Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY
BANGALORE - 56

AIDED BY GOVERNMENT OF KARNATAKA
&
AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,

PROPOSED SYLLABUS

For

VII & VIII Semester
(FOR THE ACADEMIC YEAR 2023-2024)
(Batch 2020)

Department of Industrial Engineering & Management

Website: www.drait.edu.in **e-mail id: principal@drait.edu.in**

Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY
BANGALORE - 56

AIDED BY GOVERNMENT OF KARNATAKA
&
AUTONOMUS INSTITUTION AFFILIATED TO VTU, BELGAUM,

Vision

- To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

Mission

- To offer state-of-the-art undergraduate, postgraduate and doctoral programs in the fields of Engineering, Technology And Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industry requirements.
- To install moral and ethical values with social and professional commitment.

Department of Industrial Engineering & Management

Objective

- To maintain a Comprehensive curriculum that enables students to become leading engineers and creative researchers in the global marketplace.
- To collaborate with private and public sectors in the search of methodologies and creative solutions to problems that contributes to the advancement of education, technology and professional development.
- To contribute to the profitable growth of industrial economic sectors by using IE analytical tools, effective computational approaches, and systems thinking methodologies.
- To maintain high standards of professional and ethical responsibility.
- To provide a broad education necessary to determine the impact of engineering solutions in a global economic, environmental, a societal context.

Vision:

- To be globally recognized as a leader in industrial engineering education, research and enhance the application of technical knowledge to benefit the society.

Mission:

- To offer globally recognized programs that equip graduates with strong problem solving ability in the design, analysis and implementation of integrated systems in manufacturing and service sectors.
- Create state-of-the-art infrastructure for research and training in Industrial Engineering
- Promoting collaboration with academia, industries and Research organizations at national and international levels for socioeconomic development

Program Outcomes (POs)

1. Ability to apply knowledge of mathematics, science and engineering.

2. Ability to design and conduct experiments related to deterministic or stochastic systems, as well as to analyze and interpret data.

3. Ability to design a system, component, or process to meet desired needs withinrealistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Ability to identify, formulate and solve Industrial and Management Systems Engineering problems.
5. Student will be able to use modern industrial Engineering and management tools necessary for engineering practice.
6. Ability to determine the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Determine the major environmental, social and economic drivers pertaining to the necessity of developing sustainable operations.
8. Student will exhibit professionalism and ethical responsibility.
9. Effectively collaborate and function on multidisciplinary teams.
10. Student will be able to communicate orally and verbally with different sections of society.
11. Manage Project and Finance to satisfy customer expectations.
12. Engage in life-long learning and appreciate the need for continual self-development.

Program Educational Objectives

PEO 1: Have a strong foundation in Mathematics, Science and Engineering fundamentals that prepare them for a successful career in Industrial Engineering, Management and allied fields.

PEO 2: Function at a technically competent level in designing a system within realistic constraints such as economic, environmental, social, political, ethical, manufacturability, health and safety and sustainability.

PEO 3: To effectively and economically utilize the resources of the Enterprise using various optimization techniques.

PEO 4: Exhibit professionalism, good oral & written communication skills, team work and develop an attitude for lifelong learning.

Department of Industrial Engineering & Management

Faculty List:

1	**Dr.N.Mohan**	**Professor and Head**
2	**Dr. S. K. Rajendra**	**Associate Professor**
3	**Dr. Rajeshwari P**	**Associate Professor**
4	**Dr. C R Mahesha**	**Assistant Professor**
5	**Mrs. Suprabha R**	**Assistant Professor**
6	**Mr. Chetan N**	**Assistant Professor**
7	**Mrs. Sarvamangala S P**	**Assistant Professor**

Dept. of IEM. VII & VIII Semester (FOR THE ACADEMIC YEAR 2022-2023) Batch 2019

VII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	MC	18HS71/ 72	CMEP / OSHA	IM/ CV	2	--	--	03	50	50	100	2
2	PC	18IM71	Operations Management		2	2	--	03	50	50	100	4
3	PE	18IM72	Supply Chain Management		2	2	--	03	50	50	100	4
4	PE	18IM73 X	Professional Elective -3		3	--	--	03	50	50	100	3
5	PE	18IM74 X	Professional Elective -4		3	--	--	03	50	50	100	3
6	OE	18IM75 X	Open Elective - C		3	--	--	03	50	50	100	3
7	PC	18IML76	Statistics Laboratory		--	--	2	03	50	50	100	1
8	PC	18IML77	ERP & OR Laboratory		--	--	2	03	50	50	100	1
9	Proj ect	18IMP78	Project Work Phase - 1		--	--	2	03	50	50	100	2
10	INT		Internship	(If not completed after VI semester examinations, it has to be carried out during the intervening vacations of VII and VIII semesters)				--	--	--	--	--
TOTAL					**15**	4	**6**	**27**	**450**	**450**	**900**	**23**

Note: PC: Professional Core, PE: Professional Elective, OE: Open Elective, INT: Internship, MC: Mandatory Course

Internship: All the students admitted to III year of BE have to undergo mandatory internship of 4 weeks during the vacations of VI and VII semesters and /or VII and VIII semesters. A SEE examination will be conducted during VIII semester and prescribed credits shall be added to VIII semester. Internship is considered as a head of passing and is considered for the award of degree. Those, who do not take-up/complete the internship will be declared as failed and have to complete during subsequent SEE examination after satisfy the internship requirements.

Dept. of IEM. VII & VIII Semester (FOR THE ACADEMIC YEAR 2022-2023) Batch 2019

Electives			
Course code	Professional Electives - 3	Course code	Professional Electives - 4
18IM731	**Project Management**	**18IM741**	**Design of Experiments**
18IM732	**Nanotechnology**	**18IM742**	**Strategic Management**
18IM733	**Human Resource Management**	**18IM743**	**Product Design and Manufacturing**
18IM734	**Database Management System**	**18IM744**	**Total Quality Management**
18IM735	**Technology Management**	**18IM745**	**Industrial Relations and Labour Welfare**
CMEP: Cost Management of Engineering Projects, OSHA: Occupational Safety and Health Administration			

Course code	Open Elective -C
18IM751	**Human Resource Management**

VIII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	MC	18HS81/82	CMEP / OSHA	IM/CV	2	--	--	03	50	50	100	2
2	Project	18IMP81	Project Work Phase - 2		--	--	2	03	50	50	100	10
3	Seminar	18IMS82	Technical Seminar		--	--	2	03	50	50	100	1
4	INT	18IMI83	Internship	(Completed during the intervening vacations of VI and VII semesters and /or VII and VIII semesters.)				03	50	50	100	2
TOTAL					**2**	**--**	**4**	**12**	**350**	**350**	**700**	**15**

Note: PC: Professional Core, PE: Professional Elective, OE: Open Elective, INT: Internship, MC: Mandatory Course

Internship: Those, who have not pursued /completed the internship, will be declared as failed and have to complete during subsequent SEE examination after they satisfy the internship requirements.

CMEP: Cost Management of Engineering Projects OSHA: Occupational Safety and Health Administration

VII SEMESTER

Sub Title : COST MANAGEMENT OF ENGINEEREINGT PROJECTS		
Sub Code : 18HS71	**No. of Credits: 2**	**No. of lecture hours/week : 2**
Exam Duration : 2 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 26**

Objectives:
1. The objective of this course is to familiarize the student with the basic concepts, standards and practices of financial accounting. 2. The course is devoted to the basic financial statements, the analysis and recording of transactions, and the underlying concepts and procedures, 3. To carry out financial statement analysis and studying and preparation of cost sheet and budget.

Unit No.	**Syllabus Content**	**No of Hours**
1	**COST CONCEPTS:** Cost- meaning, Cost v/s Expense, meaning of loss, classification of cost, cost driver & cost unit. Overheads- Meaning and Classification of Overheads.	05
2	**COMPONENTS OF COSTING:** objectives of costing, elements of Costing. Preparation of Cost Sheet, Job Costing-Batch Costing, Process Costing and Activity Based Costing(Simple Problems on Activity Based Costing)	05
3	**INTRODUCTION TO ECONOMICS**: Meaning, Scope, Engineering Decision Makers, Nature and Significance of Economies, Laws of Demand - Concepts, Exceptions. Elasticity of Demand, Demand Forecasting - meaning, methods. Law of Supply - Concepts, Exception. Law of Diminishing Marginal Utility. .	05
4	**INDIAN AND GLOBAL BUSINESS ECONOMICS / MACRO ECONOMICS:** National Income Concept, Per Capita Income (PCI), Gross Domestic Product (GDP) – Concept, Components. Business Cycles – Meaning, Phases. Inflation-Types, Causes and Measurements-Consumer Price Index (CPI) and Whole Sale Price Index (WSI). SWOT Analysis of Indian Economy.	05
5	**FINANCIAL PLANNING:** Income Statement and Balance Sheet (Proforma), Indian Financial System Components. Capital Budgetiing – Phases, Techniques- Pay Back Period (PBP), Net present Value (NPV), Internal Rate of Returns (IRR). Projecting the Cash Flows – Components.	06

Outcomes:

Upon completion of the course, you will be able to:

1. Understand and apply fundamental accounting concepts, principles and conventions and to carry out journal entries and adjustments.
2. Prepare financial statements in accordance with generally accepted accounting principles.
3. Prepare and analyze a trial balance, cash flow statement, cost sheet variance analysis.
4. To prepare and analyze different types of budget
5. To explain the concepts of financial management, working capital and their applications to industries.

Mapping with POs:

Cos	Mapping with POs
CO1	PO1, PO4, PO5, PO7, PO8, PO11, PO12
CO2	PO1, PO3, PO5, PO6, PO11, PO12
CO3	PO1,PO3, PO5, PO11, PO12
CO4	PO1,PO3,PO5,PO10,PO11,PO12
CO5	PO3,PO5,PO8,PO11,PO12

TEXT BOOKS:

1Cost Accouting- Principles and Practices, S P Jain K L Narang, Kalyani Publishers.

