OPEN ELECTIVES (Offered by other Branches)

### OPEN ELECTIVE I, SEMESTER V

<table>
<thead>
<tr>
<th>S. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATE</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>OIC551</td>
<td>Biomedical Instrumentation</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>OMD553</td>
<td>Telehealth Technology</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>OMF551</td>
<td>Product Design and Development</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>OME551</td>
<td>Energy Conservation and Management</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>OMD552</td>
<td>Hospital Waste Management</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>OIC501</td>
<td>Basic Control Theory</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>OEC551</td>
<td>Control System Engineering</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### OPEN ELECTIVE II, SEMESTER VII

<table>
<thead>
<tr>
<th>S. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATE</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>OME754</td>
<td>Industrial Safety</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>OCE751</td>
<td>Environmental and Social Impact Assessment</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>OME751</td>
<td>Design of Experiments</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>OBM752</td>
<td>Hospital Management</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>OMT701</td>
<td>Industrial Robotics</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>ORO751</td>
<td>Nano Computing</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>OML753</td>
<td>Selection of Materials</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

UNIT I  HUMAN BODY SUBSYSTEM AND TRANSDUCERS
Brief description of muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities. Principles and classification of transducers for Bio-medical applications. Electrode theory, different types of electrodes; Selection criteria for transducers and electrodes.

UNIT II  NON ELECTRICAL PARAMETERS MEASUREMENT

UNIT III  ELECTRICAL PARAMETERS MEASUREMENT AND ELECTRICAL SAFETY

UNIT IV  IMAGING MODALITIES AND BIO-TELEMETRY

UNIT V  LIFE ASSISTING AND THERAPEUTIC DEVICES

OUTCOMES:
- Ability to understand communication mechanics in a biomedical system.
- Ability to understand and analyze measurement of certain electrical and non-electrical parameters.
- Ability to understand basic principles of imaging techniques, life assisting and therapeutic devices.

TEXT BOOKS:
REFERENCES:

OMD553 TELEHEALTH TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the key principles for telemedicine and health.
- Understand telemedical technology.
- Know telemedical standards, mobile telemedicine and it applications

UNIT I TELEMEDICINE AND HEALTH 9
History and Evolution of telemedicine, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

UNIT II TELEMEDICAL TECHNOLOGY 9

UNIT III TELEMEDICAL STANDARDS 9

UNIT IV MOBILE TELEMEDICINE 9
Tele radiology: Image Acquisition system Display system, Tele pathology. Medical information storage and management for telemedicine- patient information, medical history, test reports, medical images, Hospital information system

UNIT V TELEMEDICAL APPLICATIONS 9

OUTCOMES:
At the end of the course, the student should be able to:
• Apply multimedia technologies in telemedicine.
• Explain Protocols behind encryption techniques for secure transmission of data.
• Apply telehealth in healthcare.

TEXT BOOK:

REFERENCES:

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

UNIT II CONCEPT GENERATION AND SELECTION 9

UNIT III PRODUCT ARCHITECTURE 9
system level design issues – secondary systems – architecture of the chunks – creating detailed interface specifications.

UNIT IV  INDUSTRIAL DESIGN  9

UNIT V  DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT  9

TOTAL: 45 PERIODS

OUTCOME:
- The student will be able to design some products for the given set of applications; also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

TEXT BOOK:

REFERENCES:

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

UNIT II ELECTRICAL SYSTEMS

UNIT III THERMAL SYSTEMS

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS
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:

REFERENCES:

OMD552 HOSPITAL WASTE MANAGEMENT

OBJECTIVES:
The student should be made to:
- Know about the healthcare hazard control and accidents
- Understand biomedical waste management
- Learn the facility guidelines, infection control and patient safety.
UNIT I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS 9

UNIT II BIOMEDICAL WASTE MANAGEMENT 9
Biomedical Waste Management: Types of wastes, major and minor sources of biomedical waste, Categories and classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labeling, waste handling and disposal.

UNIT III HAZARDOUS MATERIALS 9

UNIT IV FACILITY SAFETY 9

UNIT V INFECTION CONTROL, PREVENTION AND PATIENT SAFETY 9

TOTAL : 45 PERIODS

OUTCOMES:
- After successful completion of the course, the students will be able to know the concepts of healthcare waste management, its prevention and safety.

REFERENCES:
OBJECTIVES:

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.
- To introduce stability analysis
- To introduce state variable representation of physical systems

UNIT I SYSTEMS AND THEIR REPRESENTATION

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Block diagram reduction techniques.

UNIT II TIME RESPONSE


UNIT III FREQUENCY RESPONSE


UNIT IV STABILITY AND COMPENSATOR DESIGN

Characteristics equation – Routh Hurwitz criterion – controller design.

UNIT V STATE VARIABLE ANALYSIS


TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply control theory to engineering problems.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the state variable analysis.

