

**ANNA UNIVERSITY, CHENNAI**  
**AFFILIATED INSTITUTIONS**  
**B.TECH. TEXTILE TECHNOLOGY**  
**REGULATIONS 2017**  
**CHOICE BASED CREDIT SYSTEM**  
**OPEN ELECTIVES (Offered by other Branches)**

**OPEN ELECTIVES I, SEMESTER V**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	OCE551	Air Pollution and Control Engineering	OE	3	3	0	0	3
2.	OME551	Energy Conservation and Management	OE	3	3	0	0	3
3.	OCY553	Industrial Chemistry	OE	3	3	0	0	3
4.	OMF551	Product Design and Development	OE	3	3	0	0	3
5.	ORO551	Renewable Energy Sources	OE	3	3	0	0	3
6.	OME552	Vibration and Noise Control	OE	3	3	0	0	3
7.	OIM551	World Class Manufacturing	OE	3	3	0	0	3

**OPEN ELECTIVES II, SEMESTER VII**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	OBM751	Basics of Human Anatomy and Physiology	OE	3	0	0	0	3
2.	OME751	Design of Experiments	OE	3	3	0	0	3
3.	OML752	Electronics Materials	OE	3	3	0	0	3
4.	OCE751	Environmental and Social Impact Assessment	OE	3	3	0	0	3
5.	OEN751	Green Building Design	OE	3	3	0	0	3
6.	OME754	Industrial Safety	OE	3	3	0	0	3
7.	OMF751	Lean Six Sigma	OE	3	3	0	0	3
8.	OAN751	Low Cost Automation	OE	3	3	0	0	3
9.	OCS752	Introduction to C Programming	OE	3	3	0	0	3

**OBJECTIVE:**

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

**UNIT I INTRODUCTION****7**

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

**UNIT II METEOROLOGY****6**

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

**UNIT III CONTROL OF PARTICULATE CONTAMINANTS****11**

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

**UNIT IV CONTROL OF GASEOUS CONTAMINANTS****11**

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

**UNIT V INDOOR AIR QUALITY MANAGEMENT****10**

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

**TOTAL: 45 PERIODS****OUTCOMES:**

The students completing the course will have

- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

**TEXTBOOKS:**

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

**REFERENCES:**

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.

2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution",Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, "Environmental Pollution Control Engineering",New Age International(P) Limited Publishers,2006.

**OME551**

**ENERGY CONSERVATION AND MANAGEMENT**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

At the end of the course, the student is expected to

- understand and analyse the energy data of industries
- carryout energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings and
- utilise the available resources in optimal ways

**UNIT I INTRODUCTION**

**9**

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

**UNIT II ELECTRICAL SYSTEMS**

**9**

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

**UNIT III THERMAL SYSTEMS**

**9**

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

**UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES**

**9**

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

**UNIT V ECONOMICS**

**9**

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the students can able to analyse the energy data of industries.

- Can carryout energy accounting and balancing
- Can suggest methodologies for energy savings

**TEXT BOOKS:**

1. Energy Manager Training Manual (4 Volumes) available at [www.energymanagertraining.com](http://www.energymanagertraining.com),a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

**REFERENCES:**

1. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.

3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982
4. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982.
5. Murphy. W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987.

**OCY553**

**INDUSTRIAL CHEMISTRY**

**L T P C**  
**3 0 0 3**

**OBJECTIVES**

- Elaborate study of fuels-introduction – classification, preparation, properties - alternate fuels.
- To get introduced to high polymers such as rubber and plastics and to industrial importance of cementing materials.
- To get introduction on the chemistry of various industrial processes such as sugar and leather processing.

**UNIT I INORGANIC CEMENTING MATERIALS**

**9**

Introduction - Lime and its manufacture - Gypsum plaster - cement - types of cement, chemical composition-manufacture of Portland cement - chemical composition of Portland cement - setting and hardening of Portland cement. Heat of hydration of cement - special cement - concrete and RCC - decay of concrete-glass and ceramics - Introduction - manufacture of glass - varieties of glasses- plasticity of clay - white wares, glazing- applications - Earthenware's and stoneware's - optical fibers.

**UNIT II FUELS AND COMBUSTION**

**9**

Introduction - classification of fuels - calorific value - gross calorific value and net calorific value - characteristics of a good fuel. theoretical calculation of calorific value of a fuel - solid fuels – wood-coal - classification of coal by rank - selection of coal - analysis of coal and its significance -types of coking - types of carbonization of coal - role of sulphur in coal - role of ash in coal. Gaseous fuels - producer gas - water gas - natural gas - oil gas - biogas - components - composition-preparation - advantages- disadvantages and applications of coal gas.