2 Enineering Economy, Riggs J.L., 5th Edition, Tata McGraw Hill, ISBN 0-07-058670-5.

3. Financial Management-Theory and practices, Shashi.K.Gupta, R K Sharma, Kalyani Publishers, ISBN 13, 978 9327235975.

REFERENCE BOOKS:

1 Cost Accounting, Khan M Y, 2nd Edition, 2000, Tata McGraw Hill, ISBN 007042248.

2 Engineering Economics, R.Paneerselvam, Eastern Economy Edition 2001, PHI, ISBN-81-203-1743-2Khan & Jain.

3. Financial Management, Khan & Jain, McGrawHill, India.

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.

Note 2: Two assignments are evaluated for 5 marks.

Scheme of semester End Examination (SEE):

Units	Unit-1				Unit-2				Unit-3				
Qno.	1.a	1.b	O	2.a	3.a	3.b	O	4.a	5.a	5.b	O	6.a	6.b
Marks	05	05	R	10	05	05	R	10	05	05	R	05	05

Units	Unit-4					Unit- 5				
Qno.	7.a	7.b	O	8.a	8.b	9.a	9.b	O	10.a	10.b
Marks	05	05	R	05	05	05	05	R	05	05

Semester: VII / VIII	
Course Title: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)	
Course Code: **18HS72**	Evaluation Procedure: CIE + Assignment + Group Activity + SEE Marks = 40 + 5 + 5 + 50 = 100
Credits: **02**	
Teaching Hours: 26 Hrs. (L:T:P:S) - 2:0:0:0	SEE Duration: 2 Hrs

Course Learning Objectives:	
1	To gain an historical, economic, and organizational perspective of occupational safety and health.
2	To investigate current occupational safety and health problems and solutions.
3	To identify the forces that influence occupational safety and health.
4	To demonstrate the knowledge and skills needed to identify work place problems and safe work practice.

UNIT - I	
OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES: Safety, History and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation.	**6 Hrs**
UNIT - II	
ERGONOMICS AT WORK PLACE: Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Emergency Response - Decision for action – purpose and considerations.	**5 Hrs**
UNIT - III	
FIRE PREVENTION AND PROTECTION: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers. Electrical Safety.	**5 Hrs**
UNIT – IV (Blended Learning)	
HEALTH CONSIDERATIONS AT WORK PLACE: Types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) – types and advantages, effects of exposure and treatment for engineering industries, municipal solid waste. Environment management plans (EMP) for safety and sustainability.	**5 Hrs**
UNIT - V	
OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS: Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, supervisors and managers.	**5 Hrs**

Course Outcomes: The students will be able to	
1	Acquire knowledge on OSHA policies, Laws and regulations.

2	Identify hazards in the workplace that pose a danger or threat to the safety or health, or that of others.
3	Control unsafe or unhealthy hazards and propose methods to eliminate the hazards.
4	Discuss the role of health and safety in the workplace and effects of industries on environment.
5	Identify workplace hazards, safety considerations and roles and responsibilities of workers, supervisors and managers.

Question paper pattern:

The question paper will have ten full questions carrying equal marks.
Each full question will be for 20 marks.
There will be two full questions (with a maximum of four sub - questions) from each unit.
Each full question will have sub - question covering all the topics under a unit.
The students will have to answer five full questions, selecting one full question from each unit.

Text Books:

1	Goetsch D. L., (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall.
2	Heinrich H.W., (2007), "Industrial Accident Prevention- A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991).
3	Industrial Safety and Pollution Control Handbook.

Reference Books:

1	Colling D.A., (1990), "Industrial Safety Management and Technology", Prentice Hall, New Delhi.
2	Della D.E., and Giustina, (1996), "Safety and Environmental Management", Van Nostr and Reinhold International Thomson Publishing Inc.

Additional Books:

1	Industrial safety, health and environmental management. R K Jain, Sunil S Rao, Khanna Publications.
2	Safety, occupational health and environmental management in construction. S E Sharma, Vineeth Kumar, Khanna Publications.
3	Labour laws, Commercial law publishers India Pvt Ltd.
4	The occupational Safety, health & working conditions code. Commercial law publishers 2020.
5	Occupational health and safety management - A practical approach by Charles-De-Reese.
6	Occupational ergonomics, theory and applications by Amith Battacharya & James D Mc Glotthin.
7	Occupational Safety and health law handbook. Mc Dermott will & Enercy LLP.
8	Occupational health and safety management. Lambert Academic Publishing.
9	Fundamentals of Industrial Ergonomics - Babur Musthaffa (Google books).
10	Global occupational safety health and management handbook. Thomas Fuller, CAC press.
11	Introduction to Industrial Ergonomics.
12	Ergonomics and practical manual for beginners. Manjith Kaur Chauhan.

Sub Title : OPERATIONS MANAGEMENT		
Sub Code : 18IM71	**No. of Credits: 4= 3: 2 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Course Objectives :

1. Introduction of operations management and its importance in production operations and decision making.
2. To apply the knowledge of forecasting of production demand.
3. To study and apply the knowledge of Aggregate planning, MPS and MRP
4. To study and apply different scheduling methods to determine the idle times of the machines.

Unit No.	Syllabus Content	No of Hours
1	**OPERATIONS MANAGEMENT CONCEPTS**: Introduction, Historicaldevelopment, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations. Manufacturing and service systems. **OPERATIONS DECISION MAKING:** Introduction, Management as a science, Characteristics of decisions, and Framework for decision making, Decision methodology.	**07**
2	**FORECASTING DEMAND:** Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.	**07**
3	**AGGREGATE PLANNING:** Introduction- planning and scheduling, Objectives of aggregate plan, Aggregate planning methods. **MASTER PRODUCTION SCHEDULING**: Master scheduling objectives, Master scheduling methods. Developing a master production schedule, Reconciling the MPS with sales operation. **RESOURCE PLANNING FOR SERVICE PROVIDERS**: Dependent demand for srvices, Bill of resources. Case study-ERP implementation by SAP	**08**
4	**MATERIAL AND CAPACITY REQUIREMENTS PLANNING:** Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.	**08**
5	**SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES:** Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control. **SINGLE MACHINE SCHEDULING**: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, minimizing the number of tardy jobs. **FLOW -SHOP SCHEDULING**: Introduction, Johnson's rule for V jobs on 2 and 3 machines, CDS heuristic. **JOB-SHOP SHEDULING**: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines.	**09**

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.

Note 2: Two assignments are evaluated for 5 marks.

Course Outcomes:

1. Able to memorize history and describe importance of OM to take decision based on different models.
2. Able to calculate forecasted values using different forecasting methods
3. Will be able to operate the production activities on Aggregate planning, MPS and MRP
4. Will be able to operate the production activities based on priorities and capacity.
5. Will be able to select the best course of action for better production quality and quantity based on new methods of production.

Cos	Mapping with POs
CO1	PO2,PO4,PO5,PO6,PO9,PO10,PO12
CO2	PO1,PO2,PO3,PO4,PO5,PO8,PO9,PO12
CO3	PO2,PO3,PO4,PO5,PO7,PO8,PO9,PO11,PO12
CO4	PO1,PO2,PO3,PO4,PO6,PO9,PO10,PO11,PO12
CO5	PO2,PO3,PO4,PO5,PO8,PO9,PO12

TEXT BOOKS:

1. Operations Management- Monks, J.G., McGraw Hill; Second edition (8 January 2020)
2. Production and Operations Management- Pannerselvam. R, Prentice Hall India Learning Private Limited; 3rd edition (1 January 2012).
3. Production and Operations Management- Chary S.N, McGraw-Hill; Sixth edition (10 April 2019)

REFERENCE BOOKS:

4. Modern Production/ Operations Management- John Wiley & Sons Inc; 7th edition (1 January 1983)
5. Operations Management for Competitive Advantage by Chase and Jacobs, McGraw-Hill Education; 11th edition (16 May 2005)
6. B. Mahadevan Operations Management: Theory and Practice, Pearson (1 January 2018)

Sub Title : SUPPLY CHAIN MANAGEMENT		
Sub Code : 18IM72	**No. of Credits: 4= 3 : 2 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. To describe the basic strategic frame work to analyze supply chain
2. To outline the concept of facility location and network design
3. To define about planning and managing inventories, sourcing, transportation.
4. To explain about the role of Information & Technology in Supply chain

Unit No.	Syllabus Content	No of Hours
1	**BUILDING A STRATEGIC FRAMEWORK TO ANALYSE SUPPLY CHAINS:** Supply chain stages and decision phases process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance	**08**
2	**FACILITY LOCATION AND NETWORK DESIGN:** Models for facility location and capacity allocation. Impact of uncertainty on SCN –. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit. Case discussions. Distribution Networking – Role, Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.	**08**
3	**PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN:** Review of inventory concepts. Trade promotions, Managing multi-echelon cycle inventory, safety inventory determination. Impact of supply uncertainty aggregation, Optimum level of product availability; importance factors. Managerial levers to improve supply chain profitability.	**08**
4	**SOURCING, TRANSPORTATION AND PRICING PRODUCTS:** Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration. Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Tailored transportation, International transportation.	**08**
5	**COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN:** Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships. The role of IT supply Chain, The role of E-business in a supply chain.	**07**

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
Note 2: Two assignments are evaluated for 5 marks.