UNIT I  SYSTEMS COMPONENTS AND THEIR REPRESENTATION
Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems-Synchros-Multivariable control system

UNIT II  TIME RESPONSE ANALYSIS
Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system-type number-PID control-Analytical design for PD,PI,PID control systems

UNIT III  FREQUENCY RESPONSE AND SYSTEM ANALYSIS
Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system- Bode Plot - Polar Plot- Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation

UNIT IV  CONCEPTS OF STABILITY ANALYSIS

UNIT V  CONTROL SYSTEM ANALYSIS USING STATE VARIABLE
METHODS

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.

TOTAL: 45 PERIODS

OUTCOMES: Upon completion of the course, the student should be able to:

- Identify the various control system components and their representations.
- Analyze the various time domain parameters.
- Analysis the various frequency response plots and its system.
- Apply the concepts of various system stability criterions.
- Design various transfer functions of digital control system using state variable models.

TEXT BOOK:


REFERENCES


OME754 INDUSTRIAL SAFETY

OBJECTIVES:

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

UNIT I INTRODUCTION

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

UNIT II CHEMICAL HAZARDS

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

UNIT III ENVIRONMENTAL CONTROL

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

UNIT IV HAZARD ANALYSIS

System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis
UNIT V  SAFETY REGULATIONS  

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:

REFERENCES:

OCE751 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT  L T P C  3 0 0 3

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

UNIT I  INTRODUCTION  9

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

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

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:

REFERENCES:

OME751 DESIGN OF EXPERIMENTS

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

UNIT I FUNDAMENTALS OF EXPERIMENTAL DESIGNS
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
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
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
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
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:

REFERENCES:

OBM752 HOSPITAL MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
- To understand the fundamentals of hospital administration and management.
- To know the market related research process
- To explore various information management systems and relative supportive services.
To learn the quality and safety aspects in hospital.

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning – Functional Planning

UNIT II HUMAN RESOURCE MANAGEMENT IN HOSPITAL

Principles of HRM – Functions of HRM – Profile of HRD Manager – Human Resource Inventory – Manpower Planning.

UNIT III RECRUITMENT AND TRAINING

Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV SUPPORTIVE SERVICES

Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services.

UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL


TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the principles of Hospital administration.
- Identify the importance of Human resource management.
- List various marketing research techniques.
- Identify Information management systems and its uses.
- Understand safety procedures followed in hospitals

TEXT BOOKS:


REFERENCES:

OMT701 INDUSTRIAL ROBOTICS L T P C
3 0 0 3

OBJECTIVE:
- To introduce the basic concepts, laws, parts of robots, end effectors, sensors, programming methods, various applications of robots, justification and implementation of robot.

UNIT I INTRODUCTION 9

UNIT II ROBOT END EFFECTORS 9

UNIT III SENSORS 9

UNIT IV ROBOT PROGRAMMING 9
Robot Languages- Classification of robot language-Computer control and robot software-Val system and Languages.

UNIT V FIELD APPLICATIONS OF ROBOTICS 9
Material transfer, Machine loading, Assembly, inspection, processing operations and service robots, Delivery Robots – Intelligent vehicles – Survey and inspection robots – Space Robots – Autonomous aircrafts – Underwater Inspection – Agriculture and Forestry – Military robots

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
CO1: Express the basic concepts, laws, components and parameters of robots
CO2: Explain the types of grippers and its functions.
CO3: Summarize and determine various types of sensors involved in controlling the robots.
CO4: Describing the various programming techniques used in industrial robots
CO5: Use of robots in various field of applications

TEXT BOOKS:

REFERENCES:

ORO751 NANO COMPUTING L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn nano computing challenges
- Be familiar with the imperfections
- Be exposed to reliability evaluation strategies
- Learn nano scale quantum computing
- Understand Molecular Computing and Optimal Computing

UNIT I NANOComputing-Prospects and Challenges

UNIT II Nanocomputing with Imperfections

UNIT III Reliability of Nanocomputing

UNIT IV Nanoscale Quantum Computing

UNIT V QCADESIGNER SOFTWARE AND QCA IMPLEMENTATION

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the student should be able to:
- Discuss nano computing challenges.
- Handle the imperfections.
- Apply reliability evaluation strategies.
- Use nano scale quantum computing.
- Utilize Molecular Computing and Optimal Computing.

TEXT BOOK:

REFERENCES:
OBJECTIVES:

- The subject exposes students to the basics parameter for selection of materials and different classes of materials, manufacturing processes and their properties, applications of materials.

UNIT I  ENGINEERING MATERIALS


UNIT II  MATERIAL PROPERTIES


UNIT III  MANUFACTURING PROCESSING AND ECONOMIC ANALYSIS


UNIT IV  MATERIALS SELECTION CHARTS AND TESTING


UNIT V  APPLICATIONS AND USES


TOTAL: 45 PERIODS

OUTCOMES:

- Understand different types of availability materials
- Easy and effective way to select required materials
- Ability to identify the material properties

TEXT BOOKS:


REFERENCES: