization for Engineering Design Algorithms and Examples (1996).

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2	3								
CO2		3	2									
CO3		3	1	2								
CO4		2		1	3							

IEPC 04 QUALITY CONTROL AND RELIABILITY ENGINEERING

M.Tech II Semester
Industrial Engineering

Lectures / Week: 3 periods

Course Objectives:

1. Able to know the concepts and methods of modern statistical quality control.
2. Students learn to apply standard quality control tools, theoretical statistical concepts that justify the use of particular quality control tools in particular situations.
3. They learn theory and methods for analyzing the performance of different quality control tools.

Course Content:

UNIT-I

Product Quality, Quality Control, Factors affecting quality, Systems approach to quality, Quality Costs, Quality Circles, Total Quality Management, ISO 9000.

UNIT-II

Control charts for variables and attributes, Process capability studies, Quality Rating System

UNIT-III

Lot — by — Lot acceptance sampling plans by attributes — Acceptance sampling plans for continuous production — Acceptance Sampling plans for variables.

UNIT-IV

Concepts of Reliability, Quality and Reliability, Failure data analysis, Life testing characteristics Failure Rate, Hazard Rate, Reliability. Hazard models (Exponential and Weibull), System reliability with components in series and in parallel, mixed configurations.

UNIT-V

Reliability improvement, Active and standby redundancy, introduction to reliability optimization, Availability and maintainability, Application of reliability in maintenance strategies.

Course Outcomes:

At the end of the course student will be able to learn the-

1. Able to maintain quality in products using quality circle principles.
2. Able to apply statistical methods to accept the lot of samples.
3. Able to increase the reliability of product through statistical approach.
4. Able to judge whether the lots of samples are to be accept or reject.
5. Learn fundamentals of reliability management and risk assessment.

REFERENCES:

1. Fergenbaum,V. Armand, Total Quality Control — Tata MeGrawhill(40th Edition)
2. Besterfield H. Dale., Quality Control — A practical approach — Pearson Education Asia (2nd Edition).
3. Grant, E. L., Statistical Quality Control — Tata Mc Grawhill (6th Edition)
4. Montgomary — Statistical Quality Control — John Wiley & Sons
5. Srinath, L.S., Concepts in Reliability Engineering — Prentice Hall India.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			3								
CO2			2	3								
CO3	1		3									
CO4	1				3	2					1	1
CO5			2		3						1	

IEPE 31 SUPPLY CHAIN MANAGEMENT

M.Tech II Semester
Industrial Engineering

Lectures / Week: 3 periods

Course Objectives:

1. To understand the managerial decision strategies relating to suppliers and related logistics
2. To compute the tradeoffs between the supplier and the purchaser for continuous process operation
3. To understand and optimal utilization of financial resources

Course Content:

UNIT-I

Strategic Frame work to analyze supply chains — understanding supply chain — supply performance — planning demand and supply in a supply chain.

UNIT-II

Demand forecasting in a supply chain — Aggregate planning in a supply chain — planning managing Inventories in a supply chain.

UNIT-III

Determining optimal level of product availability. Transportation, Network design and information Technology in a supply chains.

UNIT-IV

Coordinating a Supply chain — E — business and the supply chain.

UNIT-V

Financial factors influencing supply chain decisions.

Course Outcomes:

At the end of the course student will be able to learn the-

1. Managerial decision plans for effective implementation with competitive supplies
2. Demand of the materials and maintain zero inventories with proper supply chain.
3. Manufacturing operations and allocation of resources for optimal production.
4. Proper sales market so as to plan the MRP and lean manufacturing concepts
5. Logistics for purchasing raw materials and maintain continuous chain with suppliers and customers

REFERENCES*:*

1. Supply Chain Management Strategy, Planning and operation — Sunil Chopra and Peter Meindl.
2. Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies by David Simchi-Levi, Philip Kaminsky and Edith Simchi-Levi
3. Supply Chain Management: Strategy, Planning, and Operation by Sunil Chopra and Peter Meindl
4. Supply Chain Logistics Management by Donald Bowersox, David Closs and M. Bixby Cooper
5. The Handbook of Logistics and Distribution Management: Understanding the Supply Chain by Alan Rushton, Phil Croucher and Peter Baker

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3		2							1
CO2	2		2	3								
CO3	1	3										
CO4	1		3									
CO5		3										

IEPE32 PROJECT MANAGEMENT

Common to Industrial Engineering & Production Engineering
Open Elective

Lectures / Week: 3 periods

Course Objectives:

1. To understand the basic concepts of projects, need of projects, project life cycle and knowledge for management
2. To understand the project planning concepts, feasibility studies so as to design a project to achieve break-even point
3. To understand the roles of individual and team work leadership styles, challenges in project improvementation identify the conflict issues and solution process for better execution and control

Course Content:

UNIT-I

Basics of Project Management: Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), Phases of Project Management Life Cycle, Project Management Processes, Impact of Delays in Project Completions, Essentials of Project Management Philosophy, Project Management Principles

UNIT-II

Project Identification and Selection: Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point

Project Planning: Introduction, Project Planning, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Breakdown Structure (WBS)

UNIT-III

Organisational Structure and Organisational Issues: Introduction, Concept of Organisational Structure, Roles and Responsibilities of Project Leader, Relationship between Project Manager and Line Manager, Leadership Styles for Project Managers, Conflict Resolution, Team Management and Diversity Management, Change management

UNIT-IV

Project Performance Measurement and Evaluation: Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement and Evaluation, Controlling the Projects

UNIT-V

Project Execution and Control: Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control

Course Outcomes:

At the end of the course student will be able to learn the-

1. Better understanding of the project principles and project life cycle so as to avoid the project delays and the design stage itself to arrive at the Break-even point
2. Better analysis of the project planning, the role and responsibility of the team work in the assignment of jobs
3. Organization structure the responsibilities and role of leaders and team management
4. Process of implementation of performance measurements for better productivity and project process control

REFERENCES:

1. Effective project management by Robert K. Wysoki

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2							2		3	
CO2		2							1		3	
CO3	1	2		2							3	
CO4	1	2	3								2	
CO5		2		3					1		1	

IEPE33 DISCRETE EVENT SYSTEM SIMULATION

Industrial Engineering
Elective

Lectures / Week: 3 periods

Course Objectives:

1. Able to understand the need for system modeling and generation of random numbers
2. Able to know the concept of stochastic variates and Various methods of generating stochastic variates
3. Able to learn the design of simulation experiments, simulation languages and applications

Course Content:

UNIT-I

Introduction: Systems — Need for system modeling — General Systems theory — Systems approach to modeling. Open and closed loop models. Concept of Simulation as decision making tool types of simulations — Continuous and discrete probability distributions.

UNIT-II

Generation of Random Numbers: Pseudo random numbers — methods of generation — characteristics of Random numbers and various statistical tests to assess the randomness.

UNIT-III

Generation of Stochastic Variates: Concept of stochastic variates — Various methods of generating stochastic variates — generation of stochastic variates from various statistical distributions(uniform, exponential, normal and empirical distributions etc.,)

UNIT-IV

Design of Simulation Experiments: Problem Formulation — Data collection and reduction — Time flow mechanisms — Flow charts. Starting conditions — Run size experimental design considerations output analysis and interpretation — validation. Variance reduction techniques.

UNIT-V

Simulation Languages — comparison and selection of simulation languages GPSS, SIMSCRIPT, SIMULA, DYNAMO etc.

Application of Simulation: Study of queuing Systems, Production systems, Inventory systems, Maintenance and Replacement systems, Investment analysis etc.

Course Outcomes:

1. Classify various simulation models and give practical examples for each category
2. Construct a model for a given set of data and motivate its validity
3. Generate and test random number variates and apply them to develop simulation models
4. Analyze output data produced by a model and test validity of the model
5. Explain parallel and distributed simulation methods

REFERENCES

1. Banks, J. and Carson II, Discrete Event System Simulation — Prentice Hall International Series(1984).
2. Naylor et al., Computer Simulation techniques — John Wiley & Sons.
3. Geoffrey Gordon — System Simulation — Prentice Hall, India(2" Edition).