Outcomes :

1. Will be able to indicate the utilization of supply chain management systems and resources being effectively used in an organization
2. Will be able to identify capacity allocation facility location models, apply Managerial levers to improve supply chain profitability
3. Will be able to plan and manage inventories to improve supply chain profitability
4. Will be able to identify factors affecting transportation decisions and design transportation network to improve supply chain operations
5. Will be able to relate Bullwhip effect, role of information technology in supply Chain,

apply concepts of Reverse Logistics and recommend Implementation of Six Sigma in Supply Chains

Cos	Mapping with POs
CO1	PO3,PO5,PO8,PO10
CO2	PO3,PO5,PO,PO11
CO3	PO3,PO5,PO11
CO4	PO3,PO5,PO10,PO11
CO5	PO3,PO5,PO8,PO10,PO11

TEXT BOOK:

1. **Supply Chain Management** – 2001, Strategy, Planning & Operation. Sunil Chopra & Peter Meindl; Pearson Education Asia, ISBN: 81-7808-272-1.
2. **Supply Chain Management** – N Chandrashekaran , Oxford Higher education , 2013
3. **Supply Chain Engineering: Models and Applications,** A. Ravi Ravindran, Donald Warsing Jr., CRC Press; First edition (1 January 2019)

REFERENCE BOOKS:

1. **Supply Chain Redesign** – Transforming Supply Chains into Integrated Value Systems –Robert B Handfield, Ernest L Nichols, Jr., 2002, Pearson Education Inc, ISBN: 81-297-0113-8
2. **Modelling the Supply Chain** –Jeremy F Shapiro, Duxbury;, 2002, Thomson Defineing, ISBN 0-534-37363
3. **Designing & Managing the Supply Chain** –David Simchi Levi, Philip Kaminsky & Edith Simchi Levi;; Mc Graw Hill

Professional Electives - 3

Sub Title : PROJECT MANAGEMENT		
Sub Code : 18IM731	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. To introduce concepts of project management with a strong emphasis on issues and problems associated with delivering successful projects.
2. To Define and study the project planning and estimating its cost.
3. To determine the elapsed time and idle time through project scheduling
4. To determine the critical path for the projects through project management tools and techniques.

Unit No.	Syllabus Content	No of Hours
1	**CONCEPTS OF PROJECT MANAGEMENT:** Concepts of a Project, Categories of projects, Phases of project life cycle, Roles and responsibility of project leader, tools and techniques for project management.	06
2	**PROJECT PLANNING AND INTEGRATION**: Feasibility report phased planning, Project planning steps, Preparation of cost estimation. **Project Integration Management:** Develop project charter, develop project management plan, direct & manage project work, monitor & control project work, perform integrated change control, close project or phase.	07
3	**ORGANIZING AND STAFFING THE PROJECT TEAM:** Authorities and responsibilities of project manager, Project organization and types of accountability in project execution, controls. Tendering and selection of contractors.	06
4	**PROJECT SCOPE MANAGEMENT**: Project scope management, collect requirements, define scope, create WBS, validate scope, and control scope. **Project Risk Management** : Plan risk management, identify risk, Perform qualitative risk analysis, perform quantitative risk analysis, plan risk resources, control risk	10
5	**PROJECT TIME MANGEMENT**: Plan schedule management, define activities, sequence activities, estimate activity resources, estimate activity durations, develop schedule, control schedule. Exercises on PERT/CPM. Case studies on project management.	10

Outcomes :

Upon successful completion of this course, the student will be able to:

1. Apply the concept, tools and techniques for managing large projects.
2. Construct project plans for different types of organizations.
3. Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities;
4. Will be able to explain on resource and time planning, controls, communication mechanisms, reviews and other project management tools.
5. Analyze and evaluate risks in large and complex project environments

Cos	Mapping with POs
CO1	PO3,PO4,PO5,PO7,PO8,PO9,PO11
CO2	PO3,PO4,PO5,PO7,PO8,PO9,PO11,PO12
CO3	PO3,PO4,PO5,PO6,PO11
CO4	PO4,PO5,PO11
CO5	PO4,PO10,PO11,PO12

TEXT BOOKS:

1. **Project Management a System approach to Planning Scheduling & Controlling** - Harold Kerzner, CBS Publishers and Distributors. 2016.
2. **Project Execution Plan: Plan for project Execution interaction -** Chaudhry S.2016
3. **Project Management Institute, "A guide to the projectmanagement body of knowledge (PMBOK Guide)".** 5th edition, 2013, ISBN: 978-1-935589-67-9. 2015

REFERENCES BOOKS:

1. **Project Planning Analysis selection financing Implementation and Review-** Tata Mc Graw Hill Publication, 7th edition 2010, Prasana Chandra.
2. **Project Management** – Beningston Lawrence McGraw Hill 1970.
3. **A Management Guide to PERT and CPM**, WEIST & LeVY Eastern Economy of PH 2002.
4. **PERT & CPM**.-L.S.Srinnath, Affiliated East West Press Pvt. Ltd. 2002.
5. **Project planning analysis selection implementation & review** Prasanna Chandra, ISBNO-07-462049-5 2002.
6. **Performing and Controlling Project,-**Angus, Planning, 3rd End, Person Education, ISBN:812970020.2001
7. **Project planning scheduling & control**, James P.Lawis, Meo Publishing Company 2001.
8. **Project Management -**Bhavesh M.Patel, Vikas Publishing House, ISBN 81-259-0777-7 2002

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.

Note 2: Two assignments are evaluated for 5 marks.

Sub Title : NANOTECHNOLOGY		
Sub Code : 18IM732	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives :

1. To have the basic knowledge of nanomaterials and the process.
2. Descrive methods ogf nanoscale manufacturing and the characterization can be enabled.
3. To learn about Nano sensors and their applications in mechanical , electrical , electronic.Magnetic, Chemical field
4. To understand the concept for a nanoscale product based on sensing, transducing and actuating mechanism.

Unit No.	Syllabus Content	No of Hours
1.	**Introduction to Nanomaterials :** History of Nanotechnology ,structure and properties of carbon based: Fullerenes(Bucky Ball,Nanotubes) ,metal based:Nano shells,Quantum Dots , Dendrimers , Diamond like carbon (DLC) Nanocarriers ,bionanomaterials:protein & DNA based nanostructures,Hybrids:hybrid biological/inorganic ,Nanosafety Issues : Toxicology health effects caused by nanoparticals.	**09 Hrs**
2.	**Characterization of Nanostructures**: Spectroscopy: UV-Visible spectroscopy, Fourier Transform infrared spectroscopy (FTIR), Raman Spectroscopy, X-rat spectroscopy. **Electron microscopy**: Scanning electron microscopy (HRSEM). Transmission electron microscopy (TEM). **Scanning probe microscopy**: Atomic Force microscopy (AFM), Scanning tunnel microscopy (STM).	**08 Hrs**
3.	**Nano Synthesis and Fabrication:** Introduction & overview of Nanofabrication: Bottom up and Top-down approaches-Nano Grinding, Sol-gel Process, Chemical Vapour deposition (CVD). Plasma arching and various lithography techniques Hard & Soft lithography. **Nanosensors**: Introduction, classification of Nanosensors and their applications.	**09 Hrs**
4.	**Micro & Nano – Electromechanical Systems and Microfluidics**:MEMS/NEMS :Magnetic ,Chemical and Mechanical Transducers Sensing and Actuators ,Microfluidics:Laminar flow ,Hagen-Poiuselle equation ,basic fluid ideas ,Special comsideration of flow in small channels,mixing ,microvalves &micropumps.	**06 Hrs**
5.	**Applications of Nanotechnology**: Molecular electronics ,molecular switches ,mechanical cutting tools , machine components ,DLC coated grinding wheels ,solar cells ,Batteries ,fuel cells,Nanofilters Medical nanotechnology in Diagnosyic,Therapeutics,Drug delivery and Nanosurgery. Electromagnetic nanosensors, Biosensors: Biosensors in modern medicine.	**07 Hrs**

Course Outcomes : After completing the course ,the students will be able to

CO1: Remember, understand and apply knowledge about of nanomaterials and their uses.

CO2: Interpret and apply the techniques of manufacturing and characterization processes

CO3: Apply the knowledge of Nanosensors, related to nanosensors in electronics, mechanical, chemical and

biological systems.
CO4:Create and evaluate nano Design and System in various disciplines

TEXT Books:

1. B S Murthy, P Shankar, B Raj and J Murday, Text book of nanoscience and nanotechnology, Springer, Copublication with university press (India) Pvt Ltd. VCH, XII, 1st edition
2. V K Khanna, Nanocensors, Physical, Chemical and Biological CRC Press, 1st edition, 2013
3. C C Kock, Nanostructured materials, William Andrew publishing, 2nd edition
4. M Wilson, K Kannangara, G Smith, M Simmons, B Raguse, Nano Technology, Overseas Press (India) Pvt Ltd. 1st edition 2005

REFERENCES BOOKS:

1. Charles P. Poole Introduction to Nanotechnology 1st Edition, Frank J. Owens
2. Manasi Karkare, Nanotechnology 0th Edition, Publisher, I K International Publishing House ISBN-13978-8189866990
3. Thomas Varghese, K.M. Balakrishna , an Introduction to Synthesis, Properties and Applications of Nanomaterials 1st Edition, by Thomas Varghese (Author),
4. Rakesh Rathi , Nanotechnology, S.Chand And Publishing Limited, First edition, 2009

Sub Title : HUMAN RESOURCE MANAGEMENT		
Sub Code : 18IM733	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives :

1. An ability to evaluate and apply theories of social science disciplines to workplace issues
2. Use of HRM functional capabilities to select, develop, and motivate workers
3. To develop strong analytical, communication, and decision making skills.

Unit No.	Syllabus Content	No of Hours
1	**INTRODUCTION:** Introduction, meaning, nature, scope of HRM. Importance and Evolution of the concept of HRM. Major functions ofHRM, Principles of HRM, Organization of Personnel department, Role of HR Manager. **JOB ANALYSIS:**Meaning, process of job analysis, methods of collecting job analysis data, Job Description and Specification, Role Analysis	**08**
2	**HUMAN RESOURCE PLANNING**: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting.. **RECRUITMENT:** Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process.	**08**
3	**SELECTION:** Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion exit interview, (Tutorial on written test, Group Discussion, Interviews)	**08**
4	**TRAINING AND DEVELOPMENT:** Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods. **PERFORMANCE APPRAISAL:** Components (all round performance appraisal), Methods, Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports.	**08**
5	**INDUSTRIAL RELATIONS:** Meaning Characteristics of Industrial Relations, Factors of Industrial, Relations, the Three Actors of Industrial Relations, Importance of Harmonious Industrial Relations, Objectives of Industrial Relations, Functions of Industrial Relations, Code of Industrial Relations, Conditions for Congenial Industrial Relations.	**07**

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
Note 2: Two assignments are evaluated for 5 marks.

