## PROPOSED SCHEME OF TEACHING AND EXAMINATION

### B.E. VIII SEMESTER MECHATRONICS ENGINEERING

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Board of Study</th>
<th>Sub. Code</th>
<th>SUBJECT</th>
<th>PERIODS PER WEEK</th>
<th>SCHEME OF EXAM</th>
<th>TOTAL MARKS</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1</td>
<td>Mechatronics</td>
<td>367831(67)</td>
<td>367831(67)</td>
<td>Automated Manufacturing II</td>
<td>4 1 -</td>
<td>80 20 20</td>
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<td>2</td>
<td>Mechatronics</td>
<td>367832(67)</td>
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<td>Process Control</td>
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<td>Refer Table 3</td>
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<td>80 20 20</td>
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<td>Refer Table 4</td>
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<td>6</td>
<td>Mechatronics</td>
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<td>Flexible Manufacturing System Lab</td>
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<td>7</td>
<td>Mechatronics</td>
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<td>Mechatronics Systems Design Lab</td>
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<td>Major Project</td>
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<td>Report Writing and Seminar</td>
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<td>Total</td>
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</table>

**L-** Lecture **T-** Tutorial, **P-** Practical, **ESE-** End Semester Exam  
**CT-** Class Test, **TA-** Teacher's Assessment

**Note (1):** Duration of all theory papers will be of Three Hours.

### Table – III

#### Professional Elective - III

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Board of Studies</th>
<th>Code</th>
<th>Name of Subject</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Mechatronics</td>
<td>367841(67)</td>
<td>Production and Product Management</td>
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<tr>
<td>3</td>
<td>Mech. Engg.</td>
<td>337844(37)</td>
<td>Computational Fluid Dynamics</td>
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<td>4</td>
<td>Mechatronics</td>
<td>367843(67)</td>
<td>Micro Electro – Mechanical Systems</td>
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<td>5</td>
<td>Mechatronics</td>
<td>367845(67)</td>
<td>Neural Network &amp; Fuzzy Systems</td>
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<td>Mechatronics</td>
<td>367846(67)</td>
<td>Medical Electronics</td>
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<td>367847(67)</td>
<td>Virtual Instrumentation</td>
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<td>8</td>
<td>Mechatronics</td>
<td>367848(67)</td>
<td>Computer Organization and Software Engineering</td>
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</table>

**Note :** 1/4th of total strength of students subject to Minimum Strength of twenty students is required to offer an elective in the college in a particular academic session.

**Note :** Choice of elective course once made for an examination cannot be changed for future examinations.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Board of Studies</th>
<th>Code</th>
<th>Name of Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Management</td>
<td>300851(76)</td>
<td>Enterprise Resource Planning <em>(Except CSE &amp; IT Branch)</em></td>
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<tr>
<td>2</td>
<td>Information Technology</td>
<td>300852(33)</td>
<td>E-Commerce &amp; strategic IT <em>(Except CSE &amp; IT Branch)</em></td>
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<td>3</td>
<td>Management</td>
<td>300853(76)</td>
<td>Technology Management</td>
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<td>4</td>
<td>Information Technology</td>
<td>300854(33)</td>
<td>Decision Support &amp; Executive Information system</td>
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<tr>
<td>5</td>
<td>Computer Science &amp; Engg.</td>
<td>300855(22)</td>
<td>Software Technology</td>
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<tr>
<td>6</td>
<td>Management</td>
<td>300856(76)</td>
<td>Knowledge Entrepreneurship</td>
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<td>7</td>
<td>Management</td>
<td>300857(76)</td>
<td>Finance Management</td>
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<tr>
<td>8</td>
<td>Management</td>
<td>300858(76)</td>
<td>Project Planning, Management &amp; Evaluation</td>
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<tr>
<td>9</td>
<td>Mechanical Engg.</td>
<td>300859(37)</td>
<td>Safety Engineering</td>
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<td>10</td>
<td>Computer Science &amp; Engg.</td>
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<td>Bio Informatics</td>
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<tr>
<td>11</td>
<td>Mechanical Engg.</td>
<td>300862(37)</td>
<td>Energy Conservation &amp; Management</td>
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<td>12</td>
<td>Nanotechnology</td>
<td>300863(47)</td>
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<tr>
<td>13</td>
<td>Management</td>
<td>300864(76)</td>
<td>Intellectual Property Rights</td>
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<td>14</td>
<td>Mechanical Engg.</td>
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<td>Value Engineering</td>
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<td>15</td>
<td>Civil Engg.</td>
<td>300866(20)</td>
<td>Disaster Management</td>
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<tr>
<td>16</td>
<td>Civil Engg.</td>
<td>300867(20)</td>
<td>Construction Management</td>
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<tr>
<td>17</td>
<td>Civil Engg.</td>
<td>300868(20)</td>
<td>Ecology and Sustainable Development</td>
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<td>18</td>
<td>Chem. Engg.</td>
<td>300869(19)</td>
<td>Non Conventional Energy Sources</td>
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<tr>
<td>20</td>
<td>Mechanical Engg.</td>
<td>300871(37)</td>
<td>Managing Innovation &amp; Entrepreneurship</td>
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<tr>
<td>21</td>
<td>Information Technology</td>
<td>300872(33)</td>
<td>Biometrics</td>
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<tr>
<td>22</td>
<td>Information Technology</td>
<td>300873(33)</td>
<td>Information Theory &amp; Coding</td>
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<tr>
<td>23</td>
<td>Computer Science &amp; Engg.</td>
<td>300874(22)</td>
<td>Supply Chain Management</td>
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<tr>
<td>24</td>
<td>Computer Science &amp; Engg.</td>
<td>300875(22)</td>
<td>Internet &amp; Web Technology</td>
</tr>
<tr>
<td>25</td>
<td>Electrical Engg.</td>
<td>300876(24)</td>
<td>Electrical Estimation and Costing</td>
</tr>
<tr>
<td>26</td>
<td>Electrical &amp; Electronics Engg.</td>
<td>300877(25)</td>
<td>Non Conventional Energy Sources</td>
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<tr>
<td>27</td>
<td>Computer Science &amp; Engg.</td>
<td>300878(22)</td>
<td>Big Data and Hadoop</td>
</tr>
</tbody>
</table>

Note (1) 1/4th of total strength of students is required to offer an elective in the college in a particular academic session.
(2) - Choice of elective course once made for an examination cannot be changed.
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)

Name of the Program: Bachelor of Engineering
Branch: Mechatronics Engineering
Subject: Automated Manufacturing II
Semester: VIII
Code: 367831(67)

Total Theory Periods: 40
Class Tests: Two (Minimum)
ESE Duration: Three Hours

Total Tutorial Periods: 10
Assignments: Two (Minimum)
Maximum Marks: 80
Minimum Marks: 28

Course Objective:
- To introduce the concept of CIM
- To give knowledge about the Numerical Control Systems
- To understand Group Technology
- To study about flexible manufacturing systems

UNIT I

UNIT II
Numerical Controls, types, evolution of controllers, components of NC/CNC system, specification of CNC system. Classification of NC/CNC machines, transducers used, salient features, Tape, Tape codes and tape readers used in NC machines, constructional details of CNC machines, axis designation, NC/CNC tooling. Programmable Logic Controllers (PLCs) Automated Programmed Tools language – its types of statement, command and programming.

UNIT III
GROUP TECHNOLOGY: introduction, part families, part classification and coding, production flow analysis, machining cells, benefits of group technology, application considerations in Group Technology

UNIT IV

UNIT V
CIM ADVANCES: Role of management in CIM, Expert system & participate management, impact of CIM on personnel, Role of manufacturing engineers, CIM Wheel.
COMPUTER AIDED PRODUCTION MANAGEMENT: Introduction, PPC fundamentals, Problems with traditional PPC, use of computer in PPC - CAPP, MRPI, MRPII, CAGC.

TEXT BOOK
1. Automation, Production Systems and Computer Integrated Manufacturing by Groover, Pearson Education
2. Computer Aided Manufacturing by Tien Chien Chang, Pearson Education

REFERENCE BOOKS
1. CNC Programming- Dr.S.K.Sinha, Golgotaia Publications

Course Outcomes:
- The students will know about the concepts and scope of CIM
- The students will know about the NC/CNC systems
- They will understand the concept of Group Technology
- The students will understand Flexible Manufacturing Systems
- They will understand Computer Aided Production Management
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)

Name of the Program: Bachelor of Engineering
Branch: Mechatronics Engineering
Subject: Process Control
Semester: VIII
Code: 367832(67)
Total Theory Periods: 40
Class Tests: Two (Minimum)
ESE Duration: Three Hours
Total Tutorial Periods: 10
Assignments: Two (Minimum)
Maximum Marks: 80
Minimum Marks: 28

Course Objectives
- To develop and apply mathematics & engineering skills to identify, formulate, and solve industrial process problems
- This subject seeks to close the gap between Instrumentation & Mechanical Engineering.
- The subject provides the knowledge of different types of controller & their application in plant such as oil & refinery.