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2		3	2	1								
CO3			2		3							
CO4		3	2	1								
CO5		1	3	2								

IEPE41 PRODUCTIVITY ENGINEERING MANAGEMENT

Common to Industrial Engineering & Production Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. To know the basic definition and concepts of diversity and the difference between productivity and efficiency for economic growth.
2. To understand the various parameters and variables those influence the productivity and model the system performance on computers and measurements the output.
3. To know the long & short term productivity models based on technology and improvement for achievement of management goals

Course Content:

UNIT-I

Basic definitions and Scope — Significance of Productivity in economic development. Productivity measurement at nation level. Benefits of higher productivity at firm level. Diversity of productivity concepts.

UNIT-II

Productivity measurement models — Partial Productivity models, the multi — factor productivity Computers for productivity measurement. Productivity Evaluation Productivity Models, Total Model, Objectives Matrix. Expression for Total Productivity change, the Productivity Evaluation Tree.

UNIT-III

Productivity Planning — Long and Short Term Productivity models — Causes of low productivity in companies — Various strategies for productivity improvement. The Analytical Productivity Model.

UNIT-IV

Productivity Management at Enterprise level — Productivity Improvement Techniques — Technology based, Materials based, Product based, employee based and cost based. Productivity in service industries

UNIT-V

Case Studies, R&D Productivity, Evaluation of R&D, productivity, Technology Transfer.

Course Outcomes:

At the end of the course student will be able to learn the-

1. Identification and formulation productivity measurement at national level with diversity concepts
2. Development of suitable software for productive evaluation based on objective matrix and decision tree
3. Identification of long term and short term productive models in industry for improvement of the productivity
4. University-industry interaction for entrepreneurship development and technology transfer

References

1. Sumanth David, J., Productivity Engineering and Management — Mc Grawhill Book(1984)
2. Scott, Sink, D., Productivity Management Planning, Measurement and evaluation, control and Improvement.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	3		2		1							
CO3	2		3									
CO4	1											

IEPE42 LOGISTIC ENGINEERING AND MANAGEMENT

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objective:

1. Acquire a working knowledge regarding the art of Logistics Systems Modeling
2. Able to conceptualize real world situations related to logistics systems development decisions, originating from source requirements and goals.
3. Able to know the concept of TPM, Data collection, Analysis and system evaluation.

Course Content:

UNIT-I

Introduction to logistics: Scope and elements — Need for logistics Engineering — Related Terms and definitions.

UNIT-II

Logistics in the design and Development phase: The design process related discipline — Design for maintainability — Design for Maintainability — Design for Human factors and safety — Design Integration — Configuration change control.

UNIT-III

Logistics in the Production /Construction Phase: Industrial Engineering and operation analysis — quality control — production operations — Transition from Production to user operation.

UNIT-IV

Logistics in the utilization and Support Phase: Totsal Productive maintenance (TPM) — Data collection, Analysis and system evaluation — evaluation of Logistics support Elements.

UNIT-V

Logistics Management: Logistics Planning — Work breakdown structure — cost estimating & controlling — Major Interfaces with other program activities — Management & Control.

Course Outcomes:

1. An ability to apply the knowledge, techniques, skills, and modern tools of the discipline to Engineering Logistics technology;
2. An ability to apply knowledge of engineering, management and technology to Engineering Logistics related issues;
3. An ability to identify analyse and solve Engineering Logistics related issues;
4. An ability to identify, analyse, and solve narrowly defined Engineering Logistics technology problems;

5. An ability to apply written, oral, and graphical communications in both technical and non-technical environments and an ability to identify and use appropriate technical and management literature;

REFERENCES

1. Logistics Engineering and Management — Benjamin S. Blanchard.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1			2	3							
CO2	1	2	3									
CO3	1	2		3								
CO4	1	2		3	1							
CO5		2	2	3								

IEPE43 SERVICE ENGINEERING MANAGEMENT

Industrial Engineering
Elective

Lectures / Week: 3 periods

Course Objectives:

1. Able to understand the Strategic service vision, service concepts and business process management
2. Able to know the applications of inventory models, queuing theory, simulation modeling
3. Able to understand various management control systems, BPO and Services marketing and applications

Course Content:

UNIT-I

Introduction

Strategic service vision, service concepts and strategy, Understanding services, focus on customers, customer service management; Design and delivery of the services, Managing capacity and demand, Service quality and productivity, Globalization of services, Service Network; IT Enabled services, Design and operation of systems for eBusiness ;

UNIT-II

Business Process Management - process analysis, reengineering, process measurement and effectiveness;

UNIT-III

Management science application in services- Applications of inventory models, location analysis, queuing theory, operations scheduling, economic analysis, decision models, utility theory, simulation modeling, performance evaluation with data envelopment analysis, AHP and productivity models, evaluation of the dynamics of enablers, inhibitors and results

UNIT-IV

Management Control systems -control processes, performance measurement, variations in management control and modern control systems, management control of projects, management control of reliability; BPO and Services marketing

UNIT-V

Applications of Technology management, Benchmarking, Customer relationship management, Data mining and Knowledge management

Course Outcome:

1. Able to acquire knowledge on focusing on customer and service management
2. Able to manage modern control system, BPO and Services marketing
3. Able to maintain good customer relationship, data mining knowledge management
4. Able to apply utility theory, simulation modeling in management science applications.

REFERENCES:

1. James A. Fitzsimmons and Mona J. Fitzsimmons (2000(T)), Service Management: Operation, Strategy and JIT, Third Edition, McGraw-Hill, Inc, NY.
2. Joseph M. Juran (1992), Quality by Design, The Free press.
3. R. Kalakota and A. B. Whiston (1999), Frontier of Electronic Commerce, Addison-Wesley.
4. R. N. Anthony and V. Govindarajan (1998), Management Control Systems, Tata McGraw Hill Publishing Co. Ltd.
5. K. D. Hoffmann and J. E. G. Bateson (2002), Essentials of Services Marketing, Thomson South Western College Publishing.
6. M. J. A. Berry and G. S. Linoff (2001), Mastering Data Mining-The Art and Science of CRM, John Wiley & Sons Inc

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3								
CO2	1	2	3	1								
CO3	1	2		3								
CO4		3			2	2						
CO5			3	2					1			

IECP03 Industrial Engineering LAB –II

List of Experiments:

1. Computations using sales forecasting Techniques.
2. Control charts for Variables.
3. Control charts for Attributes.
4. Development of Bill of Materials for MRP.
5. Draw SIMO charts for Ball Point Pen assembly
6. Determine cycle time using MTM
7. Draw flow process charts on Activities in Workshop/Laboratory.
8. Determine percentage utilization using work sampling.

Course Objectives:

1. Able to learn forecasting techniques, control charts variables and attributes.
2. Able to learn MRP, SIMO charts, & MTM cycles.
3. Able to learn the processing the charts & utilization of work sampling.

Course Outcomes:

1. Understand the forecasting techniques.
2. Understand the control charts for variables and attributes.
3. Understand the development of bills.
4. Understand the processing the charts.
5. Understand the utilization of work sampling.
6. **Mapping of Course Outcomes with Program Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3			2							1
CO2	1	3		2	1							1
CO3		3	1									1
CO4		3	2	2								1
CO5		3			3		3					1

IECP04 SIMULATION LAB-II

List of Experiments:

1. PERT Model
2. Transportation Model
3. Queuing Model
4. Sequencing Problem
5. Assignment Problem.
6. DOE by Taguchi design.
7. DOE by Response surface methodology.
8. Single response Optimization.
9. Multi response Optimization.

Course Objectives:

1. Able to learn the PERT, Transportation, and Queuing models.
2. Able to solve the sequencing and assignment problems
3. Able to learn the single response and multi response optimisation technique

Course Outcomes:

1. Understand the concept of PERT, Transportation and Queuing models.
2. Understand the solving of sequencing and assignment problem.
3. Understand the Taguchi and response Surface Methadology using DOE.
4. Understand the single & multi response optimization.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3			2							1
CO2	1	3			1							1
CO3		3		2								2
CO4	2	3		2								3
CO5		3		1								2

IEPE 51 DESIGN AND ANALYSIS OF EXPERIMENTS

Common to Industrial Engineering & Production Engineering
Elective

Lectures / Week: 3 periods

Course Objectives:

1. Able to know the basic principles of design of experiments, ANOVA
2. able to understand the concept of 2k design and 2k-p fractional factorial design
3. Able to learn basics of robust, Taguchi designs and responses in surface methodology

Course Content:

UNIT-I

Introduction to design of experiments: Background and overview, A brief history of Design of Experiments (DOE), Overview of basic statistical concepts, Basic principles of DOE and Types and purpose of DOE methods.