Outcomes:

1. Apply the knowledge and skills needed to effectively manage human resources
2. Examine current issues, trends, practices, and processes in HRM
3. Compare the common methods for recruiting and selecting human resource

4. Contribute to employee performance management and organizational effectiveness
5. Evaluate employee orientation, training, and development programs.

Cos	Mapping with POs
CO1	PO2,PO8,PO12
CO2	PO3,PO5,PO11
CO3	PO2,PO8,PO12
CO4	PO3,PO5,PO11
CO5	PO2,PO8,PO11,PO12

TEXT BOOKS

1. **Human Resources Management** – Dr. K Ashwathappa, Tata McGraw Hill, Edition 2016
2. **Essentials of HRM and industrial relations** – Subbarao,P , Himalaya publishing house 2016

REFERENCES BOOKS

1 Management of Human Resources – CB Mamoria – Himalaya Publication House, 2003

2 Personnel / Human resource Management – Decenoz and robbins PHI, 2002

3 Industrial Acts by Jain, 2004

4 Industrial Relations – Arun Monappa – TMH, ISBN – 0-07-451710-8

Sub Title : DATA BASE MANAGEMENT SYSTEM		
Sub Code : 18IM734	**No. of Credits:3=3: 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. Explain the fundamental concepts of database management such as database design, database languages, and database-system implementation
2. Analyze database models & entity relationship models.
3. Determine the physical and logical database designs, data modeling, relational, hierarchical and network models.
4. Define the Structured Query Language for easy accessibility of the Database.

Unit No.	Syllabus Content	No of Hours
1	**DATABASES AND DATABASE USERS:** Introduction, characteristics of data base approach, intended uses of a DBMS, advantages and implication of database approach. **DATABASE SYSTEMS CONCEPTS AND ARCHITECTURE:** Data models, Schemas and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of data base management systems.	10
2	**DATA MODELING:** High level conceptual data models for database design. Entity types, entity sets, attributes, and keys. Relationships, relationship types, roles, and structural constraints. Weak entity types. ER diagrams. **RECORD STORAGE AND PRIMARY FILE ORGANIZATIONS:** Secondary storage devices, buffering of blocks, placing file records on disk, operations on files, heap files and sorted files, hashing techniques. Single-level and multilevel ordered indexes, dynamic multi level indexes using B-trees and B+trees.	10
3	**RELATIONAL DATA MODEL AND RELATIONAL ALGEBRA:** Brief discussion on **Codd** rules, relational model concepts, constraints, and schemas. Update operation on relations, basic and additional relational algebraoperations, and queries in relational algebra.	06
4	**Structured Query Language (SQL):** Data definition etc. in SQL2. Basic and complex queries in SQL. Insert, delete, update statements, and views in SQL, embedded SQL.	07

5	**DATABASE DESIGN:** Design guidelines for relational schemes, functional Dependencies, normalization -1st, 2nd, 3rd, 4th, and 5th normal forms. Database design process, factors influencing physical database design guidelines, and guidelines for relational systems.	**06**

Note 1: Unit 1 and Unit 2 will have internal choice.

Note 2: Two assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2. Assignment - 2 from units 3, 4 and 5.

Outcomes:

By the end of the course students will be able to

1. Distinguish Data Base systems, Data models and DBMS architecture.
2. Model the data models for database design and experiment storage devices.
3. Write relational algebra operations, and queries in relational algebra.
4. Demonstrate the Structured Query Language (SQL) to query, update and manage a database
5. Define and relate the database design guidelines, and guidelines for relational systems.

Cos	Mapping with POs
CO1	PO3,PO4,PO5,PO6,PO9,PO10,PO11
CO2	PO3,PO4,PO5,PO6,PO9,PO10,PO11
CO3	PO3,PO5,PO8
CO4	PO3,PO5,PO8
CO5	PO5,PO6,PO8,PO9,PO10

TEXT BOOKS:

1. **"Fundamentals of database systems"-**Ramez Elmasri and Shamkanth B. Navathe, , 6th Edition, Addison Wesley Publishing Company.
2. **"Database Management System", -**Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, TATA McGraw Hill, ISBN 0-07-1231511

REFERENCE BOOKS:

1. **Modern Data base management** - Mc Lfadden, hoffer, Prescott
2. **Database Management Design -** Gary W. Hansen and James V. Hanesn, "and" 2nd Edition, PHI Pvt. Ltd.

Sub Title :TECHNOLOGY MANAGEMENT		
Sub Code : 18IM735	**No. of Credits: 3= 3: 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. Integrate framework that will allow students to synthesize knowledge from other courses into a comprehensive understanding of competitive advantage.
2. Explain the nature of technology and its types, application in development of new technologies.
3. Discuss how to think critically in the research and development

Unit No.	Syllabus Content	No of Hours
1	**THE CONCEPT OF TECHNOLOGY:** Introduction, The nature of knowledge, Aspects of classification, Concept and Meaning of technology, The character of a specific technology, Scope of technology, Examples of classification of technology, Scale of technology information, Levels of technology, Technology portfolios, Technology as an environment.	**8**
2	**THE NATURE OF TECHNOLOGICAL CHANGE:** Introduction, Meaning of technological change, Concept of invention, Nature of innovation, Emergence of new technologies, Life cycle of a technology, Motivation for technological change, Nature of technological progress, Nature of mature technology, Nature of diffusion, Technological convergence.	**8**
3	**THE ECONOMICS OF TECHNOLOGY:** Introduction, Meaning of technological economics, Examples of technological economics, Scope of technological economics, Engineering economics, Production economics, Concept of economy of scale, Concept of optimum size, Technology as a commodity, Technology at the macro-economic level.	**8**
4	**CORPORATE TECHNOLOGY STRATEGY:** Introduction, The Business Mission, Where Is The Business? Concept Of Business Strategy, Capability For Strategic Planning, Corporate Technology Strategy, Competitive Technology, Focus Of Strategy, Technological Alliances, Realization Of Strategy, Technology Crisis	**8**
5	**TECHNOLOGY- AN INSTRUMENT OF COMPETITION:** Introduction, securing competitive advantage, Technological competition analysis, Technological leadership, Adoption of new technology, marketing a new technology product, Retention of competitive advantages.	**7**

Note 1: SEE Question paper contains total 10 Questions, student should answer any one question from each Unit shall answer total five question.

Note 2: Two assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2. Assignment - 2 from units 3, 4 and 5.

Outcomes:

After completing the course students are able to

1. Describe and assess tool, techniques and strategies of the management of technology and innovation.
2. Examine the management of techno logy and innovation from the perspective of research and development, new product development, production, operations, finance, commercialization and strategy.
3. Analyze the high levels of complexity and risk associated with the management of technology and innovation and develop company strategies.

COs	Mapping with POs
CO1	PO2,PO8,PO12
CO2	PO3,PO5,PO11
CO3	PO2,PO8,PO12
CO4	PO3,PO5,PO11
CO5	PO2,PO8,PO11,PO12

TEXT BOOKS:

1. Paul Lowe – The management of technology, Perception and opportunities, Chapman and Hall, London 1995. NEW TEXT BOOK

REFERENCE BOOKS:

1. Frederick Betz – Strategic Management of technology, Mc Graw hill inc. 1993.
2. Rastogi P.N. – Management of Technology & Innovation: Competing through Technology Excellence, Sage Publications, 1995.

PROFESSIONAL ELECTIVES - 4

Sub Title : DESIGN OF EXPERIMENTS		
Sub Code : 18IM741	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. To describe how to design experiments, carry them out, and analyze the data they yield.
2. To introduce Taguchi methods, and compare and contrast them with more traditional techniques.
3. To examine how a factorial design allows cost reduction, increases efficiency of experimentation
4. Design and conduct orthogonal array experiments for process improvement.

Unit No.	Syllabus Content	No of Hours
1	**Introduction:** Strategy of Experimentation, Design of Experiments: Definition, Objectives, Principles of DOE, Applications, Guidelines. Principles of Quality Engineering- Definition of quality, Taguchi's Quality philosophy, Off-line and on-line quality control, Quality loss function, Quadratic loss function, Noise Factors, P- diagram, Optimization of Product and Process design	**07**
2	**Factorial Experimentation –** Single Factor Experiments, The 2^2 Design, The 2^3 Design, The General 2^k Design, A Single Replicate of the 2^k Design, Problems.	**10**
3	**Blocking and Confounding in the 2^k Design:** Blocking a Replicated 2^k Factorial Design, Confounding in the 2^k factorial design, Confounding the 2^k factorial design in two Blocks and Four Blocks	**08**
4	**Designing of experiments through Orthogonal Arrays:** Counting degrees or freedom, selecting a standard orthogonal array, dummy level technique, and compound factor method. Linear graphs and interaction assignment. Modification of linear graphs, column merging method, branching design. Strategy for constructing an orthogonal array. Comparison with the classical statistical experiment design.	**07**
5	**Robust Design:** Case study discussion, Noise factors and testing conditions. Quality characteristics and objective functions. Control factors and their levels. Matrix experiment and data analysis plan. Conducting the matrix experiment, Data analysis, Verification experiment and future plan. **Signal-To-Noise Ratio:** Evaluation of sensitivity to noise. S/N ratios for Static problems: Smaller-the-better, Larger-the-better, Nominal-the-best and Asymmetric Cases. Signal-to-noise ratio for dynamic problems: S/N ratios for Continuous-continuous, continuous-digital, digital-continuous, digital-digital cases. Introduction to Response Surface Methodology.	**07**

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
Note 2: Two assignments are evaluated for 5 marks.