Unit I: Process Dynamics

Unit II: Basic Control Actions
Process Characteristics: process equation, process load, process lag, error, variable range, cycling, dead time, Discontinuous controller modes – Two position mode, Multi-position Mode, Floating control Mode, Continuous Controller mode – Proportional, Integral and Derivative modes, composite control modes - PI, PD and PID control modes.

Unit III: Control Scheme & Controller Tunings
Feed Forward control, Cascade control, Ratio control, Adaptive control, Multivariable control, split range control, Inferential control, Batch and continuous process. Process – Loop Tuning: Open loop transient response method, Ziegler Nichols method, Frequency response method

Unit IV: Final Control Elements
I/P & P/I Convertor, Electric, Pneumatic & Hydraulic actuator, valve positioner, Characteristics of control valve, Valve bodies: Sliding steam control valves, rotating shaft control valves, butterfly, diaphragm, ball valves, control valve sizing, Cavitation & flashing in control valves, Selection of control valve.

Unit V: Applications
Distillation column, control of top and bottom product compositions, reflux ratio, control of chemical reactor, control of heat exchangers, steam boiler, drum level control and combustion, drying, Filtration, humidification / dehumidification.

Text Books

Reference Books:
2. Process Control, Peter Harriot , TMH

Course Outcomes:
The students will be able to:
- Know the importance of on-off, proportional, integral and derivative modes, composite control modes - PI, PD and PID control modes.
- Understand different tuning methods like continuous cycling method, Ziegler - Nichol's tuning.
Name of the Program: Bachelor of Engineering  
Branch: Mechatronics Engineering  
Subject: Mechatronics Systems Design  
Semester: VIII  
Code : 367833(67)  
Total Theory Periods: 40  
Class Tests : Two(Minimum)  
ESE Duration :  Three Hours  
Total Tutorial Periods: 10  
Assignments : Two (Minimum)  
Maximum Marks: 80  
Minimum Marks:  28  

Course objectives:  
- To study various types of control and advance control mechanisms.  
- To understand the application of control actions based on AI concepts and Fuzzy Logic.  
- To study basics of virtual instrumentation.  
- To go through case study of related topics.  

UNIT 1 :  
INTRODUCTION  

MODELING AND SIMULATION OF PHYSICAL SYSTEMS  

UNIT 2 :  
SENSORS AND TRANSDUCERS  

UNIT 3 :  
ACTUATING DEVICES & CONTROLLERS  

SYSTEM CONTROL—LOGIC METHODS  
Binary Logic, Programmable Logic Controllers. Digital control systems.  

UNIT 4 :  
SIGNALS, SYSTEMS, AND CONTROLS  

SIGNAL CONDITIONING AND REAL TIME INTERFACING  

UNIT 5 :  
CASE STUDIES  
Comprehensive Case Studies.  
Rotary optical encoders, Design of a coin counter, design of a robotic machine, control of a CD player, Data Acquisition & Control case studies.  
Virtual Instrumentation, Artificial Intelligence, fuzzy logic & Computer Networks-based system design case studies.  

Text Books:  

Reference Books:  
1.Mechatronics, Dan Neculescu, Pearson Education  
Course outcomes:

- The students will receive the basic knowledge modern control system.
- They will study how basic control actions are defined and works
- They will study about various aspects of virtual instrumentation
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Name of the Program: Bachelor of Engineering  
Branch: Mechatronics Engineering  
Subject: Production and Product Management  
Semester: VIII  
Code: 367841(67)

Total Theory Periods: 40  
Total Tutorial Periods: 10  
Class Tests: Two(Minimum)  
Assignments: Two (Minimum)  
ESE Duration: Three Hours  
Maximum Marks: 80  
Minimum Marks: 28

Course Objectives:
- To introduce the concept of Organization, Production systems and Cost analysis
- To give knowledge about the Sales Forecasting Methods
- To understand Production Planning and Control and Material Handling
- To study about Materials Management and Quality Control

UNIT-I: Production Management
Definition, objectives, scope, benefits, functions of production management, place of production management in an organization, types of production system, Product life cycle, product design and development, production cycle.

Costing and Cost Analysis
Elements of costs, Break even analysis, Incremental costs, make or buy decision.

UNIT-II: Sales Forecasting
Purposes, methods – Delphi, linear regression, economic indicators, time-series analysis, adjustment for seasonal variations, moving average, exponential smoothing.

UNIT-III: Production Planning and Control
Functions, Organization, Master Scheduling, Aggregate planning and strategies, Materials requirement planning, product structure tree, Routing, Loading Scheduling – forward and backward, Dispatching – priority rules, Sequencing, Johnson’s algorithm for n jobs and two machines, Gantt’s chart, Bar chart, Flow process chart.

Materials Handling
Principles of materials handling, unit load, Types of materials handling equipment, Relation between materials handling and plant layout.

UNIT-IV: Material Management
Objectives and functions of materials management, Organization of materials management.

Procurement
Objectives of purchase deptt. purchase responsibilities and organization, types of purchasing, purchase procedures, Import and Export.

Stores Keeping
Stores management, functions of stores, classification of materials, standardization of materials, identification and maintenance of layout of stores, physical control of materials, pricing of stores, issuing of stores.

Inventory Control
Objective, scope and functions of inventory control, inventory control techniques, economic ordering quantity, periodic ordering quantity, A.B.C. analysis, General idea regarding inventory control under risk and uncertainty.

UNIT-V: Quality Control
Difference between inspection and quality control, acceptance sampling, procedure’s risk and consumer’s risk, operating characteristic curve for single sampling plan, AQL
Quality of conformance, quality of design, economics of quality, SQC charts for variables and attributes.
Introduction to JIT manufacturing, Kanban system.

TEXT BOOKS
2. Production and operation Management – By R. Mayer – TMH
3. Quality Planning and Analysis, Juran and Gryna

REFERENCE BOOKS
1. Industrial Engineering & Production Management – Martand Telsang – S. Chand & Co., 2004
3. Production planning and Control – By Samuel Eilon, Navneet Prakashan Ltd., Bombay

Course Outcomes:
- The students will know about the Organization, Production systems and Cost analysis
- The students will know about the methods of making sales forecasting
- They will understand the methods of material handling and materials management
- The students will be able to appreciate the methods of Quality Control
Course Objectives:

- To introduce the understanding of Material properties and the modern methods for its studies
- To give knowledge about Iron and steel, non-ferrous metals and alloys and Polymers
- To understand Ceramics and Composites

UNIT – I: Engineering Materials:


b) Modern methods for materials studies:
   - Optical Microscopy, Electron Microscopy, Chemical Analysis using atomic absorption spectroscopy, photo electron spectroscope, magnetic response, Moss Bayer spectroscopy, non destructive testing (NDT)

UNIT – II:

a) Iron & Steel

b) Non Ferrous metals and alloys
   - Copper – properties of copper, uses of copper
   - Copper alloys – properties and uses of brasses and bronzes
   - Aluminum – Aluminum castings, wrought Aluminum alloy, application of Aluminum and its alloys.
   - Magnesium – Application of Magnesium and its alloys
   - Titanium – Titanium and its alloys
   - Lead, Tin and Nickel
   - Heat treatment of non ferrous metal & alloys

UNIT – III: Polymers

The structure of polymers, thermoplastics, thermo setting plastics, additives in plastics, properties and application of thermo setting plastics, thermo setting plastics biodegradable plastics, elastomers (rubber)

UNIT – IV: Ceramics and Composites:

a) Ceramics: Ceramics and non ceramic phases, classification of ceramics, the structure of ceramics, properties and application of ceramics, glass, glass ceramics, graphite, diamond.

b) Composite: Introduction, particle reinforced composite, fiber reinforced composite, structural composite, other composites, their structure, properties and applications.

UNIT – V: Miscellaneous Materials

a) Dielectric Material: Basic concept, frequency and temperature dependencies, energy loss, requirement of insulating materials, insulating materials and their application.

b) Magnetic Materials: Ferro magnetic anisotropy, hard and soft magnetic materials, application of soft and hard magnetic materials.

c) Super Conductivity: Experimental results, theoretical approaches, flux quantization, electron tunneling, application of super conductivity.

d) Semiconductors: Energy band concept, Intrinsic and Extrinsic semiconductors, mechanism of current conductors, materials for semiconductors, application of semiconducting materials.

e) Materials for Nuclear and space applications.
TEXT BOOKS


REFERENCE BOOKS


Course Outcomes:

• The students will know about the Engineering Materials and the modern methods for the material study
• The students will understand the properties and uses of Iron and steel, non-ferrous metals and alloys and Polymers
• They will understand the properties of ceramic and composites and other materials for modern applications
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Name of the Program: Bachelor of Engineering
Branch: Mechatronics Engineering
Subject: Computational Fluid Dynamics
Semester: VIII
Code: 337844(37)
Total Theory Periods: 40
Total Tutorial Periods: 10
Class Tests: Two (Minimum)
Assignments: Two (Minimum)
ESE Duration: Three Hours
Maximum Marks: 80
Minimum Marks: 28

Course Objective:
- To introduce the student to widely used techniques in the numerical solution of fluid equations, issues that arise in the solution of such equations, and modern trends in CFD.
- To acquire core knowledge of the fundamentals of CFD for engineers, and an introduction to the methods and analysis techniques used in CFD.
- By studying a variety of flow situations students will develop a better intuition of fluid mechanics more quickly than is possible with traditional analytical approaches.
- Quantify and analyze the numerical error in CFD discretization schemes.
- Develop finite difference and finite volume forms of the CFD equations and important model systems
- Formulate explicit and implicit algorithms for solving the Navier-Stokes equations.
- Understand and apply verification strategies for evaluating CFD code.