UNIT-II

Full factorial Design: The basic “full factorials”, ANOVA, Factorial effects and plots, and Model evaluation.

UNIT-III

Fractional Factorial Design: The one-half fraction and one-quarter of the 2k design, The general 2k-p fractional factorial design and Resolution III, IV and V designs.

UNIT-IV

The Robust Design: The basics of robust designs, Taguchi designs and Robust design example.

UNIT-V

Response Surface Methodology – Central composite designs, Box-Behnken design, Analysis of second order response surfaces and process optimization.

Course Outcomes:

1. Formulate objective(s) and identify key factors in designing experiments for a given problem.
2. Develop appropriate experimental design to conduct experiments for a given problem.
3. Analyze experimental data to derive valid conclusions.
4. Optimize process conditions by developing empirical models using experimental data.
5. Design robust products and processes using parameter design approach.

REFERENCES:

1. Design and Analysis of Experiments, 5th edition, by D.C. Montgomery, John Wiley & Sons, New York, 2001.
2. Design of experiments using Taguchi approach, Ranjith K Roy, John Wiley & Sons.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2									
CO2	2	3	2									
CO3	3		3									
CO4	2		3									
CO5	3		2									

IEPE 52 SYSTEM DYNAMICS

Industrial Engineering
Elective

Lectures / Week: 3 periods

Course Objective:

1. Able to learn models for traditional management and their strengths & weaknesses, principles of modeling.
2. Able to learn software packages like DYNAMO and DYSMAP compilers, and DYMOSIM
3. Able to know the concept of Comparison of system dynamics with popular social science modeling paradigms and some applications of system methodologies.

Course Content:

UNIT-I

Mental models for traditional management — their strengths and weaknesses; Synthesizing concept of traditional management, feedback control, and computer simulation.

UNIT-II

Physical and information flows Causality and its interpretation — Causal ioop diagrams and flow diagrams — Decisions and Policies — Level and rate configurations — Principles of modelling — Behavioural characteristics of low order systems; Smoothing of information — Exponential delays — Response characteristics of smoothing and delay functions.

UNIT-III

Simulation of system dynamics models; DYNAMO and DYSMAP compilers, and DYMOSIM software package.

UNIT-IV

Some applications of system dynamics methodology to policy design problems in industrial economic social, environmental, and technological systems, etc.

UNIT-V

Comparison of system dynamics with popular social science modelling paradigms such as operations research economics and cross — impact theory.

Course Outcomes:

1. Ability to develop students' skills in analyzing, simulating, and identifying dynamic systems based upon their input-output responses.
2. Develop and analyze a simulation model that provides a useful explanation of a given problematic behaviour in a narrowly-defined task
3. Able to compare popular social science modeling paradigms such as research economics and cross impact theory

REFERENCES

1. Coyle, RG., Management System Dynamics.
2. Forrester, J.W., Industrial Dynamics.
3. Forrester, J.W., Principles of System.
4. Goodman, M.R, Study Notes on System Dynamics.
5. Richardson, G.P.and Pugh, A.L., Introduction to System Dynamics Modelling with DYNAMO.
6. Roberts, E.B., Managerial Applications of System Dynamics.
7. Roberts, N. et al., Introduction to Computer Simulation — The System Dynamics Approach.
8. Mohapatra, P.K.J., P.Mandal, and Bora, M.C., Lecture Notes on System Dynamics.
9. System Dynamics An International Journal of Policy Modelling, System Dynamics Society of India.
10. System Dynamics Review, System Dynamics Society, M.I.T.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3								
CO2		3	2	2								
CO3		3	1	2								
CO4	2	1		1								
CO5	1	3	2	1								

OPEN ELECTIVES
PGOP13 Operations Research

Lectures: 3 hrs/week

Course Outcomes: At the end of the course, the student should be able to

1. Students should able to apply the dynamic programming to solve problems of discreet and Continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.