Course Outcomes:

CO1: Determine the importance of statistical design of experiments and benefits in R&D
CO2: Investigate the logic of hypothesis testing, including analysis of variance and the detailed

analysis of experimental data.
CO3: Design and conduct orthogonal array experiments for process improvement.
CO4:Choose an appropriate experimental design based on the study objectives
CO5:Interpret the results of the experiment and report the conclusions based on S/N ratio analysis

Cos	Mapping with POs
CO1	PO1,PO3,PO4
CO2	PO2,PO4,PO5
CO3	PO3,PO4
CO4	PO2,PO3
CO5	PO2,PO4

TEXT BOOKS:

1. **Quality Engineering Using Robust Design –** Madhav S. Phadke, Prentice Hall PTR, Englewood Cliffs, 2012
2. **Applied Design of Experiments and Taguchi Methods** - K. Krishnaiah, P. Shahabudeen, PHI, 2013

REFERENCE BOOKS:

1. **Design and Analysis of Experiments –** D.C. Montgomery, John Wiley and Sons, 10th Edition, 2019.
2. **Designing for Quality** – Robert H. Lochner and Joseph E. Matar, - an Introduction Best of Taghuchi and Western Methods or Statistical Experimental Design", Chapman and Hall Madras, 2nd edition, 1990
3. **Taguchi techniques for quality engineering**, Phillip J. Ross, McGraw Hill, 1996.

Sub Title : STRATEGIC MANAGEMENT		
Sub Code : 18IM742	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. To provide an integrative framework that will allow students to blend knowledge from other courses into a comprehensive determining of competitive advantage.
2. To provide a basic determining of the nature and dynamics of the strategy formulation and implementation processes.
3. To encourage students to think critically and strategically.

Unit No.	Syllabus Content	No of Hours
1	**STRATEGIC MANAGEMENT INTRODUCTION:** Definition- Levels of strategy- Roles of Strategist- Strategic Management Process benefits and limitations. Mission -Objectives -Social responsibilities.	**07**
2	**STRATEGY FORMULATION:** Strategic Thinking, SWOT analysis- Techniques for environmental analysis- TOWS matrix, Balanced Score Card,Steps in strategy implementation -formulation of SBU strategy. Leadership implementation, communicating the strategy:- Annual and Functional objectives- Development of policies- Organizational Implementation- Evaluation and control. Reward system.	**10**
3	**STRATEGY AND STRUCTURE:** Strategy- Structure relationship. Organizational restructuring and Transformation, Principles of Organization. Strategic control- Premise and Implementation control strategic Surveillance special alert control- Operational control - Steps in Operational Control, Types of Operational control.	**06**
4	**PORTFOLIO STRATEGY:** Business portfolio analysis- BCG matrix, GE multi matrix, an evaluation of Portfolio models - factors influencing portfolio strategy.	**06**
5	**COMPETITIVE ANALYSIS AND STRATEGIES:** Structural analysis of industries threat of entry rivalry among existing competitors, threat of substitutes; Bargaining power of suppliers; structural analysis and competitive strategy - competitor analysis value chain. **BUSINESS GROWTH:** Reasons, Risks and indicators of Business growth, Growth Strategies- Intensive, Growth Strategies, Integrative Growth Strategies, Diversification, External Growth Strategies.	**10**

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
Note 2: Two assignments are evaluated for 5 marks.

Outcomes:

1. Articulate a vision that gives meaning to all the firm's stakeholders of the firm's objectives
2. Formulate a strategic plan that operationalizes the goals and objectives of the firm
3. Implement a strategic plan that takes into account the functional areas of business

4. Evaluate and revise programs and procedures in order to achieve organizational goals
5. Analyse dynamics in competitive rivalry including competitive action and response, for acting both proactively and defensively.

Cos	Mapping with POs
CO1	PO4,PO7,PO8
CO2	PO6,PO7,PO9
CO3	PO6,PO7,PO9,PO11
CO4	PO7,PO10,PO11
CO5	PO7,PO11,PO12

TEXT BOOKS:

1. **Strategic Management** - Francis Cherunilam, Himalya Publishers, 4th Edition, 2016
2. **Strategic Management**, Azhar Kazmi, Adela Kazmi, McGraw Hill, Fifth Edition, 2020

REFERENCE BOOKS:

1. **Business Policy and Strategic Management** -P Subba Rao, Himalya Publishers 1st Edition, 2011
2. **The Competitive Strategy: Techniques for Analyzing Industries and Competitors,** Michael Porter, Simon & Schuster, 2004
3. **Strategic Management** – Robert A Pitts and David Lei, South Western Publishing, 4th Edition, 2006

Sub Title : PRODUCT DESIGN AND MANUFACTURING		
Sub Code : 18IM743	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. To know the principles, contemporary theories and practices of effective product design.
2. To Determine and apply concept of adaptive on consumer products.
3. To develop skills and concepts on economic product manufacturing
4. To translate ideas in to sketches

Unit No.	Syllabus Content	No of Hours
1	**Introduction to Product design**: Asimow's Model : definition of product design ,Design by evolution, design by innovation, Essential factors of product design, production-consumption cycle, Flow and value addition I the production – consumption cycle, The morphology of design (The seven phases),primary design phases and flow charting, Roll of allowances, process capability and tolerance in detailed design and assembly.	10
2	**Product design practice and Industry**: Introduction, product strategies, Time to market, Analyses of the product, The three S's standardization , Renard series(preferred numbers), simplification, The designer and his role, the designer myth and reality, The industrial design organization, Basic design consideration, Problems faced by industrial designer, procedure adopted by industrial designer, Types of model designed by industrial designers, what the designer contributes, Role of aesthetics in product design, functional design practice.	7
3	**Strength consideration in product design:** Principal stress trajectories force , floe lines, balanced design, Criteria and objectives of design, material toughness, Resilience, Designing for uniform strength, Tension via-a via compression. **Design for production- Metal parts**: Producibility requirement in the design of machine components, forging design, pressed component design, casting design, design for machining ease, The role of process engineer, Ease of location & clamping, Some additional aspect of production design, Die casting and special castings, Design for powder metallurgical parts, expanded metals & wire forms.	10
4	**Optimization in design**: Introduction, siddal's, classification of design approaches, optimization by differential calculus, langrage multipliers, geometric programming Lohnson's methods of optimum design.	6
5	**Economic factors influencing design**: Product value, Design for safely, reliability and environmental consideration, Manufacturing operation in relations to design, Economic analysis, and Profit and competitiveness breakeven analyses, Economics of a news product design (Samual Eilon model). **Value engineering & product design**: Introduction, Historical perfective, what is value? Nature and management of value, maximum value, normal degree of value, Importance of value. The value analyses job plan, creativity, creative techniques. **Modern approaches to product design**: Concurrent design, Quality functions development(QFD)	6

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
Note 2: Two assignments are evaluated for 5 marks.

Outcomes:

1. Determine principles and concepts of effective product design
2. Apply creative thinking skills for idea generation
3. Illustrate conceptual ideas through clear drawing.
4. Construct ideas using software and to develop the drawings

Cos	Mapping with POs
CO1	PO3,PO8
CO2	PO3,PO8,PO10
CO3	PO3,PO8
CO4	PO3,PO8,PO11

Text Books:

1. Product Design & Manufacturing, A C Chitale and R C Gupta, Prentice Hall India Learning Private Limited; 5th edition (1 January 2011)

Reference Book:

1. Tim Jihns, Butterworth Heinmana – New product development Oxford,UIC 1997
2. Ronald engine Kinetivicz - New product development design & Analyses, John Wiley & Sons
3. Geoffery Boothroyod, Peter Dew Hurst and Winston knight- Product design for manufacture and assembly

Sub Title : TOTAL QUALITY MANAGEMENT		
Sub Code: 18IM744	**No. of Credits:3 =3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Course objectives:

1. Develop and determining the necessary information and skills needed to manage, control and improve quality practices in the organization through TQM Philosophy.
2. Apply the improvement methodologies for problem solving in organizations.
3. Demonstrate the importance of TQM tools required for problem solving processes.
4. Demonstrate the quality Management standards for the present industrial scenario.

Unit No.	Syllabus Content	No of Hours
1	**Introdction:** TQM introduction- Historical review- Obstacles- Benefits of TQM, Elements of TQM- Principles of TQM- Concepts of TQM- Fundamental Characteristics of TQM- TQM routine duties and awareness- Quality in Manufacturing and Service Systems.	**6**
2	**Principles and Philosophies of Total Quality Management** -Gurus of TQM and their Contribution-Deming's Management Philosophy- 14 points for management and PDCA cycle – Juran's Philosophy, Juran-quality trilogy, Imai,s Kaizen and innovation, The Crosby Philosophy- quality treatment and and 14 points. Taguchi Loss Function. Leadership: Definition, characteristics of quality leaders, leadership concept.	**8**
3	**Quality Evolution,Customer Satisfaction and Employee Involvement** Evolution of Quality Concepts -Four Fitness of quality and Weakness-Evolution of Quality Methodology- Evolution of Company Integration- Quality of Conformance versus Quality of Design-From Deviations to Weakness to Opportunities- Aware of Four Finesses-Future Finesses- Four Revolutions of Management Thinking and Four Levels of Practice of TQM. A Customer Focus – Fact-Based Management– Continuous Improvement – Teamwork and Participation. Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement,	**10**
4	**TQM Tools and Techniques** 7 Basic tools of TQM –Nominal Group Technique – Quality Circles – Flow Charts – Pareto Analysis– Poka Yoke (Mistake Proofing), Process, Quality Function Deployment (QFD), House of Quality, QFD Process, Benefits, Total Productive Maintenance (TPM) Concept, Improvement Needs, FMEA, Stages of FMEA, cybernetic Analysis, Six Sigma Concepts and Methodology (Introducion ascpets only)	**10**
5	**Quality Management Systems (Introductory Aspects Only**) a. The ISO 9001:2000 Quality Management System Standard b. The ISO 14001:2004 Environmental Management System Standard c. ISO 27001:2005 Information Security Management System d. ISO / TS16949:2002 for Automobile Industry e. CMMI Fundamentals and Concepts and f. Certification process.	**05**

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
Note 2: Two assignments are evaluated for 5 marks.