UNIT I
Fundamental Concepts

UNIT II
Finite Element and Finite Difference Method
Overview of Finite Element and Finite difference Techniques in Computational Fluid Dynamics. Strong and Weak Formulations of a Boundary Value Problem.

UNIT III
Finite Volume Schemes

UNIT IV
Discretization
Boundary layer Equations and methods of solution -Implicit time dependent methods for inviscid and viscous compressible flows - Concept of numerical dissipation --Stability properties of explicit and implicit methods - Conservative up-wind discretization for Hyperbolic systems - Further advantages of upwind differencing.

UNIT V
Principles of Grid Generation

TEXT BOOKS
1. Introduction to computational fluid dynamics: the finite volume method - Versteeg, & Malalasekera - Addison-Wesley.
2. Introduction to Computational Fluid Dynamics – Niyog & Chakraborty – Pearson ,Singapore

REFERENCES

Contribution to Outcome:
- Develop an understanding for the major theories, approaches and methodologies used in CFD.
- Build up the skills in the actual implementation of CFD methods for mechanical engineering design, analysis and application.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Name of the Program: Bachelor of Engineering
Branch: Mechatronics Engineering
Subject: Micro Electro Mechanical Systems
Semester: VIII
Code: 367843(67)

Total Theory Periods: 40
Class Tests: Two (Minimum)
ESE Duration: Three Hours

Marks: Maximum Marks: 80
Minimum Marks: 28

Course Objectives:
- To introduce the concept of Microsystem Technology
- To give knowledge about the Micro-manufacturing techniques
- To understand micro and nano fluidics

UNIT I: INTRODUCTION TO MICROSYSTEMS
Overview of Microsystems technology, Multi disciplinary nature of MEMS. Survey of materials central to micro engineering. Applications of MEMS in various industries.

UNIT II: MICRO MANUFACTURING TECHNIQUES
Photolithography, Film deposition, Etching processes, Bulk micro machining, silicon surface micro machining, LIGA process, Rapid micro product development.

UNIT III: MICRO SENSORS AND MICRO ACTUATORS

UNIT IV: INTRODUCTION TO MICRO AND NANO FLUIDICS

UNIT V: MICROSYSTEMS DESIGN AND PACKAGING
Design considerations, Mechanical Design, Process design, Realisation of MEMS components using intellisuite. Micro system packaging, Packing Technologies, Assembly of Microsystems, Reliability in MEMS.

TEXTBOOK:

REFERENCES:

Course Outcomes:
- The students will know about the micro-system technology and MEMS
- The students will get the knowledge of micro-manufacturing techniques
- They will be able to appreciate the micro and nano-fluidics
Name of the Program: Bachelor of Engineering
Branch: Mechatronics Engineering
Subject: Neural Network & Fuzzy Systems
Semester: VIII
Code: 367845(67)

Total Theory Periods: 40
Total Tutorial Periods: 10
Class Tests: Two (Minimum)
Assignments: Two (Minimum)

ESE Duration: Three Hours
Maximum Marks: 80
Minimum Marks: 28

Course objectives:
- To study various architectures of neural network
- To understand how neural networks are used for control
- To study what is fuzzy logic?
- To understand neuro-fuzzy logic control.

UNIT – I: Introduction and different architectures of neural networks:

UNIT – II: Neural network for controls

UNIT – III: Introduction to fuzzy logic.

UNIT – IV: Fuzzy logic control system
Fuzzy logic controller – fuzzification interface - knowledge base- decision making logic – Defuzzification interface – decision of fuzzy logic controller – case study.

UNIT – V: Neuro Fuzzy logic control

List of Text Books:

List of Reference Books:
2. Fundamentals of Neural Networks, Laurance Fausett, Prentice Hall
5. Fuzzy sets & Fuzzy logic, Klir G.J. & Yuan B.B., Prentice Hall of India

Course outcomes:
- The student will receive the basic knowledge neural network
- They will study how neural network is applied
- They will study about fuzzy logic and its application
Course objectives:

- Understanding man instrument system and related concepts
- Getting knowledge of cardiovascular system and electrocardiography.
- Getting knowledge of measurements of various Biological parameters
- To understand various issues related to patient care and monitoring

UNIT I:

UNIT II:

UNIT III:

UNIT IV:
Patient Care and Monitoring: The Elements of Intensive Care Monitoring, Pacemakers, Defibrillators, Electrical Safety of Medical Equipment.

UNIT V:

TEXT BOOKS:

REFERENCE BOOKS:
1. Electronics in Medicine and Biomedical Instrumentation – Nandini K. Jog, PHI
2. Biomedical Instrumentation – Dr. A. Arumugam, Anuradha Agencies, Chennai.
4. Introduction to Biomedical Engineering, Domach, Pearson Education

Course Outcomes:

- The students will know the advancement of Mechatronics in medical technology
- The students will come to know that how the knowledge is shared to a remote area for patient care through telemetry
- The student will get the knowledge of measurements with various biological parameters
OBJECTIVES

- To review background information required for studying virtual instrumentation.
- To study the basic building blocks of virtual instrumentation.
- To study the various techniques of interfacing of external instruments of PC.
- To study the various graphical programming environment in virtual instrumentation.
- To study a few applications in virtual instrumentation.

UNIT I REVIEW OF DIGITAL INSTRUMENTATION

Representation of analog signals in the digital domain – Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

UNIT II FUNDAMENTALS OF VIRTUAL INSTRUMENTATION


UNIT III CLUSTER OF INSTRUMENTS IN VI SYSTEM


UNIT IV GRAPHICAL PROGRAMMING ENVIRONMENT IN VI

Concepts of graphical programming – Lab-view software – Concept of VIs and sub VI - Display types – Digital – Analog – Chart – Oscilloscope types – Loops – Case and sequence structures - Types of data – Arrays – Formulae nodes –Local and global variables – String and file I/O.

UNIT V ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI


TEXT BOOKS

2. Understanding Serial Communications, Peter W. Goflon, Sybex International.

REFERENCE BOOKS


Note: To offer this elective, multi-user licensed copy of Lab-view software should be available.

Course outcomes:

- The students will come to know importance of VI in present scenario.
- They will also come to know about application of mathematical tools in Virtual Instrumentation.
Course Objectives

- To review background information for computer processor design
- To study the basic building blocks of control unit.
- To study the basic building blocks of arithmetic processor
- To study the various techniques of memory organisation in PC.
- To study the various S/W processes and S/W project management

Unit I Central Processor organization:
Bus organized computer, Memory address structure, Memory data register, program counter, Accumulator, Instruction register, Program counter, Accumulator, Instruction register, Instruction field, Micro operations, Register transfer languages, Instruction field, Decoding and execution, Instruction formats and addressing modes.

Unit II Control Unit And Arithmetic Processor Design
Control unit organization: Instruction sequencing, Instruction interpretation, Hardwired control, Micro-programmed control organization, Control memory, Address sequencing, Micro-instruction, Formats, Micro-program sequence, Microprogramming. Arithmetic processor design, Design of control unit and floating point arithmetic.

Unit III Input Output and Memory organization:
Programmed I/O, I/O, addressing, I/O instruction, Synchronization, I/O interfacing, Interrupt mechanism, DMA, RISC, CISC, Loosely Coupled & Tightly Coupled system.
Basic concepts and terminology, Memory hierarchy, Semiconductor memories (RAM, ROM), Multiple module, Memories and interleaving (Virtual memory, Cache memory, Associative memory), Memory management hardware requirements

Unit IV Software Process

Unit V Software Project Management

Name of Text Books:
1. Computer System Architecture by M. Morris Mano, PHI
2. Computer Organization Architecture by J.P. Hayes, PHI

Name of Reference Books:
1. Digital Computer Logic Design By M. Morris Mano, PHI
2. Structured Computer Organization by Andrew S. Tanenbaum PHI

Course Outcomes:
- The students will acquire the knowledge of computer organization and software project management
List of Experiments (Minimum ten experiments to be performed)

Only for Demo on one Machine FMS

FMS: Programming of ASRS and linear shuttle conveyor with CNC and loading and unloading arm and ASRS to be carried out on simple components
Robot Programming: Using teach pendant and offline programme to perform pick and place, stacking of objects - 2 programs