Syllabus Contents:

Unit 1:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex
method - sensitivity analysis - parametric programming

Unit 3:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5

Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3		1								
CO2	1	3										
CO3	1	3		1								
CO4	1	3		1								
CO5	1	3										

Open Elective

PGOP 14 Cost Management of Engineering Projects

Lecture: - 3 h/week

Introduction and Overview of the Strategic Cost Management Process
Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity
cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational
control; Provision of data for Decision-Making.
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project
execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical
activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts
and Network diagram. Project commissioning: mechanical and process
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and
Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making
problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target
costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement
Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.
Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis.
Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of
Divisional profitability pricing decisions including transfer pricing.
Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation
problems, Assignment problems, Simulation, Learning Curve Theory.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

Open Elective
PGOP 15 Composite Materials

Lecture: - 3 h/week

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Composite materials.
Advantages and application of composites. Functional requirements of reinforcement and matrix.
Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.
UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass
fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle
reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures.
Isostrain and Isostress conditions.
UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique,
Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix
Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon
composites: Knitting, Braiding, Weaving. Properties and applications.
UNIT–IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and
prepregs – hand layup method – Autoclave method – Filament winding method – Compression
moulding – Reaction injection moulding. Properties and applications.
UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum
strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight
strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using
caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi.

Open Elective
PGOP 16 Waste to Energy

Lecture: - 3 h/week

Course Objectives:

1. Familiarizing with management, especially with management in energy sector engineering.
2. Studying methods of energy accounting and energy auditing in energy sector, industry and final consumption.
3. Able to understand the fundamentals of product strategy management and Finding opportunities to increase the rational use of alternative energies.

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest
residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors
Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods -
Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.
Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –
Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for
thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.
Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs,
Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.
Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology
and status - Bio energy system - Design and constructional features - Biomass resources and their
classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion -
biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion -
Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production -
Urban waste to energy conversion - Biomass energy programme in India.

Course Outcomes:

At the end of the course student will be able to learn the-

1. Need and analysis of non-conventional energy sources and the processes of energy conservation.
2. Harnessing the solar energy, storage devices so as to produce electricity; ways for energy distribution.
3. Understand the issue of fuel availability and analyse the supply and demand of fuel at the national level

4. Comparison of the coal-fired power plant with the non-conventional energy utilization to reduce environmental pollution. Working principle of carnot cycle for maximum efficiency, need for power generation systems with thermodynamic concepts.

References:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3	2							
CO2	2	2		3	3							
CO3	1	2		3	2							
CO4	1	2		3	3							
CO5	1	2		3	3							

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives:

Students will be able to:

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

Syllabus

Units CONTENTS Hours

1 Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
4

2 Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction
4

3 Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
4

4 key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction,
4

skills needed when writing a Review of the Literature,
5 skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions
4

6 useful phrases, how to ensure paper is as good as it could possibly be the first- time submission
4

Course Outcomes:

1. Improve your writing skills and level of readability
2. Learn about what to write in each section
3. Skills needed when writing a Title
4. Good quality of paper at very first-time submission

Suggested Studies:

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

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2							2		3	
CO2		2							1		3	
CO3	1	2		2							3	
CO4	1	2	3								2	

AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to:
1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries.

Syllabus

Units CONTENTS Hours

1 **Introduction**
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.
4

2 **Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem.
Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.
4

3 **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
4

4 **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.
4

5 **Risk Assessment** 4
Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

6 **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.
4

Course Outcomes:
1. Understanding of key concepts in disaster risk reduction and humanitarian response.
2. Evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Understanding the development of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									
CO2	2	1			2							
CO3		2	2									2
CO4		1	2	1		1						2

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

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

Syllabus

Unit *Content Hours*

1 · Alphabets in Sanskrit,

· Past/Present/Future Tense,

· Simple Sentences

8

2 · Order

· Introduction of roots

· Technical information about Sanskrit Literature

8

3 · Technical concepts of Engineering-Electrical, Mechanical,

Architecture, Mathematics

8

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be 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

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	2	3								
CO3		2	3	1								

AUDIT 1 and 2: VALUE EDUCATION

Course Objectives

Students will be able to

1.Understand value of education and self- development

2. Imbibe good values in students

3. Let the should know about the importance of character

Syllabus

Unit *Content Hours*

1 · Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.

· Moral and non- moral valuation. Standards and principles.

· Value judgements

4

2 · Importance of cultivation of values.

· Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.

· Honesty, Humanity. Power of faith, National Unity.

· Patriotism.Love for nature ,Discipline

6

3 · Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.

· Punctuality, Love and Kindness.