**UNIT III RUBBER AND PLASTICS**

**9**

Introduction to rubber - latex - processing latex - mastication - compounding of rubber - vulcanizations of rubber - engineering polymers thermoforming - degradation stability and environment- synthetic rubbers - preparation and applications of SBR - butyl rubber - nitrile rubber - neoprene and silicone rubber- plastic materials - classification of plastics (or resins) - moulding constituents of a plastic - fabrication techniques used for thermoplastic resin (moulding process)-important thermoplastic resins- natural resins - celluloses - polyethylene – PVC.

**UNIT IV PAINTS, PIGMENTS AND INSULATING MATERIALS**

**9**

Paints - ingredients and their functions required properties of a paint - paint constituents and their functions - manufacture of paint- types of pigments - characteristics of pigment - oils - uses in paint - emulsion paints - special paints - paint remover. varnishes - lacquers – enamels-electrical insulating materials - dielectric properties - requirements of an electrical insulating material - classification of insulating material - electrical rigid insulations.

**UNIT V SUGAR AND LEATHER CHEMISTRY**

**9**

Sugar Chemistry - introduction - manufacture of cane sugar - recovery of sugar from molasses - preparation of celotex - manufacture of sucrose from beat root - testing and estimation of sugar-leather chemistry - introduction - manufacture of leather preparation of hides for tanning - vegetable, chrome and oil tanning - byproduct.

**TOTAL: 45 PERIODS**

**OUTCOMES**

- Will have knowledge about adsorption and oxidation process.
- Will gain idea about various methods available for water treatment.
- Will appreciate the necessity of water and acquire knowledge of preliminary treatment.

**TEXTBOOKS:**

1. B.K. Sharma, "Industrial chemistry, Krishna Prakashan Media (p) Ltd", 2011.
2. K. Bagavathi, "Sundari Applied Chemistry", 1<sup>st</sup> Ed., MJP Publishers, , 2006.
3. Jayashree Ghosh, "Fundamental Concept of Applied Chemistry", S. Chand & Company Ltd., 2006.

**REFERENCES:**

1. A. Heaton, "An Introduction to Industrial Chemistry. 3<sup>rd</sup> Ed., Chapman and Hall, New York, 1996.
2. H.L. White, "Introduction to Industrial Chemistry", 1<sup>st</sup> Ed., John Wiley, 2015.

**OMF551**

**PRODUCT DESIGN AND DEVELOPMENT**

**L T P C**

**3 0 0 3**

**OBJECTIVE:**

- The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

**UNIT I INTRODUCTION**

**9**

Need for IPPD – Strategic importance of Product development – integration of customer, designer, material supplier and process planner, Competitor and customer – Behaviour analysis. Understanding customer – prompting customer understanding – involve customer in development and managing requirements – Organization – process management and improvement – Plan and establish product specifications.

**UNIT II CONCEPT GENERATION AND SELECTION**

**9**

Task – Structured approaches – clarification – search – externally and internally – explore systematically – reflect on the solutions and processes – concept selection – methodology – benefits.

**UNIT III PRODUCT ARCHITECTURE**

**9**

Implications – Product change – variety – component standardization – product performance – manufacturability – product development management – establishing the architecture – creation – clustering – geometric layout development – fundamental and incidental interactions – related system level design issues – secondary systems – architecture of the chunks – creating detailed interface specifications.

**UNIT IV INDUSTRIAL DESIGN**

**9**

Integrate process design – Managing costs – Robust design – Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically – Need for industrial design – impact – design process – investigation of for industrial design – impact – design process – investigation of customer needs – conceptualization – refinement – management of the industrial design process – technology driven products – user – driven products – assessing the quality of industrial design.



**UNIT IV WIND ENERGY****10**

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

**UNIT V GEOTHERMAL ENERGY:****9**

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

**TOTAL : 45 PERIODS****OUTCOMES:**

- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.
- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
- Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.