1. Knowledge on interfacing and automation techniques
2. Understanding the concepts of automation combined with advanced manufacturing
3. Understanding sequence planning, process planning, shop floor layout generation
4. Understanding Offline/Online sequence execution techniques
5. Understanding Data acquisition and process techniques
6. Understanding Monitoring and Virtual simulation generation for sequences
7. Understanding of Automated storage/retrieval systems
8. Understanding of Material Handling Facilities and Systems
9. Study of Bulk and Powdered Material Handling Technology
10. Study of Pneumatic, Hydraulic and Capsule Conveying
11. Understanding of Industrial Vehicles, AGVS
12. Understanding of Industrial Robots and Manipulators
13. Understanding of Control Techniques and Control Systems
14. Study of Material Flow and Facilities Layout
15. Study of Logistics and Supply Chains
16. Study of Distribution Centers and Automation in Warehousing
17. Study of Intermodal Transport Systems
18. Study of PLC Controlled Conveyor System

List of Equipments required:

1. One machine FMS
Name of Program: Bachelor of Engineering
Branch: Mechatronics Engineering
Subject: Mechatronics Systems Design Laboratory
Total Lab Periods: 24
Maximum Marks: 40

LIST OF EXPERIMENTS (Minimum Ten experiments to be performed)
1) Understanding of Mechanical linear translation system
2) Understanding of special purpose Actuators in pneumatics
3) Understanding of various types of sensors and their application areas
4) Understanding of basic construction and use various types of conveyor used in Automation
5) Study of Palletizing in conveyors system for high speed conveyerised production.
6) Simulation of hydraulic circuits.
7) Simulation of pneumatic circuits.
8) Design of circuits with logic sequence using Electro pneumatic trainer kits.
9) Simulation of basic Hydraulic, Pneumatic and Electric circuits
10) Design of Circuits with multiple cylinder sequences in Electro pneumatics
11) Speed Control of AC & DC motors
12) Servo motor interfacing using PLC
13) PID controller interfacing
14) Stepper motor interfacing with 8051 Micro controller(i) full step resolution (ii) half step resolution
15) Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LAB VIEW

List of Equipments required:
1) Fluid SIM 5.0 or related software
2) Software Labview
3) Hydraulic Trainer kit
4) Electro-pneumatic trainer kit
Experiments to be performed (Minimum Ten experiments to be performed)

1. To Design, implement and Simulate Fixed bias and self bias transistorized circuit for determining the bandwidth
2. To Design, implement and Simulate Fixed bias and self bias for studying the low frequency and high frequency effect.
3. To Design, implement and Simulate Miller integrator for determining the nonlinearities.
4. To Design, implement and simulate current Sweep generator for determining the nonlinearities.
5. To Design, implement and Simulate Inverting and non inverting amplifier for determining the bandwidth
6. To Design, implement and Simulate Integrator & differentiator for studying output responses for different inputs.
7. To Design, implement and Simulate zero crossing detector & comparator for studying output responses for different inputs.
8. To Design, implement and Simulate Series Voltage regulator.
9. To Design, implement and Simulate 1st & 2nd order LPF for determining the bandwidth and studying output responses for different inputs.
10. To Design, implement and Simulate 1st & 2nd order HPF for determining the bandwidth
11. To Design, implement and Simulate Half ware & Full ware rectifier way op-Amp for determining the bandwidth.
12. To Design, implement and Simulate Series and Shunt Clipper for studying output responses
13. To Design, implement and Simulate Clamping circuit for studying output responses for different inputs
14. To Design, implement and Simulate Clamping Circuit with op-Amp for studying output responses for different inputs.
15. To Design, implement and Simulate Instrumentation Amplifier using three op-Amp for determining the bandwidth
16. To Design, implement and Simulate Monostable & Astable using 555 timer
17. To Design, implement and Simulate R -2R ladder type Digital to analog converter
18. To Design, implement and Simulate Flash type Analog to digital

List of Equipments/Machine Required:
Desktop PCs, Simulation Software for Analog Circuits like MULTISIM, PSPICE etc.

Recommended Books:
1. Experiments and SPICE Simulations in Analog Electronics Laboratory, Maheswari & Anand, PHI
2. Manuals of MULTISIM
3. Manuals of PSPICE
CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VIII                  Branch: Common to All Branches (Except CSE & IT)
Subject: Enterprise Resource Planning            Code: 300851(76)
Total Theory Periods: 40           Total Tutorial Periods: 12
Total Marks in End Semester Exam: 80         Minimum number of CT to be conducted: 02

UNIT - I Overview of Business Functions:
Business function in an organization, material management, scheduling, shop floor control. Forecasting, accounting & finance, human resources, productivity management.

UNIT - II Typical Business Processes:
Core processes, product control, sales order processing, purchase, administrative process, human resource, finance support processes, marketing, strategic planning, research & development problems in traditional functional view. Need for integrated process view, information as a resource, motivation for ERP.

UNIT – III Evolution of Information System:
EDP (electronic data processing) system, management information systems (MIS), executive information systems, information needs of organization, ERP as an integrator of information needs at various levels, decision making involved at the above level.

UNIT – IV Erp Models /Functionality:
Sales order processing, MRP, scheduling, forecasting, maintenance, distribution, finance, features of each of the models description of data flows across module, overview of the supporting databases, technologies required for ERP.

UNIT – V Implementation Issues:
Pre Implementation issues, financial justification of ERP, evaluation of commercial software during implementation issues, reengineering of various business process, education & training, project management, post implementation issues, performance measurement.

Text Books
1. V.K. Garg & N.K. Venkatkrishnan : ERP, concepts & practices, PHI.
2. S. Sadagopan : MIS, PHI

Reference Books:
1. V. Rajaraman : Analysis & Design of Information Systems, PHI
2. K. M. Hussain & D. hussain ; Information systems, Analysis, Design & Implementation, TMH.
3. MONAK & BRADY : Conceptss in ERP, vikas pub. Thosmson
4. J. Kanter : Managing with information, PHI
CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VIII  
Branch: Common to All Branches (Except CSE & IT)  
Subject: E-Commerce and Strategic IT  
Code: 300852(33)  
Total Theory Periods: 50  
Total Tutorial Periods: NIL  
Total Marks in End Semester Exam: 80  
Minimum number of CT to be conducted: 02

Course Objective:
- To understand the business impact and potential of e-commerce
- To learn about the technologies required to make e-Commerce viable
- To learn e-commerce from an enterprise point of view
- To learn about the working of various electronic payment systems

UNIT – Introduction:

UNIT –II -Network Infrastructure:
LAN, Ethernet (IEEE standard 802.3) LAN , WAN , Internet, TCP/IP Reference Model, Domain Name Server , Internet Industry Structure.

UNIT –III: Electronic payment systems:
Types of electronic payment systems, digital token-based electronic payment systems, smart cards & electronic payment systems, credit card based electronic payment systems, risk and electronic payment systems, designing electronic payment systems.

UNIT –IV: Information Distribution and Messaging:
FTP,E-Mail, www server, HTTP, Web service implementation, Information publishing , Web Browsers, HTML, Common Gateway Interface

UNIT –V: Mobile & wireless computing fundamentals:
Mobile computing framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications, personal communication service.

Course outcome: After successful completion of the course, students
- Will be able to apply the skills necessary for large-scale web based e-commerce project development.
- Will be able to work on information distribution and messaging services in e-commerce application.
- Will be able to work on business applications of wireless and mobile technologies for e-commerce.

Text books:
1. Frontiers of E-commerce by Kalakota & Whinston, Addison Wesley.
2. E-business road map for success by Dr. Ravi Kalakota& Marcia Robinson, Addison Wesley.

Reference book:
1. Electronic Commerce by Bharat Bhasker, TMH.
Unit I
Technology: - Definitions, Types and Characteristics, Management of Technology (MOT), Technological Environment, Parameters of Technological Environment; Science & Technology in India.

[No of Periods: 8 + 2]

Unit II

[No of Periods: 8 + 2]

Unit III
Technology life cycle, Technology evolution and S-curves of Technology Evolution, Technology Diffusion, Dynamics of Diffusion, Mechanism of Diffusion.

[No of Periods: 8 + 2]

Unit IV
Technology strategies & Intelligence: Technology Strategy & types, Models for technology strategy formulation Definition of Technology Intelligence, Technology Audit, Process of Technology Intelligence: Technology Scanning, Monitoring, Forecasting and Assessment.

[No of Periods: 8 + 2]

Unit V
Acquisition and technology transfer. Other view of - GATT, Intellectual property rights (IPR)

[No of Periods: 8 + 2]

Texts Books:

Reference Books:
3. Pisek, Creativity, Innovation and Quality, PHI
Course Objective

1. To review and clarify the fundamental terms, concepts and theories associated with Decision Support Systems, computerized decision aids, expert systems, group support systems and executive information systems.

2. To examine examples and case studies documenting computer support for organizational decision making, and various planning, analysis and control tasks.

3. To discuss and develop skills in the analysis, design and implementation of computerized Decision Support Systems.

UNIT-I Decision Support System:
What is a DSS, Decision Making, Rational Decisions, Definitions of Rationality, Bounded Rationality and Muddling Through, The Nature of Managers, Appropriate Data Support, Information Processing Models, Group Decision Making?

UNIT-II Component OF DSS:

UNIT-III Intelligence and Decision Support Systems:

UNIT-IV Designing A DSS: Planning for DSS, Designing a Specific DSS, Interviewing Techniques, Other Techniques, Situational Analysis Design Approaches, Systems Built from Scratch, Using Technology to Form the Basis of the DSS, Evaluating a DSS Generator, Using a DSS Generator, The Design Team, DSS Design and Re-engineering Discussion.


Course outcomes:
On completion of this program student will:

1. Recognize the relationship between business information needs and decision making
2. Appraise the general nature and range of decision support systems
3. Appraise issues related to the development of DSS

Name Of Text Books:
Decision Support System By Vicki l Sauter
Management Information system-Gerald V. Post & David L. Anderson
CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VIII  Branch: Common to All Branches
Subject: Software Technology  Code: 300855(22)
Total Theory Periods: 50  Total Tutorial Periods: NIL
Total Marks in End Semester Exam: 80  Minimum number of CT to be conducted: 02

Course Objective

- The basic objective in offering this course is to be employed as a practicing engineer in fields such as design, research, development, testing, and manufacturing

UNIT-1 ASSEMBLY LANGUAGE PROGRAMMING

UNIT-2 LINKERS
Linking -Combining Object Modules, Pass I, Pass II; Library Linking; Position Independent Code(PIC); Shared Library Linking. LOADERS- Binary Image; Types of Loaders.

UNIT-3 MACROPROCESSORS
Macro in NASM- Local Labels in Macro Body, Nested Macros.; Design of Macroprocessors – Major Data Structures, Macroprocessing Technique, Simple macroprocessors without nesting, Nested calls & definitions

UNIT – 4 COMPILERS
Lexical Analysis; Syntax Analysis; Intermediate Code Generation; Target Code Generation;Optimizing Transformation

UNIT – 5 TEXT EDITORS
Design of a Text Editor ; Data Structures for Text Sequences; Text Document Design; Text view Design
DEBUGGER Features; Breakpoint mechanism; Hardware support; context of Debugger; Check pointing & reverse Execution

Outcomes: After successful completion of the course, student will be able to
1. an ability to apply knowledge of mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.

Textbooks
1. SYSTEM SOFTWARE by Santanu Chattopadhyay ; Prentice Hall of India
2. Software Engineering By Roger S Pressman ; Mc -Graw Hill

References
1. Foundations of Software Technology and Theoretical Computer Science, By V. (Venkatesh) Raman: Springer
2. Software Visualization by John Stasko; MIT press
3. Software Engineering By Rajib Mall : PHI
Unit – I
Introduction: Entrepreneurship in Knowledge economy, abundant & accessible information, implication, impact & consequence, knowledge based opportunities, aims, scope, and objectives.

Unit-II
Managing knowledge & intellectual capital:
Knowledge management, loss of knowledge, knowledge implementation, knowledge creation, property intellectual capital.

Unit-III
Contemporary information problems:
Information overload, winning & losing barrier to entry, emerging issues, customers, investors, myth of inevitable program.

Unit-IV
Creating enterprise cultures:
Working with employer, organizing for entrepreneurship, unity & diversity, ten essential freedoms, freedom of operation, effective issue monitoring, establish search criteria.

Unit-V
Becoming a knowledge entrepreneur:
Entrepreneur qualities, knowledge entrepreneur, challenge of launching new product, creating launch support tool, examples of best practice.

Text & Reference Books
Amrit Tiwana, The Knowledge Management tool kit, Pearson Education.
Lunlin Conlon, Knowledge Entrepreneur, Thomas Press.
Catherine L. Mann, Knowledge entrepreneurship, Oxford.
Heinke Robkern, Knowledge entrepreneurship..
Bonnie Montano, Knowledge Management, , IRM Press, London.
CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VIII  Branch: Common to All Branches
Subject: Financial Management  Code: 300857(76)
Total Theory Periods: 30  Total Tutorial Periods: 12
Total Marks in End Semester Exam: 80  Minimum number of CT to be conducted: 02

UNIT I
Financial Management—an overview: Introduction, finance and other disciplines, objectives and scope of financial management, role and responsibility of finance manager.  
[No of Periods: 8 + 2]

UNIT II
Working capital management—nature, need, importance and concept of working capital, trade off between profitability and risk, Determining finance mix.  
[No of Periods: 8 + 2]

UNIT III
Inventory management—Introduction, objectives, ordering cost, carrying cost, lead time, economic order quantity and safety stock, deterministic model.  
[No of Periods: 8 + 2]

UNIT IV
Management of cash—introduction motives for holding cash, objectives of cash management and technique/process of cash management.  
[No of Periods: 8 + 2]

UNIT V
Receivables management—introduction, objectives, credit terms, credit policies and collection policies.  
[No of Periods: 8 + 2]

Text books:
Basic financial management, M Y Khan and P K Jain. TMH
Financial Management, I M Paudey.

References books:
Financial management and policy, V K Bhalla. Anmol publications pvt. Ltd.
Financial management, Van Horne.
OBJECTIVES
Projects are non-recurring activities requiring a different set of skill for planning as compared to regular and operative activities. The course is aimed at developing the understanding of project activities and relevant skills.

COURSE CONTENTS

<table>
<thead>
<tr>
<th>UNIT I</th>
<th>Project Identification Analysis: Socio-economic Consideration in Project Formulation; Social Infrastructure Projects for Sustainable Development; Investment Opportunities; Project Screening and Presentation of Projects of Decision Making; Expansion of Capacity; Diversification</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT II</td>
<td>Market and Technical Analysis: Market and Demand Analysis – Market Survey, Demand Forecasting, Uncertainties in Demand Forecasting, Technical Analysis-Product Mix, Plant Capacity, Materials and Inputs, Machinery and Equipment.</td>
</tr>
<tr>
<td>UNIT III</td>
<td>Project Costing and Finance: Cost of project; Cost of production; Break even Analysis; Means of Financing Project; Tax Aspects in Project Finance; Role of Financial Institution in Project Finance.</td>
</tr>
<tr>
<td>UNIT IV</td>
<td>Project Appraisal: Time Value of Money; Project Appraisal Techniques – Playback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Benefit Cost Ratio; Social Cost Benefit Analysis; Effective Rate of Protection.</td>
</tr>
<tr>
<td>UNIT V</td>
<td>Risk Analysis: Measures of Risk; Sensitivity Analysis; Stimulation Analysis; Decision Tree Analysis.</td>
</tr>
<tr>
<td></td>
<td>Project Scheduling/Network Techniques in Project Management: CPM and PERT Analysis; Float times; Crashing of Activities; Contraction of Network for Cost Optimization, Updating; Cost Analysis of Resources Allocation. Basic knowledge of the leading softwares for Project Planning and Analysis.</td>
</tr>
</tbody>
</table>

The examination paper will include question from each unit. The list of cases / specific references including recent articles will be announced and discussed in the class.

TEXT BOOKS

SUGGESTED READINGS
Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**  
Branch: **Common to All Branches**  
Semester: **VIII**  
Subject: **Safety Engineering**  
Code: **300859(37)**  
Total Theory Periods: **40**  
Total Tutorial Periods: **10**  
Class Tests: **Two (Minimum)**  
Assignments: **Two (Minimum)**  
ESE Duration: **Three Hours**  
Maximum Marks: **80**  
Minimum Marks: **28**

**Course Objectives:**
- To know safety philosophy and principles of accident prevention
- To know the safety rules, regulations, standards and codes
- To achieve an understanding of principles of safety management.
- To learn about various functions and activities of safety department.
- To study various mechanical machines and their safety importance.

**UNIT – I**  
**Safety philosophy and principles of accident prevention**  
Introduction, accident, injury, unsafe act, unsafe condition, reportable accidents, need for safety, breakdown of accidents, hazardous industries. Theories & principle of accidents casualty, cost of accident, computation of cost, utility of cost data.  
Accident reporting & Investigation, Identification of the key facts, corrective actions, classification of facts.  
Regulation- American (OSHA) and Indian Regulation.

**UNIT – II**  
**Safety Management**  
Division of responsibility, location of Safety function, size of safety department, qualification, for safety specialist, safety committee – structure and functions.

**UNIT – III**  
**Safe working condition and their development**  
Standard Operating Procedure (SOP) for various mechanical equipments, incidental safety devices and methods, statutory of provisions related to safeguarding of Machinery and working condition.

**UNIT – IV**  
**Safety in Operation and Maintenance**  
Operational activities and hazards, starting and shut down procedures, safe operation of pumps, compressor, heaters, reactors, work permit system, entry into continued spaces.

**UNIT – V**  
**Safety in Storage and Emergency Planning**  
Safety in storage, handling of chemicals and gases, storage layout, ventilation, safety in chemical laboratories, emergency preparedness on site plan, off site plan, toxic hazard control.