· Avoid fault Thinking.

· Free from anger, Dignity of labour.

· Universal brotherhood and religious tolerance.

· True friendship.

· Happiness Vs suffering, love for truth.

· Aware of self-destructive habits.

· Association and Cooperation.

· Doing best for saving nature

6

4 · Character and Competence –Holy books vs Blind faith.

· Self-management and Good health.

· Science of reincarnation.

· Equality, Nonviolence ,Humility, Role of Women.

· All religions and same message.

· Mind your Mind, Self-control.

- Honesty, Studying effectively

6

Suggested reading

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University
Press, New Delhi

Course outcomes

Students will be able to

1.Knowledge of self-development
2.Learn the importance of Human values
3.Developing the overall personality

Mapping of Course Outcomes with Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2		3								
CO2		2	2	3		1						
CO3		1	3	1								

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. 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.
3. 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.

Syllabus

Units Content Hours

1

· **History of Making of the Indian Constitution:**

History

Drafting Committee, (Composition & Working)

4

2

· **Philosophy of the Indian Constitution:**

Preamble

Salient Features

4

3

· **Contours of Constitutional Rights & Duties:**

· Fundamental Rights

· Right to Equality

· Right to Freedom

· Right against Exploitation

· Right to Freedom of Religion

· Cultural and Educational Rights

· Right to Constitutional Remedies

· Directive Principles of State Policy

· Fundamental Duties.

4

4

· **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
4
5
· **Local Administration:**
· District's Administration head: Role and Importance,
· Municipalities: Introduction, Mayor and role of Elected Representative,
CEO of Municipal Corporation.
· Pachayati raj: Introduction, PRI: Zila Pachayat.
· Elected officials and their roles, CEO Zila Pachayat: Position and role.
· Block level: Organizational Hierarchy (Different departments),
· Village level: Role of Elected and Appointed officials,
· Importance of grass root democracy
4
6 · **Election Commission:** 4

· Election Commission: Role and Functioning.
· Chief Election Commissioner and Election Commissioners.
· State Election Commission: Role and Functioning.
· Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be 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]
4. under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
5. Discuss the passage of the Hindu Code Bill of 1956.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3								
CO2		3	2	2								
CO3		3	1	2								
CO4	2	1		1								
CO5	1	3	2	1								

AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Syllabus

Units Content Hours

1

- **Introduction and Methodology:**

· Aims and rationale, Policy background, Conceptual framework and terminology

· Theories of learning, Curriculum, Teacher education.

· Conceptual framework, Research questions**.**

· Overview of methodology and Searching.

4

2

- Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.

- Curriculum, Teacher education.

2

3

- 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.

4

· Pedagogic theory and pedagogical approaches.

· Teachers' attitudes and beliefs and Pedagogic strategies.

4

- Professional development: alignment with classroom practices and followup support

- Peer support

- Support from the head teacher and the community.

- Curriculum and assessment

- Barriers to learning: limited resources and large class sizes

4

5

- **Research gaps and future directions**

· Research design
· Contexts
· Pedagogy
· Teacher education
· Curriculum and assessment
· Dissemination and research impact.

2

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):
245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education
research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic
maths and reading in Africa: Does teacher preparation count? International Journal Educational
Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education.
Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

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?
4. alignment with classroom practices and follow-up support
5. Understand the research gaps further directions

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2				3						
CO2	2	3	1									
CO3		3	1									
CO4	2	3										
CO5		3		2								

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit *Content Hours*

1 · Definitions of Eight parts of yog. (Ashtanga) 8

2 · Yam and Niyam.

Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan
8

3 · Asan and Pranayam

i) Various yog poses and their benefits for mind & body
ii)Regularization of breathing techniques and its effects-Types of pranayam
8

Suggested reading

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

Course Outcomes:

Students will be able to:
1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency
3. Learn how to do asan and pranayama

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	2	3								
CO3		2	3	1								

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives

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

Syllabus

Unit Content Hours

1 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)

8

2 - 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.

8

3

- Statements of basic knowledge.
- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

Chapter2-Verses 17, Chapter 3-Verses 36,37,42,

- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

8

Suggested reading

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

Students will be 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.

Mapping of Course Outcomes with Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3										
CO2		3	2	1								
CO3			2		3							