**TEXT BOOKS:**

1. Rai G.D. , "Non-Conventional Energy Sources", Khanna Publishers, 2011
2. Twidell & Wier, "Renewable Energy Resources", CRC Press (Taylor & Francis), 2011

**REFERENCES:**

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007
2. Ramesh R & Kumar K.U , "Renewable Energy Technologies",Narosa Publishing House, 2004
3. Mittal K M , "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., "Renewable energy sources and emerging technologies", P.H.I, New Delhi, 2010

**OME552****VIBRATION AND NOISE CONTROL****L T P C****3 0 0 3****OBJECTIVES:**

The student will be able to understand

- Basic about the noise and its control methods
- the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components
- About the noise in the automotive sources
- Various control techniques in controlling noise and vibrations.
- Know about the source of noise

**UNIT I BASICS OF VIBRATION****9**

Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic





9. Balakumar Balachandran and Edward B. Magrab, "Fundamentals of Vibrations", 1st Edition, Cengage Learning, 2009
10. John Fenton, "Handbook of Automotive body Construction and Design Analysis – Professional Engineering Publishing, 1998

**OIM551**

**WORLD CLASS MANUFACTURING**

**L T P C**

**3 0 0 3**

**OBJECTIVES**

- Understanding of the concept and importance of strategy planning for manufacturing industries
- To apply principles and techniques in the identifiable formulation and implementation of manufacturing strategy for competitive in global context.

**UNIT I INDUSTRIAL DECLINE AND ASCENDANCY 9**

Manufacturing excellence - US Manufacturers - French Manufacturers - Japan decade – American decade - Global decade

**UNIT II BUILDING STRENGTH THROUGH CUSTOMER – FOCUSED PRINCIPLES 9**

Customer - Focused principles - General principles - Design - Operations - Human resources - Quality and Process improvement - Promotion and Marketing

**UNIT III VALUE AND VALUATION 9**

Product Costing - Motivation to improve - Value of the enterprises QUALITY - The Organization : Bulwark of stability and effectiveness - Employee stability – Quality Individuals Vs. Teams - Team stability and cohesiveness - Project cohesiveness and stability

**UNIT IV STRATEGIC LINKAGES 9**

Product decisions and customer service - Multi-company planning - Internal manufacturing planning - Soothing the demand turbulence

**UNIT V IMPEDIMENTS 9**

Bad plant design - Mismanagement of capacity - Production Lines - Assembly Lines – Whole Plant Associates - Facilitators - Teamship - Motivation and reward in the age of continuous Improvement

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Able to understand the concept and the importance of manufacturing strategy for industrial enterprise competitiveness.
- Apply appropriate techniques in the analysis and devaluation of company's opportunities for enhancing competitiveness in the local regional and global context.
- Identify formulation and implement strategies for manufacturing and therefore enterprise competitiveness.

**TEXT BOOKS:**

1. By Richard B. Chase, Nicholas J. Aquilano, F. Robert Jacobs – "Operations Management for Competitive Advantage", McGraw-Hill Irwin, ISBN 0072323159

2. Moore Ran, "Making Common Sense Common Practice: Models for Manufacturing Excellence", Elsevier Multiworth
3. Narayanan V. K., "Managing Technology & Innovation for Competitive Advantage", Pearson Education Inc.
4. Korgaonkar M. G., "Just In Time Manufacturing", MacMillan Publishers India Ltd.,
5. Sahay B. S., Saxena K. B. C., Ashish Kumar, "World Class Manufacturing", MacMillan Publishers

**OBM751**

**BASICS OF HUMAN ANATOMY AND PHYSIOLOGY**

**L T P C**

**3 0 0 3**

### **OBJECTIVES**

- To learn the basic components of formation of systems
- To identify all the organelles of an animal cell and their function.
- To understand structure and functions of the various types of systems of human body.
- To demonstrate their knowledge of importance of anatomical features and physiology of human systems

### **UNIT I INTRODUCTION**

**9**

Level of Organization – Metabolism and Homeostasis – Plan of Body – Body Parts and Areas, Planes and Sections. Elements in the Human Body – Inorganic Compounds and Organic Compounds

### **UNIT II BASIC STRUCTURE AND FUNCTION OF ANIMAL CELL**

**9**

Structure of Cell – Structure and Function of Cell Membrane and Sub organelles. Cellular Transport Mechanism – Cell Division – Mitosis and Meiosis

### **UNIT III TISSUES, MEMBRANE AND SKELETAL SYSTEM**

**9**

Epithelial tissue – Connective tissue – Muscle tissue – Nerve tissue – Membrane. Types of Bone tissue - Classification of Bones – Functions of the Skeleton system – Skull, Vertebral Column. Joint - Articulation

### **UNIT IV NERVOUS AND CARDIOVASCULAR SYSTEMS**

**10**

**Nervous system:** Types and Structure of Neuron – Mechanism of Nerve Impulse - Structure and Parts of Brain. **Sensory organ:** Eye and Ear. **Cardiovascular:** Composition of Blood and functions – Structure of Heart – Conduction system of Heart – Types of Blood vessel – Blood Pressure.

### **UNIT V DIGESTIVE AND URINARY SYSTEMS**

**8**

**Digestive:** Organs of Digestive system – Digestion and Absorption. **Urinary:** Structure of Kidney and Nephron – Mechanisms of Urine formation – Regulation of Blood pressure by Urinary System.

**TOTAL:45 PERIODS**

### **OUTCOMES**

#### **At end of the course**

- Students would be familiar with the requirements for formation of systems
- Students would be understand the basic structural and functional elements of human body
- Students would have knowledge on Skeletal and muscular systems
- Students would be able to comprehend circulatory and nervous systems and their components
- Students would study importance of digestive and urinary systems in Human body

### **TEXT BOOKS:**

1. Prabhjot Kaur. Text Book of Anatomy and Physiology. Lotus Publishers. 2014
2. Elaine.N. Marieb , “Essential of Human Anatomy and Physiology”, Eight Edition, Pearson Education, New Delhi 2007
3. Valerie C. Scanlon and Tina Sanders, “Essential of Human Anatomy and Physiology”, Fifth Edition, F.A. Davis Company, Philadelphia 2007

**REFERENCES:**

1. Frederic H. Martini, Judi L. Nath, Edwin F. Bartholomew, Fundamentals of Anatomy and Physiology. Tenth Edition, Pearson Publishers, 2014
2. William F.Ganong, “Review of Medical Physiology”, 22nd Edition, Mc Graw Hill, New Delhi. 2005
3. Eldra Pearl Solomon, “Introduction to Human Anatomy and Physiology”, Third Edition, W.B. Saunders Company, 2008
4. Guyton & Hall, “Medical Physiology”, 13<sup>th</sup> Edition, Elsevier Saunders, 2015.

<b>COURSE OUTCOMES</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
Students would be familiar with the requirements for formation of systems												
Students would be understand the basic structural and functional elements of human body												
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Students would be able to comprehend circulatory and nervous systems and their components												
Students would study importance of digestive and urinary systems in Human body												

**OME751**

**DESIGN OF EXPERIMENTS**

**L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To impart knowledge on various types of experimental designs conduct of experiments and data analysis techniques.

**UNIT I FUNDAMENTALS OF EXPERIMENTAL DESIGNS**

**9**

Hypothesis testing – single mean, two means, dependant/ correlated samples – confidence intervals, Experimentation – need, Conventional test strategies, Analysis of variance, F-test, terminology, basic principles of design, steps in experimentation – choice of sample size – Normal and half normal probability plot – simple linear and multiple linear regression, testing

using Analysis of variance.

**UNIT II SINGLE FACTOR EXPERIMENTS 9**

Completely Randomized Design- effect of coding the observations- model adequacy checking- estimation of model parameters, residuals analysis- treatment comparison methods-Duncan's multiple range test, Newman-Keuel's test, Fisher's LSD test, Tukey's test- testing using contrasts- Randomized Block Design – Latin Square Design- Graeco Latin Square Design – Applications.

**UNIT III FACTORIAL DESIGNS 9**

Main and Interaction effects - Two and three factor full factorial designs- Fixed effects and random effects model - Rule for sum of squares and Expected Mean Squares-  $2^k$  Design with two and three factors- Yate's Algorithm- fitting regression model- Randomized Block Factorial Design - Practical applications.

**UNIT IV SPECIAL EXPERIMENTAL DESIGN 9**

Blocking and Confounding in  $2^k$  Designs- blocking in replicated design-  $2^k$  Factorial Design in two blocks- Complete and partial confounding- Confounding  $2^k$  Design in four blocks- Two level Fractional Factorial Designs- one-half fraction of  $2^k$  Design, design resolution, Construction of one-half fraction with highest design resolution, one-quarter fraction of  $2^k$  Design

**UNIT V TAGUCHI METHODS 9**

Design of experiments using Orthogonal Arrays, Data analysis from Orthogonal experiments- Response Graph Method, ANOVA- attribute data analysis- Robust design- noise factors, Signal to noise ratios, Inner/outer OA design.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- Able to apply experimental techniques to practical problems to improve quality of processes / products by optimizing the process / product parameters.

**TEXT BOOK:**

1. Krishnaiah K, and Shahabudeen P, "Applied Design of Experiments and Taguchi Methods", PHI, India, 2011.

**REFERENCES:**

1. Douglas C. Montgomery, "Design and Analysis of Experiments", John Wiley & sons, 2005
2. Phillip J. Ross, "Taguchi Techniques for Quality Engineering", Tata McGraw-Hill, India, 2005.

**OML752**

**ELECTRONIC MATERIALS**

**L T P C**

**3 0 0 3**

**OBJECTIVE:**

- Understanding the various materials and its properties contribution towards electrical and electronics field. This course covers the properties of materials behind the electronic applications.

**UNIT I INTRODUCTION 7**

Structure: atomic structures and bonding, types of bonding, band formation. Defects and imperfections in solids: Point, Line and Planer defects; Interfacial defects and volume defects. Classification of materials based on bonding: conductors, semiconductors and insulators.



- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects

**UNIT I INTRODUCTION 9**

Impacts of Development on Environment – Rio Principles of Sustainable Development- Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework.

**UNIT II ENVIRONMENTAL ASSESSMENT 9**

Screening and Scoping in EIA – Drafting of Terms of Reference,Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

**UNIT III ENVIRONMENTAL MANAGEMENT PLAN 9**

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing-Environmental Clearance

**UNIT IV SOCIO ECONOMIC ASSESSMENT 9**

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis-

**UNIT V CASE STUDIES 9**

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems - Airports - Dams and Irrigation projects - Power plants.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

The students completing the course will have ability to

- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

**TEXTBOOKS:**

1. Canter, R.L, “Environmental impact Assessment “, 2nd Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, “Environmental Impact Assessment for Developing Countries in Asia”, Volume 1 – Overview, Asian Development Bank,1997.
3. Peter Morris, Riki Therivel “Methods of Environmental Impact Assessment”, Routledge Publishers,2009.

**REFERENCES:**

1. Becker H. A., Frank Vanclay,“The International handbook of social impact assessment” conceptual and methodological advances, Edward Elgar Publishing,2003.
2. Barry Sadler and Mary McCabe, “Environmental Impact Assessment Training Resource Manual”, United Nations Environment Programme,2002.



- To impart knowledge on safety engineering fundamentals and safety management practices.

**UNIT I INTRODUCTION 9**

Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

**UNIT II CHEMICAL HAZARDS 9**

Chemical exposure – Toxic materials – Ionizing Radiation and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

**UNIT III ENVIRONMENTAL CONTROL 9**

Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

**UNIT IV HAZARD ANALYSIS 9**

System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment

**UNIT V SAFETY REGULATIONS 9**

Explosions – Disaster management – catastrophe control, hazard control ,Safety education and training - Factories Act, Safety regulations Product safety – case studies.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

**TEXT BOOK:**

1. John V.Grimaldi, "Safety Management", AITB S Publishers, 2003.

**REFERENCES:**

1. Safety Manual, "EDEL Engineering Consultancy", 2000.
2. David L.Goetsch, "Occupational Safety and Health for Technologists", 5th Edition, Engineers and Managers, Pearson Education Ltd., 2005.

**OMF751**

**LEAN SIX SIGMA**

**L T P C  
3 0 0 3**

**OBJECTIVE:**

- To gain insights about the importance of lean manufacturing and six sigma practices.

**UNIT I LEAN & SIX SIGMA BACKGROUND AND FUNDAMENTALS 9**

Historical Overview – Definition of quality – What is six sigma -TQM and Six sigma - lean manufacturing and six sigma- six sigma and process tolerance – Six sigma and cultural changes – six sigma capability – six sigma need assessments - implications of quality levels, Cost of Poor Quality (COPQ), Cost of Doing Nothing – assessment questions



**UNIT II THE SCOPE OF TOOLS AND TECHNIQUES 9**

Tools for definition – IPO diagram, SIPOC diagram, Flow diagram, CTQ Tree, Project Charter – Tools for measurement – Check sheets, Histograms, Run Charts, Scatter Diagrams, Cause and effect diagram, Pareto charts, Control charts, Flow process charts, Process Capability Measurement, Tools for analysis – Process Mapping, Regression analysis, RU/CS analysis, SWOT, PESTLE, Five Whys, interrelationship diagram, overall equipment effectiveness, TRIZ innovative problem solving – Tools for improvement – Affinity diagram, Normal group technique, SMED, 5S, mistake proofing, Value stream Mapping, forced field analysis – Tools for control – Gantt chart, Activity network diagram, Radar chart, PDCA cycle, Milestone tracker diagram, Earned value management.

**UNIT III SIX SIGMA METHODOLOGIES 9**

Design For Six Sigma (DFSS), Design For Six Sigma Method - Failure Mode Effect Analysis (FMEA), FMEA process - Risk Priority Number (RPN)- Six Sigma and Leadership, committed leadership – Change Acceleration Process (CAP)- Developing communication plan – Stakeholder

**UNIT IV SIX SIGMA IMPLEMENTATION AND CHALLENGES 9**

Tools for implementation – Supplier Input Process Output Customer (SIPOC) – Quality Function Deployment or House of Quality (QFD) – alternative approach –implementation – leadership training, close communication system, project selection – project management and team – champion training – customer quality index – challenges – program failure, CPQ vs six sigma, structure the deployment of six sigma – cultural challenge – customer/internal metrics

**UNIT V EVALUATION AND CONTINUOUS IMPROVEMENT METHODS 9**

Evaluation strategy – the economics of six sigma quality, Return on six Sigma (ROSS), ROI, poor project estimates – continuous improvement – lean manufacturing – value, customer focus, Perfection, focus on waste, overproduction – waiting, inventory in process (IIP), processing waste, transportation, motion, making defective products, underutilizing people – Kaizen – 5S

**TOTAL: 45 PERIODS**

**OUTCOME:**

- The student would be able to relate the tools and techniques of lean sigma to increase productivity

**REFERENCES:**

1. Michael L.George, David Rowlands, Bill Kastle, What is Lean Six Sigma, McGraw – Hill 2003
2. Thomas Pyzdek, The Six Sigma Handbook, McGraw-Hill,2000
3. Fred Soleimannejed , Six Sigma, Basic Steps and Implementation, AuthorHouse, 2004
4. Forrest W. Breyfogle, III, James M. Cupello, Becki Meadows, Managing Six Sigma:A Practical Guide to Understanding, Assessing, and Implementing the Strategy That Yields Bottom-Line Success, John Wiley & Sons, 2000
5. James P. Womack, Daniel T.Jones, Lean Thinking, Free Press Business, 2003

**OAN751**

**LOW COST AUTOMATION**

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**OBJECTIVES**

- To give basic knowledge about automation
- To understand the basic hydraulics and pneumatics systems for automation
- To understand the assembly automation



- To develop applications in C using functions and structures

## **UNIT I INTRODUCTION 9**

Structure of C program – Basics: Data Types – Constants – Variables - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision-making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process – Exercise Programs: Check whether the required amount can be withdrawn based on the available amount – Menu-driven program to find the area of different shapes – Find the sum of even numbers

Text Book: Reema Thareja (Chapters 2,3)

## **UNIT II ARRAYS 9**

Introduction to Arrays – One dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Traversal, Insertion, Deletion, Searching - Two dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Read – Print – Sum – Transpose – Exercise Programs: Print the number of positive and negative values present in the array – Sort the numbers using bubble sort - Find whether the given matrix is diagonal or not.

Text Book: Reema Thareja (Chapters 5)

## **UNIT III STRINGS 9**

Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Indexing – Deletion – Replacement – Array of strings – Introduction to Pointers – Pointer operators – Pointer arithmetic - Exercise programs: To find the frequency of a character in a string - To find the number of vowels, consonants and white spaces in a given text - Sorting the names.

Text Book: Reema Thareja (Chapters 6 & 7)

## **UNIT IV FUNCTIONS 9**

Introduction to Functions – Types: User-defined and built-in functions - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions) – Recursive functions – Exercise programs: Calculate the total amount of power consumed by 'n' devices (passing an array to a function) – Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) – Replace the punctuations from a given sentence by the space character (passing an array to a function)

Text Book: Reema Thareja (Chapters 4)

## **UNIT V STRUCTURES 9**

Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Passing an entire structure – Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) – Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions)

Text Book: Reema Thareja (Chapters 8)

**TOTAL:45 PERIODS**

## **OUTCOMES**

**Upon completion of this course, the students will be able to**

- Develop simple applications using basic constructs

- Develop applications using arrays and strings
- Develop applications using functions and structures

**TEXT BOOK**

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016

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2. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication
3. Juneja, B. L and Anita Seth, "Programming in C", CENGAGE Learning India pvt. Ltd., 2011
4. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009