Outcomes:

1. Ability to Determine the TQM philosophies in organization and concepts of leadership.
2. To Define and Determine the evolution of quality concepts, methods and customer satisfaction.
3. To gain the knowledge of quality control tools in TQM.
4. To determine the concepts of reliability and quality failure.
5. To Determine the fundamental concepts of quality management systems

Cos	Mapping with POs
CO1	PO6,PO7,PO11
CO2	PO5,PO8,PO10,PO12
CO3	PO4,PO5,PO6,PO7
CO4	PO4,PO5,PO6,PO7
CO5	PO4,PO5,PO6,PO7

TEXT BOOKS:

1. A New American TQM Four Practical Revolutions in Management‖ –Shoji Shiba, Alan Graham and David Walden,– Productivity Press, Portlans (USA) , 1993
2. Management for Total Quality" –N Logothetis- Prentice Hall of India, New Delhi, 1994.
3.Dale H. Besterfield "Total Quality Management ''(3rd Edition) 3rd Edition Prentice Hall Publications

REFERENCE BOOK:

1. The Quality Improvement Hand Book, -Roger C Swanson, Publisher Vanity Books International, New Delhi, 1995.
2. Total Quality Management – Kesavan R – I K International Publishing house Pvt. Ltd, 2008

E BOOKS:

1. http://psbm.org/Ebooks/Total%20Quality.pdf
2. http://www.mescenter.ru/images/abook_file/Total_Quality_Management_and_Six_Sigma.pdf

MOOCs:

3. https://www.mooc-list.com/course/fundamentals-six-sigma-quality-engineering-andmanagement-edx?static=true

Sub Title : INDUSTRIAL RELATIONS AND LABOUR WELFARE		
Sub Code : IM745	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Course Objectives:	
1	To gain an historical and industrial perspective of Industrial Relations.
2	To investigate industrial conflicts to solve labour problems and find solutions.
3	To demonstrate the knowledge and skills needed to identify labour welfare measures, funds at work place for better work practice.
4	To identify the forces that influence occupational safety and health.
5.	To identify the welfare of special categories of labour form social assistance and security.

Unit No.	Syllabus Content	No of Hours
1	**INDUSTRIAL RELATIONS** Concepts – Importance – Industrial Relations problems in the Public Sector – Growth of Trade Unions – Codes of conduct.	**08**
2	**INDUSTRIAL CONFLICTS** Disputes – Impact – Causes – Strikes – Prevention – Industrial Peace – Government Machinery –Conciliation – Arbitration – Adjudication.	**08**
3	**LABOUR WELFARE** Concept – Objectives – Scope – Need – Voluntary Welfare Measures – Statutory Welfare Measures – Labour – Welfare Funds – Education and Training Schemes.	**06**
4	**INDUSTRIAL SAFETY** Causes of Accidents – Prevention – Safety Provisions – Industrial Health and Hygiene –Importance – Problems – Occupational Hazards – Diseases – Psychological problems –Counseling – Statutory Provisions	**08**
5	**WELFARE OF SPECIAL CATEGORIES OF LABOUR** Child Labour – Female Labour – Contract Labour – Construction Labour – Agricultural Labour –Differently abled Labour –BPO & KPO Labour - Social Assistance – Social Security – Implications.	**09**

<u>Note 1:</u> Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.

Note 2: **Two assignments are evaluated for 5 marks.**

Course Outcomes:
Students will know how to resolve industrial relations and human relations problems and promote welfare of industrial labour.

Cos	**Mapping with POs**
CO1	PO3, PO7, PO9, PO12
CO2	PO3, PO8, PO9
CO3	PO7, PO12
CO4	PO3, PO7
CO5	PO3, PO7

TEXT BOOKS:

1. Mamoria C.B. and Sathish Mamoria, Dynamics of Industrial Relations, Himalaya Publishing House, New Delhi, 2007.
2. Arun Monappa, Ranjeet Nambudiri, Patturaja Selvaraj. Industrial relations & Labour Laws. Tata McGraw Hill. 2012

REFERENCE BOOKS:

1. Ratna Sen, Industrial Relations in India, Shifting Paradigms, Macmillan India Ltd., New Delhi, 2007.
2. C.S.Venkata Ratnam, Globalisation and Labour Management Relations, Response Books, 2007.
3. Srivastava, Industrial Relations and Labour laws, Vikas, 2007.
4. P.N.Singh, Neeraj Kumar. Employee relations Management. Pearson. 2011.
5. P.R.N Sinha, Indu Bala Sinha, Seema Priyardarshini Shekhar. Industrial Relations, Trade Unions and Labour Legislation. Pearson. 2004

OPEN ELECTIVE –C

Sub Title : HUMAN RESOURCE MANAGEMENT		
Sub Code : 18IM751	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives :	
1	An ability to evaluate and apply theories of social science disciplines to workplace issues
2	Use of HRM functional capabilities to select, develop, and motivate workers
3	To develop strong analytical, communication, and decision making skills.

Unit No.	Syllabus Content	No of Hours
1	**INTRODUCTION:** Introduction, meaning, nature, scope of HRM. Importance and Evolution of the concept of HRM. Major functions ofHRM, Principles of HRM, Organization of Personnel department, Role of HR Manager. **JOB ANALYSIS:**Meaning, process of job analysis, methods of collecting job analysis data, Job Description and Specification, Role Analysis	**08**
2	**HUMAN RESOURCE PLANNING**: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting.. **RECRUITMENT:** Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process.	**08**
3	**SELECTION:** Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion exit interview, (Tutorial on written test, Group Discussion, Interviews)	**08**
4	**TRAINING AND DEVELOPMENT:** Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods. **PERFORMANCE APPRAISAL:** Components (all round performance appraisal), Methods, Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports.	**08**
5	**INDUSTRIAL RELATIONS:** Meaning Characteristics of Industrial Relations, Factors of Industrial, Relations, the Three Actors of Industrial Relations, Importance of Harmonious Industrial Relations, Objectives of Industrial Relations, Functions of Industrial Relations, Code of Industrial Relations, Conditions for Congenial Industrial Relations.	**07**

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.
Note 2: Two assignments are evaluated for 5 marks.

Outcomes:

6. Apply the knowledge and skills needed to effectively manage human resources
7. Examine current issues, trends, practices, and processes in HRM
8. Compare the common methods for recruiting and selecting human resource
9. Contribute to employee performance management and organizational effectiveness
10. Evaluate employee orientation, training, and development programs.

Cos	**Mapping with POs**
CO1	PO2,PO8,PO12
CO2	PO3,PO5,PO11
CO3	PO2,PO8,PO12
CO4	PO3,PO5,PO11
CO5	PO2,PO8,PO11,PO12

TEXT BOOKS

1 **Human Resources Management** – Dr. K Ashwathappa, Tata McGraw Hill, Edition 2016
2 **Essentials of HRM and industrial relations** – Subbarao,P , Himalaya publishing house 2016

REFERENCES BOOKS

1 **Management of Human Resources** – CB Mamoria – Himalaya Publication House, 2003
2 **Personnel / Human resource Management** – Decenoz and robbins PHI, 2002
3 **Industrial Acts** by Jain, 2004
4 **Industrial Relations** – Arun Monappa – TMH, ISBN – 0-07-451710-8

Sub Title : STATISTICS LAB		
Sub Code : 18IML76	**No. of Credits: 1= 0 : 0 : 1 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 36**

Objective:

1. Explain and apply the basic fundamental concepts of Statistics to engineering problems and the importance of Data summary and Display.
2. Application of probability distributions to various manufacturing problems.
3. Application of hypothesis to random experiments of manufacturing processes.
4. Test the statistical parameters by regression and correlation.
5. Design an engineering problem as random experiment to solve and test for variance.

Unit No.	Syllabus content	Hrs
1	1. Determining basic statistics (Mean, Median, Mode, and Standard deviation, Range, Harmonic Mean, Geometric Mean, Variance and Coefficient of variation) for the given quality characteristic and interpreting it. 2. Representing the data in graphical forms: Line graph, Bar graph, Pie Chart, Stem and leaf plot, Histogram, Pareto Chart. 3. Construction of Scatter diagram for the given variables and interpretation of different forms of scatter diagrams. 4. Conduction of regression analysis for two variables using least squares method and fitting a straight line. 5. Conduction of multiple regression analysis for the given variables.	**15**
2	1. Interval estimation and hypothesis testing on mean of a normal distribution. 2. Interval estimation and hypothesis testing on difference in means of two normal distributions. 3. Hypothesis testing on variance of a normal population. 4. Hypothesis testing on variances of two normal populations. 5. Hypothesis testing on a single population proportion. 6. Fitting an appropriate distribution (normal distribution) for the given variable quality characteristic 7.Conduct One way and two way ANOVA Analysis for the given problem 8.Design of experiments using CATAPULT	**21**

Outcome:

By the end of the course students will be able to

1. Apply the statistical data in the form of Tabular and Graphical display.
2. Identify discrete type of probability and solve the various engineering problems.
3. Solve Continuous type of probability and solve the various engineering problems
4. Estimate the hypothesis and give inference to random experiments.
5. Evaluate the statistical parameters by estimation.

Cos	Mapping with POs
CO1	PO1,PO2,PO3,PO6,PO7,PO11,PO12
CO2	PO1,PO2,PO3,PO6,PO7,PO11,PO12
CO3	PO1,PO2,PO3,PO6,PO7,PO11,PO12
CO4	PO1,PO2,PO3,PO6,PO7,PO11,PO12

Scheme of Examination:

ONE question from Unit -1: 15 marks
ONE question from Unit -1: 25 marks
Viva-Voce : 10 marks

Suggested software:

1. Statistical Packages : SYSTAT / MINITAB / SPSS/ R- studio and such others

Sub Title : ENTERPRISE RESOURCE PLANNING and OR LAB		
Sub Code : 18IML77	**No. of Credits: 1= 0 : 0 : 1 (L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 13**

Objective:

1. To provide an determining of the managerial issues involved in the design and implementation of Enterprise Resource Planning Systems
2. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry;
3. Use of statistical tools for data analysis.

Unit No.	Syllabus Content	No of Hours
1	Creating Item Master for various Engineering Designs Creating Supplier Master for Items Creating customer Master for Items Generating Bill of Materials for Various Engineering Designs Creating Purchase order for Items Creating Work order / job card for Items and Dispatch Instruction for Items	24
2	Optimization problems using OR packages Linear programming Transportation problem Assignment problem PERT/CPM	12

Course Outcomes:

CO1: Develop the skills and knowledge to support the implementation and maintenance of Enterprise Resource Planning (ERP) systems.

CO2: Formulate and solve Linear programming problems, transportation and assignment Problems

Cos	Mapping with POs
CO1	PO3,PO5,PO6,PO11
CO2	PO2,PO4,PO5

Scheme of Examination:

ONE question from Unit -1 : 30 marks

ONE question from Unit -2 : 10 marks

Viva-Voce: 10 marks.

Suggested Software Packages

1. Statistical Packages : SYSTAT / MINITAB / SPSS and such others
2. ERP Packages : SIXTH SENSE / RAMCO / MAARSMAN / CIMAS / UNISOFT
3. OR Packages : Lindo / Lingo / Storm

VII **SEMESTER**

Sub Title : COST MANAGEMENT OF ENGINEEREINGT PROJECTS		
Sub Code : 18HS81	**No. of Credits: 2**	**No. of lecture hours/week : 2**
Exam Duration : 2 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 26**

Objectives:
1. The objective of this course is to familiarize the student with the basic concepts, standards and practices of financial accounting. 2. The course is devoted to the basic financial statements, the analysis and recording of transactions, and the underlying concepts and procedures, 3. To carry out financial statement analysis and studying and preparation of cost sheet and budget.

Unit No.	**Syllabus Content**	**No of Hours**
1	**COST CONCEPTS:** Cost- meaning, Cost v/s Expense, meaning of loss, classification of cost, cost driver & cost unit. Overheads- Meaning and Classification of Overheads.	05
2	**COMPONENTS OF COSTING:** objectives of costing, elements of Costing. Preparation of Cost Sheet, Job Costing-Batch Costing, Process Costing and Activity Based Costing(Simple Problems on Activity Based Costing)	05
3	**INTRODUCTION TO ECONOMICS**: Meaning, Scope, Engineering Decision Makers, Nature and Significance of Economies, Laws of Demand - Concepts, Exceptions. Elasticity of Demand, Demand Forecasting - meaning, methods. Law of Supply - Concepts, Exception. Law of Diminishing Marginal Utility. .	05
4	**INDIAN AND GLOBAL BUSINESS ECONOMICS / MACRO ECONOMICS:** National Income Concept, Per Capita Income (PCI), Gross Domestic Product (GDP) – Concept, Components. Business Cycles – Meaning, Phases. Inflation-Types, Causes and Measurements-Consumer Price Index (CPI) and Whole Sale Price Index (WSI). SWOT Analysis of Indian Economy.	05
5	**FINANCIAL PLANNING:** Income Statement and Balance Sheet (Proforma), Indian Financial System Components. Capital Budgetiing – Phases, Techniques- Pay Back Period (PBP), Net present Value (NPV), Internal Rate of Returns (IRR). Projecting the Cash Flows – Components.	06

Outcomes:

Upon completion of the course, you will be able to:

6. Understand and apply fundamental accounting concepts, principles and conventions and to carry out journal entries and adjustments.
7. Prepare financial statements in accordance with generally accepted accounting principles.
8. Prepare and analyze a trial balance, cash flow statement, cost sheet variance analysis.
9. To prepare and analyze different types of budget
10. To explain the concepts of financial management, working capital and their applications to industries.

Mapping with POs:

Cos	Mapping with POs
CO1	PO1, PO4, PO5, PO7, PO8, PO11, PO12
CO2	PO1, PO3, PO5, PO6, PO11, PO12
CO3	PO1,PO3, PO5, PO11, PO12
CO4	PO1,PO3,PO5,PO10,PO11,PO12
CO5	PO3,PO5,PO8,PO11,PO12

TEXT BOOKS:

1Cost Accouting- Principles and Practices, S P Jain K L Narang, Kalyani Publishers.

2 Enineering Economy, Riggs J.L., 5th Edition, Tata McGraw Hill, ISBN 0-07-058670-5.

3. Financial Management-Theory and practices, Shashi.K.Gupta, R K Sharma, Kalyani Publishers, ISBN 13, 978 9327235975.

REFERENCE BOOKS:

1 Cost Accounting, Khan M Y, 2nd Edition, 2000, Tata McGraw Hill, ISBN 007042248.

3 Engineering Economics, R.Paneerselvam, Eastern Economy Edition 2001, PHI, ISBN-81-203-1743-2Khan & Jain.

3. Financial Management, Khan & Jain, McGrawHill, India.

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.

Note 2: Two assignments are evaluated for 5 marks.

Scheme of semester End Examination (SEE):

Units	Unit-1				Unit-2				Unit-3				
Qno.	1.a	1.b	O	2.a	3.a	3.b	O	4.a	5.a	5.b	O	6.a	6.b
Marks	05	05	R	10	05	05	R	10	05	05	R	05	05

Units	Unit-4					Unit- 5				
Qno.	7.a	7.b	O	8.a	8.b	9.a	9.b	O	10.a	10.b
Marks	05	05	R	05	05	05	05	R	05	05

Semester: VII / VIII	
Course Title: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)	
Course Code: **18HS82** Credits: **02**	Evaluation Procedure: CIE + Assignment + Group Activity + SEE Marks = 40 +5 + 5 + 50 = 100
Teaching Hours: 26 Hrs. (L:T:P:S) - 2:0:0:0	SEE Duration: 2 Hrs

Course Learning Objectives:	
1	To gain an historical, economic, and organizational perspective of occupational safety and health.
2	To investigate current occupational safety and health problems and solutions.
3	To identify the forces that influence occupational safety and health.
4	To demonstrate the knowledge and skills needed to identify work place problems and safe work practice.

UNIT - I	
OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES: Safety, History and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation.	**6 Hrs**
UNIT - II	
ERGONOMICS AT WORK PLACE: Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Emergency Response - Decision for action – purpose and considerations.	**5 Hrs**
UNIT - III	
FIRE PREVENTION AND PROTECTION: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers. Electrical Safety.	**5 Hrs**
UNIT – IV (Blended Learning)	
HEALTH CONSIDERATIONS AT WORK PLACE: Types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) – types and advantages, effects of exposure and treatment for engineering industries, municipal solid waste. Environment management plans (EMP) for safety and sustainability.	**5 Hrs**
UNIT - V	
OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS: Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, supervisors and managers.	**5 Hrs**

Course Outcomes: The students will be able to	
1	Acquire knowledge on OSHA policies, Laws and regulations.

2	Identify hazards in the workplace that pose a danger or threat to the safety or health, or that of others.
3	Control unsafe or unhealthy hazards and propose methods to eliminate the hazards.
4	Discuss the role of health and safety in the workplace and effects of industries on environment.
5	Identify workplace hazards, safety considerations and roles and responsibilities of workers, supervisors and managers.

Question paper pattern:

The question paper will have ten full questions carrying equal marks.
Each full question will be for 20 marks.
There will be two full questions (with a maximum of four sub - questions) from each unit.
Each full question will have sub - question covering all the topics under a unit.
The students will have to answer five full questions, selecting one full question from each unit.

Text Books:

1	Goetsch D. L., (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall.
2	Heinrich H.W., (2007), "Industrial Accident Prevention- A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991).
3	Industrial Safety and Pollution Control Handbook.

Reference Books:

1	Colling D.A., (1990), "Industrial Safety Management and Technology", Prentice Hall, New Delhi.
2	Della D.E., and Giustina, (1996), "Safety and Environmental Management", Van Nostr and Reinhold International Thomson Publishing Inc.

Additional Books:

1	Industrial safety, health and environmental management. R K Jain, Sunil S Rao, Khanna Publications.
2	Safety, occupational health and environmental management in construction. S E Sharma, Vineeth Kumar, Khanna Publications.
3	Labour laws, Commercial law publishers India Pvt Ltd.
4	The occupational Safety, health & working conditions code. Commercial law publishers 2020.
5	Occupational health and safety management - A practical approach by Charles-De-Reese.
6	Occupational ergonomics, theory and applications by Amith Battacharya & James D Mc Glotthin.
7	Occupational Safety and health law handbook. Mc Dermott will & Enercy LLP.
8	Occupational health and safety management. Lambert Academic Publishing.
9	Fundamentals of Industrial Ergonomics - Babur Musthaffa (Google books).
10	Global occupational safety health and management handbook. Thomas Fuller, CAC press.
11	Introduction to Industrial Ergonomics.
12	Ergonomics and practical manual for beginners. Manjith Kaur Chauhan.

Sub Title : Project Work Phase II		
Sub Code : 18IMP81	**No. of Credits: 10= 0: 0: 2 (L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 32**

Sl. No.	Syllabus
1	Phase– 02: 10 Credits in VII Semester.
2	Student shall complete the project work well in time and shall be assessed by the guide and the departmental Project Review Committee for 50 marks (CIE). Later project viva-voce shall be conducted by the exam section and both internal and external examiners for 50 marks do evaluation.

Sub Title : Technical Seminar		
Sub Code : 18IMS82	**No. of Credits: 2= 0 : 0 : 2(L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration: 3 hr.	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 32**

Objective:

1. To equip students for making a subject presentation based on a thorough research review on any contemporary area of engineering and management fields.
2. Offering the student an opportunity to interact with faculty and peer group and to build the ability to making independent presentation.

Sl. No.	Syllabus
1	**Procedure:** 1. A list of contemporary topics will be offered by the faculty of the department in the interlude period between 7th and 8th Semester. 2. Students can opt for topic of their own choice and indicate their option to the department at the beginning of the 8th semester. This component is also evaluated twice in the semester. The final marks shall be submitted to the exam section at the end of the semester.

Cos	Mapping with POs
CO1	PO2,PO8,PO12
CO2	PO3,PO5,PO11
CO3	PO2,PO8,PO12
CO4	PO3,PO5,PO11
CO5	PO2,PO8,PO11,PO12

Sub Title : Internship		
Sub Code : 18IMI83	**No. of Credits: 2= 0 : 0 : 2(L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration: 3 hr.	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 32**

Sl. No.	Syllabus
1	**Internship:** All the students admitted to III year of BE shall undergo mandatory internship program fora duration for 4 weeks either during the vacation period of IV& V semester or during VI and VII. A SEE examination will be conducted during VIII semester and prescribed credits shall be added to VIII semester. Students who do not take-up/complete the internship will be declared as failed and have to complete during subsequent SEE examination after satisfying the internship requirements.

Sub Title : COST MANAGEMENT OF ENGINEEREINGT PROJECTS		
Sub Code : 18HS81	**No. of Credits: 2**	**No. of lecture hours/week : 2**
Exam Duration : 2 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 26**

Objectives:
1. The objective of this course is to familiarize the student with the basic concepts, standards and practices of financial accounting. 2. The course is devoted to the basic financial statements, the analysis and recording of transactions, and the underlying concepts and procedures, 3. To carry out financial statement analysis and studying and preparation of cost sheet and budget.

Unit No.	Syllabus Content	No of Hours
1	**COST CONCEPTS:** Cost- meaning, Cost v/s Expense, meaning of loss, classification of cost, cost driver & cost unit. Overheads- Meaning and Classification of Overheads.	05
2	**COMPONENTS OF COSTING:** objectives of costing, elements of Costing. Preparation of Cost Sheet, Job Costing-Batch Costing, Process Costing and Activity Based Costing(Simple Problems on Activity Based Costing)	05
3	**INTRODUCTION TO ECONOMICS**: Meaning, Scope, Engineering Decision Makers, Nature and Significance of Economies, Laws of Demand - Concepts, Exceptions. Elasticity of Demand, Demand Forecasting - meaning, methods. Law of Supply - Concepts, Exception. Law of Diminishing Marginal Utility. .	05
4	**INDIAN AND GLOBAL BUSINESS ECONOMICS / MACRO ECONOMICS:** National Income Concept, Per Capita Income (PCI), Gross Domestic Product (GDP) – Concept, Components. Business Cycles – Meaning, Phases. Inflation-Types, Causes and Measurements-Consumer Price Index (CPI) and Whole Sale Price Index (WSI). SWOT Analysis of Indian Economy.	05
5	**FINANCIAL PLANNING:** Income Statement and Balance Sheet (Proforma), Indian Financial System Components. Capital Budgetiing – Phases, Techniques- Pay Back Period (PBP), Net present Value (NPV), Internal Rate of Returns (IRR). Projecting the Cash Flows – Components.	06

Outcomes:

Upon completion of the course, you will be able to:

11. Understand and apply fundamental accounting concepts, principles and conventions and to carry out journal entries and adjustments.
12. Prepare financial statements in accordance with generally accepted accounting principles.
13. Prepare and analyze a trial balance, cash flow statement, cost sheet variance analysis.
14. To prepare and analyze different types of budget
15. To explain the concepts of financial management, working capital and their applications to industries.

Mapping with POs:

Cos	Mapping with POs
CO1	**PO1, PO4, PO5, PO7, PO8, PO11, PO12**
CO2	**PO1, PO3, PO5, PO6, PO11, PO12**
CO3	**PO1,PO3, PO5, PO11, PO12**
CO4	**PO1,PO3,PO5,PO10,PO11,PO12**
CO5	**PO3,PO5,PO8,PO11,PO12**

TEXT BOOKS:

1Cost Accouting- Principles and Practices, S P Jain K L Narang, Kalyani Publishers.

2 Enineering Economy, Riggs J.L., 5th Edition, Tata McGraw Hill, ISBN 0-07-058670-5.

3. Financial Management-Theory and practices, Shashi.K.Gupta, R K Sharma, Kalyani Publishers, ISBN 13, 978 9327235975.

REFERENCE BOOKS:

1 Cost Accounting, Khan M Y, 2nd Edition, 2000, Tata McGraw Hill, ISBN 007042248.

4 Engineering Economics, R.Paneerselvam, Eastern Economy Edition 2001, PHI, ISBN-81-203-1743-2Khan & Jain.

3. Financial Management, Khan & Jain, McGrawHill, India.

Note 1: Each unit has internal choice. A total of 10 questions i.e. 2 full questions from each unit.

Note 2: Two assignments are evaluated for 5 marks.

Scheme of semester End Examination (SEE):

Units	**Unit-1**				**Unit-2**				**Unit-3**				
Qno.	1.a	1.b	O	2.a	3.a	3.b	O	4.a	5.a	5.b	O	6.a	6.b
Marks	05	05	R	10	05	05	R	10	05	05	R	05	05

Units	**Unit-4**					**Unit- 5**				
Qno.	7.a	7.b	O	8.a	8.b	9.a	9.b	O	10.a	10.b
Marks	05	05	R	05	05	05	05	R	05	05

Semester: VII / VIII	
Course Title: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)	
Course Code: **18HS82**	Evaluation Procedure: CIE + Assignment + Group Activity + SEE Marks = 40 + 5 + 5 + 50 = 100
Credits: **02**	
Teaching Hours: 26 Hrs. (L:T:P:S) - 2:0:0:0	SEE Duration: 3 Hrs

Course Learning Objectives:	
1	To gain an historical, economic, and organizational perspective of occupational safety and health.
2	To investigate current occupational safety and health problems and solutions.
3	To identify the forces that influence occupational safety and health.
4	To demonstrate the knowledge and skills needed to identify work place problems and safe work practice.

UNIT - I	
OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES: Safety, History and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation.	**6 Hrs**
UNIT - II	
ERGONOMICS AT WORK PLACE: Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Emergency Response - Decision for action – purpose and considerations.	**5 Hrs**
UNIT - III	
FIRE PREVENTION AND PROTECTION: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers. Electrical Safety.	**5 Hrs**
UNIT – IV (Blended Learning)	
HEALTH CONSIDERATIONS AT WORK PLACE: Types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) – types and advantages, effects of exposure and treatment for engineering industries, municipal solid waste. Environment management plans (EMP) for safety and sustainability.	**5 Hrs**
UNIT - V	
OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS: Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, supervisors and managers.	**5 Hrs**

Course Outcomes: The students will be able to	
1	Acquire knowledge on OSHA policies, Laws and regulations.
2	Identify hazards in the workplace that pose a danger or threat to the safety or health, or that of others.

3	Control unsafe or unhealthy hazards and propose methods to eliminate the hazards.
4	Discuss the role of health and safety in the workplace and effects of industries on environment.
5	Identify workplace hazards, safety considerations and roles and responsibilities of workers, supervisors and managers.

Question paper pattern:
The question paper will have ten full questions carrying equal marks. Each full question will be for 20 marks. There will be two full questions (with a maximum of four sub - questions) from each unit. Each full question will have sub - question covering all the topics under a unit. The students will have to answer five full questions, selecting one full question from each unit.

Text Books:	
1	Goetsch D. L., (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall.
2	Heinrich H.W., (2007), "Industrial Accident Prevention- A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991).
3	Industrial Safety and Pollution Control Handbook.

Reference Books:	
1	Colling D.A., (1990), "Industrial Safety Management and Technology", Prentice Hall, New Delhi.
2	Della D.E., and Giustina, (1996), "Safety and Environmental Management", Van Nostr and Reinhold International Thomson Publishing Inc.

Additional Books:	
1	Industrial safety, health and environmental management. R K Jain, Sunil S Rao, Khanna Publications.
2	Safety, occupational health and environmental management in construction. S E Sharma, Vineeth Kumar, Khanna Publications.
3	Labour laws, Commercial law publishers India Pvt Ltd.
4	The occupational Safety, health & working conditions code. Commercial law publishers 2020.
5	Occupational health and safety management - A practical approach by Charles-De-Reese.
6	Occupational ergonomics, theory and applications by Amith Battacharya & James D Mc Glotthin.
7	Occupational Safety and health law handbook. Mc Dermott will & Enercy LLP.
8	Occupational health and safety management. Lambert Academic Publishing.
9	Fundamentals of Industrial Ergonomics - Babur Musthaffa (Google books).
10	Global occupational safety health and management handbook. Thomas Fuller, CAC press.
11	Introduction to Industrial Ergonomics.
12	Ergonomics and practical manual for beginners. Manjith Kaur Chauhan.

Sub Title : Project Work Phase II		
Sub Code : 18IMP81	**No. of Credits: 10= 0: 0: 2 (L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration : 3 hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 32**

Sl. No.	**Syllabus**
1	Phase– 02: 10 Credits in VII Semester.
2	Student shall complete the project work well in time and shall be assessed by the guide and the departmental Project Review Committee for 50 marks (CIE). Later project viva-voce shall be conducted by the exam section and both internal and external examiners for 50 marks do evaluation.

Sub Title : Technical Seminar		
Sub Code : 18IMS82	**No. of Credits: 2= 0 : 0 : 2(L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration: 3 hr.	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 32**

Objective:

3. To equip students for making a subject presentation based on a thorough research review on any contemporary area of engineering and management fields.
4. Offering the student an opportunity to interact with faculty and peer group and to build the ability to making independent presentation.

Sl. No.	Syllabus
1	**Procedure:** 3. A list of contemporary topics will be offered by the faculty of the department in the interlude period between 7th and 8th Semester. 4. Students can opt for topic of their own choice and indicate their option to the department at the beginning of the 8th semester. This component is also evaluated twice in the semester. The final marks shall be submitted to the exam section at the end of the semester.

Cos	Mapping with POs
CO1	PO2,PO8,PO12
CO2	PO3,PO5,PO11
CO3	PO2,PO8,PO12
CO4	PO3,PO5,PO11
CO5	PO2,PO8,PO11,PO12

Sub Title : Internship		
Sub Code : 18IMI83	**No. of Credits: 2= 0 : 0 : 2(L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration: 3 hr.	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 32**

Sl. No.	Syllabus
1	**Internship:** All the students admitted to III year of BE shall undergo mandatory internship program fora duration for 4 weeks either during the vacation period of IV& V semester or during VI and VII. A SEE examination will be conducted during VIII semester and prescribed credits shall be added to VIII semester. Students who do not take-up/complete the internship will be declared as failed and have to complete during subsequent SEE examination after satisfying the internship requirements.