**TEXT BOOKS**
1. Safety Management : Strategy And Practice - Pybus R - Butterworth Heinmann, Oxford  
2. Safety and Accident Prevention in Chemical Operation – H.H. Faweett and Wood
REFERENCE BOOKS
2. Safety Management In Industry- Krishna, N V- Jaico Publication House; New Delhi
3. Industrial Safety And Pollution Control Hand Book - Nagraj, J N & Rameshchandar, R V - Associate Publisher, Securndabad
5. Safety in Use of Compressed Gas Cylinders - National Safety Counsil, Bombay
7. Industrial Safety Environmental Pollution Health Hazard And Nuclear Accidents - A Chand - Mittal Publication, New Delhi
8. Personal Protective Equipment – National Safety Counsil, Bombay

Course Outcomes:
- Ability to understand the functions and activities of safety engineering department.
- Apply knowledge of safety engineering specialization for hazard identification, risk assessment and control of occupational hazards.
- Communicate effectively on health and safety matters among the employees and with society at large.
Course Objective
1. This course aims to provide students with a practical and hands-on experience with common bioinformatics tools and databases.
2. Students will be trained in the basic theory and application of programs used for database searching, protein and DNA sequence analysis, prediction of protein function.

UNIT-1
Bioinformatics-introduction, Application, Data Bases and Data Management, Central Dogma; information search and Data retrieval, Genome Analysis and Gene mapping- Analysis, Mapping, Human Genome Project (HGP).

UNIT-2
Alignment of Pairs and Sequences; Alignment of Multiple Sequences and Phylogenetic Analysis; Tools for similarity Search and Sequence Alignment- FASTA BLAST.

UNIT-3
Profiles and Hidden Marcov Models (HMMs); Gene Identification and Prediction-Basics, Pattern Recognition, Methods and Tools; Gene Expression and Micro arrays.

UNIT-4
Protein Classification and Structure Visualization; Protein Structure Prediction; Proteomics; Computational methods-Analysis of Pathways, Metabolic Network Properties, Metabolic Control Analysis, Stimulation of Cellular Activities, Biological Mark Up Languages.

UNIT-5

Outcomes: After successful completion of the course, student will be able to have a good working knowledge of basic bioinformatics tools and databases such as GenBank, BLAST, multiple alignment, and phylogenetic tree construction. Further students will understand the basic theory behind these procedures and be able to critically analyze the results of their analysis using such tools.

TEXT BOOKS
II. BIOINFORMATICS by V. R Srinivas, Prentice Hall of India

REFERENCES
1. BIOINFORMATIC COMPUTING by Bergeron, MIT Press.
2. Evolutionary Computation in Bioinformatics, Gary B. Fogel, David W. Corne (Editors), 2002
4. Current Topics in Computational Molecular Biology (Computational Molecular Biology), Tao Jiang, Ying Xu, Michael Zhang (Editors), 2002, MIT Press
Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Engineering  
Branch: Common to All Branches
Subject: Energy Conservation and Management  
Semester: VIII
Code: 300802(37)
Total Theory Periods: 40  
Total Tutorial Periods: 10
Class Tests: Two (Minimum)
Assignments: Two (Minimum)
ESE Duration: Three Hours  
Maximum Marks: 80  
Minimum Marks: 28

Course Objectives:
- understand and analyze the energy data of industries
- carryout energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings and
- utilize the available resources in optimal ways

UNIT – I: Introduction

UNIT – II: Energy Conservation in Major utilities

UNIT – III: Thermal Systems Utilization

UNIT – IV: Energy Storage Technologies
Overview of storage technologies, Principal forms of stored energies, Application of energy storage, Specifying energy storage devices, Specifying fuels, Direct electric storage, Electrochemical energy storage, Mechanical energy storage, Direct thermal storage, Thermochemical energy storage

UNIT – V: Industrial Energy Efficiency and Energy Management
Introduction, Industrial energy management and efficiency improvement, Improving industrial energy audits, Industrial electricity end uses and electrical energy management, Thermal energy management in industry, The role of new equipment and technology in industrial energy efficiency

Textbooks:
2. Energy Management – W.R. Murphy, G. Mckay

Reference Books:
1. Energy Management – Paul O’Callaghan

Course 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
Unit I: Introduction to nanotechnology: background, definition, basic ideas about atoms and molecules, physics of solid state, review of properties of matter and quantum mechanics

Unit II: Preparation of Nanostructured Materials: Lithography: nanoscale lithography, E-beam lithography, dip pen lithography, nanosphere lithography. Sol gel technique Molecular synthesis, Self-assembly, Polymerization


References:
1. Guozhong Cao, “Nanostructures and Nanomaterials”, Imperial College Press, London
Unit-I

Unit-II
Patents: Introduction to patent law and condition for patentability, Procedure for obtaining patents, Rights of a patentee, Patent infringements, Biotechnology patents and patents on computer programs, Patents from an international perspective.

Unit-III
Trademark and geographical Indications: Statutory authorities and registration procedure, Rights conferred by registration, Licensing, assignment and transfer of trademark rights, Trademark infringement, Geographical Indication of Goods & Appellations of Origin.

Unit-IV
Copyright: Registration procedure and copyright authorities, Assignment and transfer of copyright, copyright infringement and exceptions to infringement, Software copyright

Unit-V
Introduction to the law on Industrial Designs, Registration and piracy, International perspective, Introduction to the law on semiconductor layout design, Registration, commercial exploitation and infringement.

Text Books:
2. Kumar K, Cyber law, intellectual property and ecommerce security, Dominent Publication and distribution, New Delhi.

Reference Books:
1. Inventors Guide to Trademarks and Patents- Craig Fellenstein, Rachel Raison- Pearson Education.
2. Intellectual Property –David Bainbridge, Longman
Name of program: **Bachelor of Engineering**  
Branch: **Common to All Branches**  
Semester: **VIII**  
Subject: **Value Engineering**  
Code: **300805(37)**  
Total Theory Periods: **40**  
Class Tests: **Two (Minimum)**  
Assignments: **Two (Minimum)**  
ESE Duration: **Three Hours**  
Maximum Marks: **80**  
Minimum Marks: **28**

**Course Objectives:**
- The objective of this course is to introduce students with the methodology of Value Engineering and its decision-making process.
- To familiarize students with procedures that provides standards for Value Engineering applications.
- To teach value engineering in a practical, project-based manner.
- During the course student will be engaged in decision-making using Value Engineering tools to ensure quality and value while reducing the cost of projects.
- Student will know about a number of case study applications of the Value Engineering to gain practical experience.

**UNIT – I : Basic Concepts**  
Meaning of the term value, basic kind, reasons for poor value, value addition, origin and history. Benefits, relevance in Indian scenario.

**UNIT – II : Techniques**  
Different techniques, organizing value engineering study, value engineering and quality.

**UNIT – III : Job Plan**  
Different phases, General phase, Information phase, Functional Phase, Creation Phase, Evaluation Phase, Investigation Phase, Implementation Phase, Audit.

**UNIT – IV : Selection of evaluation of VE Projects**  
Project selection, method selection, value standard, application of methodology.

**UNIT – V : Value Engineering Program**  
VE operations in maintenance and repair activities, VE Cost, life cycle, cost model, training for VE, general value engineering, case studies.

**TEXT BOOKS**

**REFERENCES**
Course Outcome:
- Understand the basics of Value Engineering (VE) to ensure that a standardized method is used for VE applications to projects
- Learn to perform function analysis for projects
- Understand the appropriate time to apply VE for projects
### Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)

<table>
<thead>
<tr>
<th>Name of program:</th>
<th>Bachelor of Engineering</th>
</tr>
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<tbody>
<tr>
<td>Branch: Common to All Branches</td>
<td>Disaster Management</td>
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<tr>
<td>Semester:</td>
<td>8th</td>
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<td>Subject Code:</td>
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<td>Total Tutorial Periods:</td>
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<td>Assignments:</td>
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<tr>
<td>Minimum Marks:</td>
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### Objectives of the Subject:
1. To introduce disaster, its nature and types.
2. To understand disaster zoning and hazard assessment.
3. To know about the disaster mitigation and preparedness.
4. To understand management during disaster and construction technology for its mitigation.
5. To identify relief measures.

### Outcomes of the Subject:
1. Students are expected to understand disaster and its nature.
2. Students are expected to understand impact and hazard assessment.
3. Students are expected to understand disaster preparedness and mitigation.
4. Students are expected to understand use of construction technology for disaster management.
5. Students are expected to identify short term and long term relief measures.

### Unit-1:
Nature of disasters – natural and other disasters, Earthquakes, floods, draught, cyclones, fire and other environmental disasters.

### Unit-2:
Behaviour of structures in disaster prone areas, Disaster zoning, Hazard assessment, Environmental Impact Assessment

### Unit-3:
Methods of mitigating damage during disasters, disaster preparedness.

### Unit-4:
Management systems during disasters, Construction Technology for mitigation of damage of structures.

### Unit-5:
Short-term and long-term relief measures.

### Text Books:
2. Dynamics of Structures: Theory and Application to Earthquake Engineering (2nd edition) – Anil K Chopra (Pearson Education Publication)

### Reference Books:
3. Earth quake engineering damage assessment and structural design – S.F. Borg
4. Disasters and development – Cuny F (Oxford University Press Publication)
Name of program: Bachelor of Engineering  
Semester: 8th

Branch: Common to All Branches  
Subject: Construction Management  
Subject Code: 300807(20)

Outcomes of the Subject:
1. Students should be able to identify owner’s perspective / perspective of project participants towards construction projects.
2. Students are expected to identify the structure of project participant’s organization and effect of project risks.
3. Students are expected to know design methodology, feasibility aspect and value engineering in design and construction.
4. Students are expected to know importance of labour productivity, material and equipment utilization.
5. Students are expected to know the different approaches of cost estimation of construction project.

Objectives of the Subject:
1. To provide an understanding of owners perspective towards life cycle of project and the changing environment of construction industry.
2. To provide an understanding of organizing for project management.
3. To provide an understanding of innovation, feasibility and value engineering in design and construction.
4. To provide an understanding of labour, material and equipment utilization.
5. To provide an understanding of approaches to cost estimation in construction project.

Unit-1: The Owner's Perspective

Unit-2: Organizing for Project Management
Definition of project management, Trends in Modern Management-Strategic planning and project programming- Effects of project risks on organization-Organization of Project Participants-Traditional designer-Constructor sequence- Professional construction management-Owner-Builder-Operation-Turnkey operation-Leadership and Motivation for the Project team-Interpersonal behaviour in project organization-perceptions of Owners and Contractors.

Unit-3: The Design and Construction Process

Unit-4: Labour, Material and Equipment Utilization

Unit-5: Cost Estimation
Costs Associated with Construction Facilities-Approaches to cost estimation-Type of construction cost estimates- Effects of scale on construction cost-Unit cost-Method of estimation-Historical cost data-Cost indices-Applications of cost Indices to Estimating-Estimate based on Engineers List of Quantities-Allocation of Construction costs over time-Estimation of operating costs, concept of pre and post construction cost management.
Text Books:

Reference Books:
Name of program: Bachelor of Engineering
Semester: 8th
ESE Duration: 3 Hours
Total Theory Periods: 40
Class Tests: 2
Maximum Marks: 80

Branch: Common to All Branches
Subject: Ecology and Sustainable Development
Subject Code: 300808(20)
Total Tutorial Periods: 12
Assignments: 2
Minimum Marks: 28

Objectives of the Subject:
1. To learn about the nature of ecology and sustainable development and various obstacles in sustainable development.

Outcomes of the Subject:
1. To be able to plan and handle issues related to sustainable development.

Unit-1: Nature of ecology and sustainable development
Definition, scope of ecology and sustainable development, geomorphology, oceanography, climatology, and biogeography.

Unit-2: Energy and environment
Introduction of energy environment, use of solar cells for heating and operated drills, methane gas digesters, environmentally friendly method of energy conservation, difference between conventional and non-conventional energy sources, future trends of energy systems.

Unit-3: Theory of isostasy
Concept of isostasy for sustainable development, discovery of the concept, concept of Hayford and Bowie, Joly, and Holmes, Global isostatic adjustment.

Unit-4: Physical geography and man human impact on the natural environment
Modification of land forms, direct alternation of land forms, wind deflation, coastal erosion and deposition, modification of the atmosphere, ultration process in eco and energy systems.

Unit-5: Obstacles in sustainable development
Pollution growth, species extinction, restriction of bat lands, desertification, soil erosion, soil pollution, characterisation of contaminated soil, global warming and ozone depletion etc.

Text Books:

Reference Books:
2. Theory and implementation of economic models for sustainable development – Jeroen C.J.M. Van Den Bergh
4. Evaluating Sustainable Development: Giving People a voice in their destiny – Okechukwu Ukaga et.al.
Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Engineering
Branch: Common to All Branches
Semester: VIII
Subject Code: 300809(19)
Class Tests: Two (Minimum)
Total Theory Periods: 40

Maximum Marks: 80 Minimum Marks: 28
ESE Duration: Three Hours

Note: Internal choices may be given in any three units.

Course Objectives: Energy is the key input to drive and improve the life cycle. The primary source of energy is fossil fuel, however the finiteness of fossil fuel reserves and large scale environmental degradation caused by their widespread use, particularly global warming, urban air pollution and acid rain, strongly suggests that harnessing of non-conventional, renewable and environment friendly energy resources is vital for steering the global energy supplies towards a sustainable path. This subject describes in brief such non-conventional energy sources and their usage.

Unit I An introduction to energy sources, Environmental Aspects of Power Generation.

Unit II Solar energy storage system, Application of solar energy: solar water heating, space heating and cooling, solar photovoltaic, solar cooking, solar distillation & desalination, Solar industrial process heating, Solar power generation. Solar Green Houses, Solar thermo mechanical power, solar refrigeration & air conditioning, Solar ponds.

Unit III Energy from Biomass: Type of biomass sources, Energy plantation, Methods for obtaining energy from biomass,
Biomass conversion technologies-wet and dry processes, Biodigestion, Community/Industrial biogas plants, Factors affecting biodigestion, Design of a biogas plant, Classification, advantages and disadvantages of biogas plants, Problems related to biogas plants, Utilization of biogas.
Thermal gasification of biomass, Gasifier- classification, chemistry, advantages, disadvantages and application. Alcohol fuels from biomass: overview, feedstock, methods for alcohol production, Ethanol as an alternative liquid fuel; engine performance with alcohol fuels, biodiesel from biomass.

Unit IV Wind Energy: Basic principles of wind energy conversion: power in the wind, maximum power, forces on the blades, lift and drag, Components of wind energy conversion systems (WEC), Classification, advantages and disadvantages of WEC systems, Types of wind machines, Performance of wind machines, Design considerations, Energy storage, Application of wind energy, Environmental aspect.
Tidal Energy. Components of tidal power plants, Single and double basin arrangements, Estimation of energy and power. Advantages and limitations of tidal power.
Wave energy- its advantages and disadvantages, energy and power from wave energy.


Text Books:

Reference Books
**Course Outcomes:**
At the end of the course, the student will be able to:
1. Address smart energy and green infrastructure
2. Build models that simulate sustainable and renewable green technology systems
3. Understand the history, global, environmental and economical impacts of green technology
4. Address non renewable energy challenges
Chhattisgarh Swami Vivekanand Technical University, Bhilai
Name of program: Bachelor of Engineering Branch: Common to All Branches
Subject: Managing Innovation & Entrepreneurship Semester: VIII
Code: 300811(37)
Total Theory Periods: 40 Total Tutorial Periods: 10
Class Tests: Two (Minimum) Assignments: Two (Minimum)
ESE Duration: Three Hours Maximum Marks: 80 Minimum Marks: 28

Course Objective
1. The course will provide a thorough coverage of conceptual framework on Entrepreneurship development.
2. Enhances student’s innovation skill.
3. Helps to provide a quick understanding of essential concepts and issues.
4. Enhance the students to have an understanding about international entrepreneurship.
5. Understand the problems and prospects related to setting up of any type of business.

UNIT – I : Introduction to Entrepreneurship
Evolution of entrepreneurship from economic theory Managerial and entrepreneurial growth and development.

UNIT – II : Creativity and Innovation

UNIT – III : Entrepreneurial Motivation
Need for continuous learning & relearning Acquiring technological Innovation Entrepreneurial motivation (nAch story) Achievement Motivation in Real life. Case Study.

UNIT – IV : International Entrepreneurship
Concepts and nature of international entrepreneurship. The changing international environment. Ethics and international entrepreneurship. Strategic issues in international entrepreneurship.

UNIT – V : Problem identification and problem solving

TEXT BOOK
1. Managing innovation and entrepreneurship in technology based firm-Martin M J-John Willey

REFERENCE BOOKS

Course Outcomes
Work effectively with engineering and science teams
Course Objective
The basic objective in offering this course is to study the state-of-the-art in biometrics technology can explore the way to improve the current technology. The students can learn and implement various biometrics technologies using advanced algorithm.

Unit I: Introduction of Biometrics
Biometrics: definition, history, basic working architecture, types; Performance measures of biometrics; applications and benefits of biometrics; design of biometrics; biometric identification versus verification.

Unit II: Face and Iris Biometrics
Background of face and iris recognition; Face recognition methods: Eigen face methods, contractive transformation method; Challenges of face biometrics; Design of iris biometrics: image segmentation, image preprocessing, determination of iris region; Advantages and disadvantages of face and iris biometrics.

Unit III: Fingerprint and Sign Language Biometrics
Fingerprint matching: image acquisition, image enhancement and segmentation, image binarization, minutiae extraction and matching; Sign language biometrics: Indian sign language (ISL) biometrics, SIFT algorithm, advantages and disadvantages of ISL and fingerprint biometrics.

Unit IV: Biometric Cryptography and Privacy Enhancement
Introduction to biometric cryptography; general purpose cryptosystems; Cryptographic algorithms: DES and RSA; Privacy concerns and issues related to biometrics; biometrics with privacy enhancement; soft biometrics; comparison of various biometrics; Identity and privacy.

Unit V: Scope of Biometrics and Biometric Standards
Multimodal biometrics: basic architecture and fusion scheme, application, example of Aadhaar; scope and future market of biometrics; role of biometrics in enterprise and border security; DNA biometrics; biometric standards; biometric APIs.

Suggested Books:

Course outcomes:
On completion of this program student will:
1. Understand the basic definition of ‘Biometric Recognition’ and the distinctive of this form of biometrics.
2. Be able to state precisely what functions these systems perform.
3. Be able to draw a system-level diagram for any biometric system and discuss its components.
4. Be able to solve verification, identification, and synthesis problems for a variety of biometrics such as fingerprint, face, iris, hand gestures and cryptography.
5. Be able to use the biometrics ingredients of existing system to obtain a given security goal.
6. Judge the appropriateness of proposal in research papers for a given applications.
7. Be able to design a biometric solution for a given application.
Course Objective
To learn the basic concepts of information theory and coding, including information, source coding, channel model, channel capacity, channel coding and so on.

UNIT-I: Uncertainty, Information and Entropy Information Measures: Characteristics on Information measure; Shannon’s concept of information; Shannon’s measure of information; Model for source coding theorem; Communication system; Source coding and line/channel coding; channel mutual information capacity (Bandwidth);

UNIT-II: Channel coding, Theorem for discrete memory less channel, Information capacity theorem: Error detecting and error correcting codes; Types of codes; Block codes; Tree codes; Hamming codes; Description of linear block codes by matrices; Description of linear tree code by matrices; Parity check codes; Parity check polynomials;

UNIT-III: Compression: Lossless and lossy; Huffman codes; Binary Image compression schemes; Run – length Encoding; CCITT group-3 1D compression; CCITT group-3 2D compression; CCITT group-4 2D compression;

UNIT-IV: Video Image Compression: Requirement of full motion video compression; CCITT H 261 video coding algorithm; MPEG compression methodology; MPEG-2 compression; Audio (Speech) compression;

UNIT-V: Cryptography: Encryption; Decryption; Cryptogram (cipher text); Concept of cipher; Cryptanalysis; Keys: Single key (Secret key); Cryptography; two-key (Public key) cryptography; Single key cryptography; Ciphers; Block Cipher code; Stream ciphers; Requirements for secrecy; The data Encryption Standard; Public Key Cryptography; Diffie-Hellmann public key distribution; The Rivest- Shamin Adelman(R-S-A) system for public key cryptography; Digital Signature;

Outcomes:

1. Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
2. Describe the real life applications based on the fundamental theory.
3. Calculate entropy, channel capacity, bit error rate, code rate, steady-state probability and so on.
Text Books:

2. Digital Communication by Proakis, TMH
4. Local Area Network by G. Keiser, TMH (for Unit – V)
Course Objective
The objective of this module is to provide the participants with a good knowledge on supply chain management and how these topics can be related with their business needs.

UNIT - I : FUNDAMENTALS OF SUPPLY CHAIN MANAGEMENT
Supply chain networks, Integrated supply chain planning, Decision phases in supply chain, process view of a supply chain, supply chain flows, Overview of supply chain models and modeling systems, Supply chain planning: Strategic, operational and tactical, Understanding supply chain through process mapping and process flow chart.

UNIT - II : SCM STRATEGIES, PERFORMANCE
Supply chain strategies, achieving strategic fit, value chain, Supply chain drivers and obstacles, Strategic Alliances and Outsourcing, purchasing aspects of supply chain, Supply chain performance measurement: The balanced score card approach, Performance Metrics. Planning demand and supply: Demand forecasting in supply chain, Aggregate planning in supply chain, Predictable variability.

UNIT- III : PLANNING AND MANAGING INVENTORIES
Introduction to Supply Chain Inventory Management. Inventory theory models: Economic Order Quantity Models, Reorder Point Models and Multi-echelon Inventory Systems, Relevant deterministic and stochastic inventory models and Vendor managed inventory models.

UNIT- IV : DISTRIBUTION MANAGEMENT
Role of transportation in a supply chain - direct shipment, warehousing, cross-docking; push vs. pull systems; transportation decisions (mode selection, fleet size), market channel structure, vehicle routing problem. Facilities decisions in a supply chain. Mathematical foundations of distribution management, Supply chain facility layout and capacity planning,

UNIT V STRATEGIC COST MANAGEMENT IN SUPPLY CHAIN
The financial impacts, Volume leveraging and cross docking, global logistics and material positioning, global supplier development, target pricing, cost management enablers, Measuring service levels in supply chains, Customer Satisfaction/Value/Profitability/Differential Advantage.

Outcomes: On completion of this program student will know how the Supply chain management is essential to company success and customer satisfaction and also how SCM knowledge and capabilities can be used to support medical missions, conduct disaster relief operations, and handle other types of emergencies. SCM also plays a role in cultural evolution and helps improve our quality of life.

REFERENCES
Course Objective

- Describe the important features of the Web and Web browser software
- Evaluate e-mail software and Web-based e-mail services
- Use FTP and other services to transfer and store data
- Demonstrate the use of real-time chat and briefly describe the history of the wireless Internet
- Create HTML documents and enhance them with browser extensions

UNIT-I INTRODUCTION TO INTERNET


UNIT-II HTML CSS AND SCRIPTING


UNIT-III XML

What is XML – Basic Standards, Schema Standards, Linking & Presentation Standards, Standards that build on XML, Generating XML data, Writing a simple XML File, Creating a Document type definition, Documents & Data, Defining Attributes & Entities in the DTD, Defining Parameter Entities & conditional Sections, Resolving a naming conflict, Using Namespaces, Designing an XML data structure, Normalizing Data, Normalizing DTDS

UNIT-IV INTERNET SECURITY & FIREWALLS


UNIT-V WEBSITE PLANNING & HOSTING


Outcomes: After successful completion of the course, student will be able to

- Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, and web applications
- Analyze a web page and identify its elements and attributes.
- Create XML documents and XML Schema

Text Books
1. Internet & Intranet Engineering,- Daniel Minoli, TMH.
2. Alexi Leon and Mathews Leon – Internet for Every One, Tech World.

Reference Books
UNIT I: Principles of Estimation and Residential Building Electrification
Introduction to estimation and costing, Electrical Schedule. Determination of cost material and labor Contingencies. Overhead charges.
General Rules guidelines for wiring of residential installation and positioning of equipments, Principles of circuit design in lighting and power circuits. Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram. Selection of type of wiring and rating of wires and cables Load calculations and selection of size of conductor, Selection of rating of main switch Distribution board, protective switchgear and wiring accessories, Preparation of detailed estimates and costing of residential installation.

UNIT II: Electrification of Commercial Installation
Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service connection and nature of supply, Deciding the size of the cables, bus bar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc, Earthing of the electrical installation, Selection of type wire, wiring system and layout, Preparation of detailed estimate and costing of commercial installation.

UNIT III: Service Connection, Power Circuits, Inspection and Testing of Installation
Concept of service connection, Types of service connection and their features, Method of installation of service connection, Estimates of underground and overhead service connections, Inspection of internal wiring installations, Inspection of new installations, testing of installations, testing of wiring installations, Important considerations regarding motor installation wiring, Determination of rating of cables Determination of rating of fuse, Determination of size of Conduit, distribution Board main switch and starter.

UNIT IV: Design of Overhead Transmission and Distribution Lines
Introduction, Typical AC electrical LT system, Main components of overhead lines, Line supports. Factors governing height of pole, Conductor materials, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, accessories, Erection of supports, setting
of stays, Fixing of cross arms, Fixing of insulators, Conductor erection, Repairing and jointing of conductor, Dead end clamps, Positioning of conductors and attachment to insulators Jumpers, Tee-offs, Earthing of transmission lines. Guarding of overhead lines, Clearances of conductor from ground Spacing between conductors.

UNIT V: Design and Estimation of Substation
Introduction, Classification of substation, Indoor substations, Outdoor substations, Selection and location of site for substation, Main Electrical Connections, Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram. Key diagram of typical substations. Equipment for substation and switchgear installations, Substation auxiliaries supply, Substation Earthing.

Note: For estimation and costing calculations refer attached sheets

Textbooks:
Electrical Design Estimating and Costing, K.B.Raina S.K.Bhattacharya, New Age

Reference Books:
Unit: 1

Unit: 2

Unit: 3

Unit: 4

Unit: 5
Thermionic Conversion – Principles of working.

2. S.P. Sukhatme – Solar Energy – TMH.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of Program: B.E. VIII
Subject: Big Data and Hadoop
Duration of period: 50 minutes
Total Theory Periods: 50
Class Test: 02
Maximum Marks: 80
Branch: Common to All Branches
Code: 300818(22)
Total tutorial periods: NIL
Assignments: 02
Minimum Marks: 28

COURSE OBJECTIVES:
1. To understand the fundamental concepts of big data analytics
2. To analyze the big data using intelligent techniques.
3. To develop various search methods and visualization techniques.
4. To explore various techniques for mining data streams.
5. To understand the applications using Map Reduce Concepts.

Course Contents:


UNIT V FRAMEWORKS: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper. Visualizations - Visual data analysis techniques, interaction techniques.

Course Outcomes:
1. To able to know about intelligent applications.
2. To use knowledge about vast data.
3. To know different big data modelling techniques.
4. Ability to work in Hadoop environment.

Text Books: