### Chhattisgarh Swami Vivekanand Technical University, Bhilai

**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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>L+(T+P)/2</td>
<td>Theory/Practical</td>
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<tr>
<td>1</td>
<td>Mech. Engg.</td>
<td>337811(37)</td>
<td>Robotics</td>
<td>4 1 -</td>
<td>80 20 20</td>
<td>120</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Electronics and Telecom</td>
<td>367811 (28)</td>
<td>Process Control</td>
<td>4 1 -</td>
<td>80 20 20</td>
<td>120</td>
<td>5</td>
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<tr>
<td>3</td>
<td>Mech. Engg.</td>
<td>367812 (37)</td>
<td>Mechatronics Systems Design</td>
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<td>80 20 20</td>
<td>120</td>
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<tr>
<td>4</td>
<td>Refer Table 3</td>
<td></td>
<td>Professional Elective 3</td>
<td>4 1 -</td>
<td>80 20 20</td>
<td>120</td>
<td>5</td>
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<tr>
<td>5</td>
<td>Refer Table 4</td>
<td></td>
<td>Open Elective – IV</td>
<td>4 1 -</td>
<td>80 20 20</td>
<td>120</td>
<td>5</td>
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<tr>
<td>6</td>
<td>Mech. Engg.</td>
<td>367821 (67)</td>
<td>Robotics Lab</td>
<td>- - 2</td>
<td>40 - 20</td>
<td>60</td>
<td>1</td>
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<tr>
<td>7</td>
<td>Electronics and Telecom</td>
<td>367822 (67)</td>
<td>Process Control Lab</td>
<td>- - 2</td>
<td>40 - 20</td>
<td>60</td>
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<td>8</td>
<td>Mech. Engg.</td>
<td>367823 (67)</td>
<td>Simulation Lab</td>
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<td>60</td>
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<td>9</td>
<td>Mech. Engg.</td>
<td>367824 (67)</td>
<td>Major Project</td>
<td>- - 6</td>
<td>100 - 80</td>
<td>180</td>
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<tr>
<td>10</td>
<td>Mech. Engg.</td>
<td>300824 (37)</td>
<td>Report Writing and Seminar</td>
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<td>- - 40</td>
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<td>11</td>
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<td><strong>20 5 15</strong></td>
<td><strong>620 100 280 1000 32</strong></td>
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</tbody>
</table>

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

### 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>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mech. Engg.</td>
<td>337813 (37)</td>
<td>Production Management</td>
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<tr>
<td>3</td>
<td>Mech. Engg.</td>
<td>367882 (37)</td>
<td>Product Development</td>
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<tr>
<td>4</td>
<td>Electronics and Telecom</td>
<td>367883 (28)</td>
<td>Neural Network &amp; Fuzzy Systems</td>
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<tr>
<td>5</td>
<td>Electronics and Telecom</td>
<td>367884 (28)</td>
<td>Programmable Logic Controller</td>
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<tr>
<td>6</td>
<td>Electronics and Telecom</td>
<td>367885 (28)</td>
<td>Automotive Electronics</td>
</tr>
</tbody>
</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.
### Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Table – IV**

<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>Management</td>
<td>300881 (36)</td>
<td>Enterprise Resource Planning</td>
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<tr>
<td>2</td>
<td>Information Technology</td>
<td>300882 (33)</td>
<td>E-Commerce &amp; strategic IT</td>
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<tr>
<td>3</td>
<td>Management</td>
<td>300883 (36)</td>
<td>Technology Management</td>
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<tr>
<td>4</td>
<td>Information Technology</td>
<td>300884 (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>300885 (22)</td>
<td>Software Technology</td>
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<tr>
<td>6</td>
<td>Management</td>
<td>300886 (36)</td>
<td>Knowledge Entrepreneurship</td>
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<tr>
<td>7</td>
<td>Management</td>
<td>300887 (36)</td>
<td>Finance Management</td>
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<td>8</td>
<td>Management</td>
<td>300888 (36)</td>
<td>Project Planning, Management &amp; Evaluation</td>
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<td>9</td>
<td>Mechanical Engg.</td>
<td>300889 (37)</td>
<td>Safety Engineering</td>
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<td>10</td>
<td>Computer Science &amp; Engg.</td>
<td>300890 (22)</td>
<td>Bio Informatics</td>
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<td>11</td>
<td>Mechanical Engg.</td>
<td>300891 (37)</td>
<td>Energy Conservation &amp; Management</td>
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<td>12</td>
<td>Nanotechnology</td>
<td>300892 (47)</td>
<td>Nanotechnology</td>
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<td>13</td>
<td>Management</td>
<td>300893 (36)</td>
<td>Intellectual Property Rights</td>
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<tr>
<td>14</td>
<td>Mechanical Engg.</td>
<td>300894 (37)</td>
<td>Value Engineering</td>
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<tr>
<td>15</td>
<td>Civil Engg.</td>
<td>300895 (20)</td>
<td>Disaster Management</td>
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<tr>
<td>16</td>
<td>Civil Engg.</td>
<td>300896 (20)</td>
<td>Construction Management</td>
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<tr>
<td>17</td>
<td>Civil Engg.</td>
<td>300897 (20)</td>
<td>Ecology and Sustainable Development</td>
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<td>18</td>
<td>Chem. Engg.</td>
<td>300898 (19)</td>
<td>Non Conventional Energy Sources</td>
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<tr>
<td>19</td>
<td>Electrical Engg.</td>
<td>300899 (24)</td>
<td>Energy Auditing and management</td>
</tr>
</tbody>
</table>

Note (1) – 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a particular academic session.

Note (2) - Choice of elective course once made for an examination cannot be changed in Future examinations.
UNIT – I
Introduction to Robotics

UNIT – II
Coordinate Frames, Mapping and Transforms
Coordinate Frames, Description of Objects in Space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation Matrices

UNIT – III
Symbolic Modeling of Robots – Direct Kinematic Model
Mechanical Structure and Notations, Description of Links and Joints, Kinematic Modeling of the Manipulator, Denavit – Hartenberg Notation, Kinematic Relationship between Adjacent Links, Manipulator Transformation Matrix. Introduction to Inverse Kinematic model

UNIT – IV
Robotic Sensors and Vision

UNIT – V
Robot Applications

TEXT BOOKS
2. Robotics for Engineers - Yoram Korean- McGrew Hill Co

REFERENCE BOOKS
2. Kinematics and Synthesis of Linkages - Hartenberg and Denavit - McGrew Hill Book Co
4. Kinematics and Dynamics of Machinery - J.Hirchhorn - McGrew Hill Book Company
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Subject: Process Control Code: 367811 (28)
Total Theory Periods: 40 Total Tutorial Periods: 10
Total Marks in End Semester Examination: 80
Minimum number of Class tests to be conducted: Two

UNIT – I : Introduction to Process control & process characteristics
Types of processes, process characteristics and controllability, step analysis method of finding time constant, self regulating and nonself regulating. Processes, interacting & non-interacting processes.

Unit II: Basic Control Actions
Characteristics of on-off, proportional, single -speed floating control, integral and derivative modes – composite control modes - PI, PD and PID control modes - Response of controllers for different types of test inputs – Integral wind up - Auto - manual transfer - Selection of control mode for different processes - Typical control schemes for level, flow, pressure and temperature.

Unit III: Process Dynamics

UNIT – IV : Process Control
Multiloop & multivariable process control systems, Feedback control, feed forward control, Cascade control, ratio control, auto selective control, adaptive control system, Coupling & decoupling control system, scaling the instruments. Analysis of flow, level, temperature loops.

UNIT – V : Applications of Process Control
Boiler Control: Combustion control, Air to fuel ratio control, 3-element drum level control, steam pressure, temp control, burner management and control, safely interlocks. Furnace control, FB-FF-CS of heat exchanger, Evaporator control.

Text Books :

Reference Books:
2. Process Control Handbook by Bela G. Liptak
5. Peter Harriot,, “Process Control” , TMH
UNIT I
Mechanical systems design:
Mechatronic approach – Control, program control, adaptive control and distributed systems – Design process –
Types of Design – Integrated product design – Mechanisms, load conditions, design and Specialisation
Mechatronics Mechanical flexibility – Structures, load conditions, flexibility and environmental isolation – Man
machine interface, industrial design and ergonomics, information transfer from machine to man and to machine,
safety.

UNIT II
Motion control:
Control devices – Electro hydraulic control devices – Electro pneumatic proportional controls – Control of electrical
drives – Basics of Magnetic circuits – Linear systems – Pneumatic ram – Hydraulic cylinder – Direct linear
electrical actuators – Solenoids – Pneumatic motors - continuous and limited rotation – Hydraulic Motors:
continuous and limited rotation – Brushless DC Motors – Hydraulic circuits and Pneumatic Circuits.

UNIT III
Advanced applications:
Sensor for condition monitoring - Mechanical control in automated manufacturing – Artificial Intelligence and
Fuzzy – Micro sensors application and real time interfacing - Elements of Data acquisition and control - Overview
of Input/Output process.

UNIT IV
Virtual Instrumentation:
Functional description of a digital instrument- Block diagram of a virtual instrument- Architecture of virtual
instruments- advantages of virtual instruments-Hardware and software- Basics of LabVIEW, For and while loops,
structures, Arrays and clusters, graphs and charts, String handling, Basics of data acquisition, Data acquisition with

UNIT V
Case Studies:
Testing of transportation bridge surface materials- Rotary optical encoder-controlling temperature of a hot/cold
reservoir-pH control system-Design of a coin counter-design of a robotic walking machine-skip and control of a CD
player, strain gauge weighing system.

Text Books:

Reference Books:
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, AOQL.

Quality of conformance, quality of design, economics of quality, SQC charts for variables and attributes.

Introduction to JIT manufacturing, kanban system.

TEXT BOOKS
1. Production and operation Management – By P. Ramamurty – New Age International Pub., 2005
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
UNIT – I
a) Engineering Materials:
- Selection of materials based on properties, cost, availability, appearance, service life and recycling.

b) Modern methods for materials studies:
- Optical Microscopy, Electron Microscopy, Chemical Analysis using atomic absorption spectroscopy, photo electron spectroscopy, 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, thermos setting plastics, additives in plastics, properties and applications of thermo 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 material.

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

d) **Semi Conductors**: Energy band concept, Intrinsic and Extrinsic semiconductors, mechanism of current conductors, materials for semiconductors, application of semi conducting materials.

e) Materials for Nuclear and space applications

**TEXT BOOKS**


**REFERENCES**

 UNIT-I
Product Development Process
Background for design, design theory, design materials, human factors in design applied ergonomics, product development processes and organization, identifying customer needs, establishing product specifications.

UNIT-II
Product Design Methods
Concept generation, selection of a concept, Testing of concept, Physical reliability & Economic feasibility of design concepts, product architecture, Creative and rational clarifying objectives - the objective trees methods, establishing functions - the function analysis methods, setting requirement - requirements specification methods determining characteristics - the QFD method, generating alternatives-the morphological chart method, evaluating alternatives-the weighted objectives methods, improving details-the value engineering method and design strategies.

UNIT – III
Design for Manufacture
Estimating manufacturing costs, reducing component, assembly and support cost design for assembly, design for disassembly, design for environment, design for graphics and packaging, effective prototyping - principle and planning.

UNIT – IV
Industrial Design
Its need - Ergonomic needs, Aesthetic needs, impact, accessing the quality, steps involved in Industrial design process, Management of Technology & user driven products, Technological Forecasting

UNIT – V
Patents, Product Development & Project Management
Legal issues in product design, trademarks, trade-secret, copy rights, patents - types, steps for disclosure, design resources, economics - quantitative & qualitative analysis, management of product development projects, Design Structure Matrix, Gantt Chart, Project schedule, budget, risk plan, accelerating project, execution, assessing and correction, Intellectual property rights.

TEXT BOOKS
2. Kevin Otto and Kristin wood “Product Design” – Pearson Education

REFERENCE BOOKS
3. Imad Moustapha “Concurrent Engineering in Product Design and Development” – New Age International Publishers
UNIT – I: Introduction and different architectures of neural networks:
Artificial neuron - MLP – Back propagation –Hope field networks – Kohonen self organizing maps – adaptive
resonance theory.

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
Optimization of membership function and rules base of fuzzy logic controller using neural networks –generic

List of Text Books:

List of Reference Books:
2. Laurance Fausett, Fundamentals of Neural Networks, Prentice Hall
UNIT I
Programmable Logic: Introduction, programmable Logic structures Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs), Programmable Gate Arrays (PGAs), Field Programmable Gate Arrays (FPGAs) Sequential network design with Programmable Logic Devices (PLDs) Design of sequential networks using ROMs and PLAs Traffic light controller using PAL.

UNIT II
Programmable Logic Controllers (PLCs): Introduction Parts of PLC Principles of operation PLC sizes PLC hardware components I/O section Analog I/O section Analog I/O modules, digital I/O modules CPU. Processor memory module Programming devices Diagnostics of PLCs with Computers.

UNIT III
PLC programming: Simple instructions Programming EXAMINE ON and EXAMINE OFF instructions Electromagnetic control relays Motor starters Manually operated switches Mechanically operated and Proximity switches Output control devices Latching relays PLC ladder diagram Converting simple relay ladder diagram in to PLC relay ladder diagram.

UNIT IV
Timer: Instructions ON DELAY timer and OFF DELAY timer counter instructions Up/Down counters Timer and Counter applications program control instructions Data manipulating instructions math instructions.

UNIT V

List of Text Books:

List of Reference Books:
4. Siemens " PLC Handbook ".

**Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)**

**Semester:** VIII  
**Subject:** Automotive Electronics (Elective – III)  
**Branch:** Mechatronics  
**Code:** 367885 (37)  
**Total Theory Periods:** 40  
**Total Tutorial Periods:** 10  
**Total Marks in End Semester Examination:** 80  
**Minimum number of Class tests to be conducted:** Two

**UNIT I**  
**Introduction:** Automotive component operation Electrical wiring terminals and switching Multiplexed wiring systems Circuit diagrams and symbols. Charging Systems and Starting Systems: Charging systems principles alternations and charging circuits. New developments requirements of the starting system. Basic starting circuit.

**UNIT II**  
**Ignition systems:** Ignition fundamental, Electronic ignition systems. Programmed ignition distribution less ignition direct ignition spark plugs. Electronic Fuel Control : Basics of combustion Engine fuelling and exhaust emissions Electronic control of carburation Petrol fuel injection Diesel fuel injection.

**UNIT III**  
**Instrumentation Systems:** Introduction to instrumentation systems Various sensors used for different parameters sensing Driver instrumentation systems vehicle condition monitoring trip computer different types of visual display

**UNIT IV**  
**Electronic control of braking and traction:** Introduction and discription control elements and control methodology Electronic control of Automatic Transmission: Introduction and description Control of gear shift and torque converter lockup Electric power steering Electronic clutch.

**UNIT V**  
**Engine Management Systems:** Combined ignition and fuel management systems Exhaust emission control Digital control techniques Complete vehicle control systems Artificial intelligence and engine management Automotive Microprocessor uses.  
**Lighting and Security Systems:** Vehicles lighting Circuits Signaling Circuit Central locking and electric windows security systems Airbags and seat belt tensioners Miscellaneous safety and comfort systems

**List of Text Books:**
1. Tom Denton, Automobile Electrical and Electronic Systems, Edward Arnold Pub.  

**List of Reference Books:**
1. Don Knowels, Automotive Electronic and Computer controlled Ignition Systems, Prentice Hall  
EXPERIMENTS TO BE PERFORMED (MINIMUM FIVE NUMBERS)

1. To detect the sensor scanning system to overcome limitation of fixed sensors on various robotic applications, ultrasonic sensor, laser range finders, infrared detectors and miniature.
2. To find the horizontal and vertical movement up to 180° in either direction.
3. To detect objects with infrared ray detector.
4. To determine object distance (3cm – 300cm).
5. To detect distance (10cm to 80 cm) with infrared object detector.
6. To determine 5 Axis Robotic Arm movement and its degree of rotation.
7. To lift the object and place 100m away in various directions.
8. To find the gripper movement (0 to 50mm).
9. To study various Robotic Arm Configurations.
10. To study Pick and Place Robot

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. 5 Axis Robotic Arm System
2. Hex Crawler Robot. The Mechatronics Robot
3. Ultrasonic Range Finder
4. Servo Power Supply
5. Infrared Object/Distance Detector
6. A 7.2V Battery Charger
7. Blue Tooth Transducer
8. Blue Tooth Pc Adaptor
9. Various Wooden Models to study Robotic Arm Configuration
10. Working model of Pick and Place Robot
List of Experiments to be performed: (at least 12 experiments are to be performed out of the following list)

1. On-Off Controller with and without neutral zone
2. Controller tuning using continuous cycling methods
3. Controller tuning using Process Reaction Curve
4. Study of P, I, D, PI, PD and PID Controller for: Temperature, Pressure, Flow and Level control system
5. Calibrations and tuning of a PID controllers.
6. Test and find the characteristics of a given control valve.
7. To study the auto tuning PID controller using virtual instrumentation (LABVIEW) based DAQ.
8. To maintain the constant pressure of a process (Pressure) tank using Auto PID in LABVIEW.
9. To study the closed loop operation of the Temperature Process control using Auto PID controller with LABVIEW. Also To find the $K_c$ and $T_i$ value of the PID controller for a particular set point.
10. Study of a typical Temperature Control Loop having Furnace, suitable final control element, SMART/Analog temperature transmitter (hand held communicator for SMART Transmitter), PID controller, and data logger etc.
11. Study of a typical Pressure Control Loop having Pressure source, Pneumatic control valve, I to P Converter, Compressor, SMART/Analog pressure transmitter, and PID controller etc.
12. Study of a typical Flow Control Loop having SMART/Analog DP/Mass Flow meter, Motorized / Pneumatic control valve (I to P Converter and Compressor for pneumatic control valve), and PID controller etc.
13. Study of a typical Level Control Loop having Ultra Sonic/ Capacitor Level Transmitter, Motorized / Pneumatic control valve (I to P Converter and Compressor for pneumatic control valve), and PID controller etc.
15. PLC Programming through PC
16. Study of a PC based Simulation Software i.e. simulation of boiler of a power plant etc.
17. Study of flow/temperature control loop with DCS

List of Instruments:
All sorts of transducers with kits, Discrete components like OPAMP, Resistor & Capacitors, Voltage source, Function generator, CRO, Models of Process Control, NI-LabView, MATLAB with SIMULINK

Reference Book:
Handbook of Instrumentation, Liptak
Experiments to be performed:

- To Design, implement and Simulate Fixed bias and self bias transistorized circuit for determining the bandwidth.
- To Design, implement and Simulate Fixed bias and self bias for studying the low frequency and high frequency effect.
- To Design, implement and Simulate Miller integrator for determining the nonlinearities.
- To Design, implement and simulate current Sweep generator for determining the nonlinearities.
- To Design, implement and Simulate Inverting and non inverting amplifier for determining the bandwidth.
- To Design, implement and Simulate Integrator & differentiator for studying output responses for different inputs.
- To Design, implement and Simulate zero crossing detector & comparator for studying output responses for different inputs.
- To Design, implement and Simulate Series Voltage regulator.
- To Design, implement and Simulate 1st & 2nd order LPF for determining the bandwidth and studying output responses for different inputs.
- To Design, implement and Simulate 1st & 2nd order HPF for determining the bandwidth.
- To Design, implement and Simulate Half ware & Full ware rectifier way op-Amp for determining the bandwidth.
- To Design, implement and Simulate Series and Shunt Clipper for studying output responses.
- To Design, implement and Simulate Clamping Circuit with op-Amp for studying output responses for different inputs.
- To Design, implement and Simulate Instrumentation Amplifier using three op-Amp for determining the bandwidth.
- To Design, implement and Simulate Monostable & Astable using 555 timer.
- To Design, implement and Simulate R -2R ladder type Digital to analog converter.
- 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 MUSLTISIM
3. Manuals of PSPICE
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: BE VIII
Subject: Report Writing & Seminar
Code: 300824 (37)
Total No. of periods: 2 per week
Total Tutorial Periods : Nil
Total marks in End Semester Exam: Nil
Teacher's Assessment: 40 marks
Minimum Number of class test to be conducted: 2

Unit -I
Introduction to Technical Writing: how differs from other types of written communication Purpose of technical writing. Correspondence: prewriting, writing and rewriting Objectives of Technical Writing. Audience Recognition: High-tech audience, Low tech audience, Lay audience, Multiple Audience.

Unit - II
Correspondence: Memos, Letters, E-mails, Its differentiation, types of letters, Document Design, its importance, Electronic Communication: Internet, Intranet, extranet, Writing effective e-mail.

Unit - III
Summary: Report Strategies, Effective style of technical report writing: Structures: content, introduction, conclusions, references, etc., Presentation, Writing first draft, revising first draft, diagrams, graphs, tables, etc. report lay-out.

Unit - IV

Unit - V
Proposals & Presentation: Title page, Cover letter, Table of Content, list of illustrations, summary, discussion, conclusion, references, glossary, appendix, Case Studies. Oral Presentation/ Seminar:

Text Books:

Reference Books:
1. Sunita Mishra, "Communication Skills for Engineers" Pearson Education
2. Davies J.W. "Communication for engineering students", Longman
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VIII  Branch : Common to All Branches
Subject : Enterprise Resource Planning  Code : 300881 (36)
Total Theory Periods : 40  Total Tut Periods : 10
Total Marks in End Semester Exam : 80
Minimum no. of class tests to be conducted : 2

UNIT-1
Conceptual foundation of Business Process reengineering: Role of information Technology and BPR; Process improvement and Process redesign, Process identification and mapping; Role/Activity diagrams, Process Visioning, and benchmarking.
[No of Periods: 8 + 2]

UNIT - 2
Enterprise Resource Planning: Evolution of ERP- MRP and MRP II, structure of ERP- two tier architecture, three tier architecture, Electronic data processing, management information system, Executive information system, ERP as an integrator of information needs at various Levels.
[No of Periods: 8 + 2]

UNIT - 3
Typical Business Processes: Core processes, Product control, Sales order processing, Purchases, Administrative processes, Human resource, Finance support processes, Marketing, Strategic planning, Research and development, Problems in traditional view.
[No of Periods: 8 + 2]

UNIT - 4
ERP models/functionality: Sales order processing, Production scheduling, forecasting, distribution, finance, features of each of the models, description of data flow across each module, overview of supporting databases & packages.
[No of Periods: 8 + 2]

UNIT - 5
ERP implementation issues: Opportunities and problems in ERP selection, and implementation; ERP implementation: identifying ERP benefits, team formation, Consultant intervention, Selection of ERP, Process of ERP.
[No of Periods: 8 + 2]

Books:
2. Rahul V. Altekar, Enterprise wide Resource Planning-theory and practice, PHI

References:
1. ALEXIS LEON: Enterprise Resource Planning, TMH
2. S. SADAGOPAN: MIS, PM
3. V. RAJARAMAN: Analysis and Design of Information Systems, PHI
4. MONK & BRADY: Concepts in ERP, Vikas pub, Thomson

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.

BOOKS :
1. Frontiers of E-commerce by Kalakota & Whinston (Addison-wesley) E-business roadmap for success by Dr. Ravi Kalakota & Marcia Robinson (addision wesicy)
2. 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. Over view of - GATT, Intellectual property rights (IPR)  
[No of Periods: 8 + 2]

Texts Books:

Reference Books:
3. Plesk, Crativity, Innovation and Quality, PHI
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)

Semester: VIII  Branch: Common to all Branches
Subject: Decision Support and Executive Information System  Code: 300884(33)
Total Theory Periods: 50  Total Tut Periods: Nil.
Total Marks in End Semester Exam: 80.
Minimum number of class tests to be conducted: 02.

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:
Data Component: Information and its Usefulness, Characteristics of Information, Databases to Support
Decision Making, Database Management Systems, Data Warehouses, Data Mining and Intelligent Agents
Model Component: Models Representation Methodology, Time Model Based Management Systems,
Access to Models Understandability of Results, Integrating Models Sensitivity of a Decision,
Mail Component: Integration of Mail Management Examples of Use implications for DSS.

Unit-III Intelligence and Decision Support Systems:
Programming Reasoning, Backward Chaining Reasoning, Forward Chaining Reasoning, Comparison,
Certainty Factors, User Interface Component: User Interface Components, The Action Language, Menus,
Command Language, I/O Structured Formats, Free Form Natural Language, The Display or Presentation
Language, Windowing Representations, Perceived Ownership of Analyses, Graphs and Bias Support for
All Phases of Decision Making, The Knowledge Base Modes of Communication

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.

Unit-V Implementation and Evaluation of DSS : Implementation Strategy, Prototypes, Interviewing,
User Involvement, Commitment to Change, Managing Change, Institutionalize System, Implementation
and System Evaluation, Technical Appropriateness, Measurement Challenges, Organizational
Appropriateness.

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

Semester: VIII
Subject: Software Technology
Total Theory Periods: 4 per week.
Total Marks in End Semester Exam: 80.
Minimum number of class tests to be conducted: 02.

Branch: Common to All Branches.
Code: 300885 (22)
Total Tut Periods: Nil.

UNIT-1 ASSEMBLY LANGUAGE PROGRAMMING
Pentium Assembly languages-Registers, Memory Model, Addressing mode, Isource Link, Installation, Assembler Directives.

ASSEMBLER DESIGN

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

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
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)

Semester: VIII  Branch: Common to All Branches
Subject: Knowledge Entrepreneurship  Code: 300886 (36)
Total Theory Periods: 40  Total Tut Periods: 12
Total Marks in End Semester Exam: 80
Minimum no. of class tests to be conducted: 2

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.
Catherine L Mann, *Knowledge entrepreneurship*, Oxford
Heinke Robkern, *Knowledge entrepreneurship*.
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI (C.G.)

Semester: VIII  
Subject: Financial Management  
Total Theory Periods: 3  
Total Marks in End Semester Exam: 80  
Minimum No. Of Class test to be conducted: 2

Branch: **Common to All Branches**  
Code: 300887(36)  
Total tutorial Period: 12

**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 Pandey.

**References books:**  
Financial management and policy, V K Bhallal,Anmol publications pvt. Ltd.  
Financial management, Van Horne.
UNIT I
Identification of projects—generation and screening of idea, monitoring corporate appraisal, preparing project profiles and project rating index.

UNIT II
Feasibility studies: Market and demand analysis, technical analysis, financial analysis and economic viability.

UNIT III
Project appraisal: Criteria, net present value, internal rate of return, payback period and accounting rate of return method.

UNIT IV
Project management and implementation—
Project planning, project control, prerequisites of implementation. Network techniques of project management—Project evaluation and review technique (PERT) and critical path method (CPM).

UNIT V
Project review and control—
Initial review, performance evaluation, abandonment analysis and its behavioral issues.

Text books:
Project planning, analysis, selection, implementation and review by Prasanna Chandra, TMH.
Reference Books:
Project management—Dr. Harold Kerzner.
Total Project management—Dr. P K Macmillan.
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: VIII  Branch: Common to All Branches
Subject: Safety Engineering  Code: 300889 (37)
Total Theory Periods:  50  Total Tutorial Period : 12
Total Marks in End Semester Exam:  80
Minimum number of class tests to be conducted: 2

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
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
Safety and Accident Prevention in Chemical Operation – H.H. Faweett and Wood
Personal Protective Equipment – NSC Bombay

REFERENCE BOOKS
Ergonomics - P. Krishna Murthy
Fire Prevention Hand Book – Derek James
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: VIII
Subject: Bioinformatics
Total Theory Periods: 4 per week.
Minimum number of class tests to be conducted: 02.

Branch: Common to All Branches
Code: 300890 (22)
Total Tut Periods: Nil.
Total Marks in End Semester Exam: 80.

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

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
UNIT – I
Energy Scenario
Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, re-structuring of the energy supply sector, energy strategy for the future, air pollution, climate change, Energy Conservation Act – 2001 and its features.

UNIT – II
Energy Conservation in Electric Utility and Industry

UNIT – III
Energy in Manufacturing

UNIT – IV
Heat Recovery System

UNIT – V
Energy Conservation Economics
Basic discounting, life cycle costing and other methods, factors affecting economics, energy pricing and incentives for conservation, energy conservation of available work identification of irreversible processes, primary energy sources, Optimum use of prime movers, energy efficient house keeping, energy recovery in thermal systems, waste systems and waste heat recovery in thermal systems, waste heat recovery techniques, conservation in energy intensive industries, thermal insulation.

TEXT BOOKS
2. Energy Management – Paul O’Callaghan –

REFERENCE BOOKS
2. Energy Management in illuminating System – Kao Chen – CRC Publishers
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: VIII
Subject: Nanotechnology
Code: 300892 (47)
Total Theory Periods: 50
Total Marks in End Semester Exam: 80
Minimum No. of Class test to be conducted: 2

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
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: VIII
Subject: Intellectual Property Rights
Total Theory Periods: 40
Total Marks in End Semester Exam: 80
Minimum No. Of Class test to be conducted: 2

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 e-commerce security, Dominent Publication and distribution, New Delhi.

Reference Books:
1. Inventors Guide to Trademarks and Patents- Craig Fellenstein, Rachel Ralson- Pearson Education.
2. Intellectual Property –David Bainbridge, Longman
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
Industrial Engineering & Management – O.P. Khanna – Dhanpat Rai & Sons

REFERENCES
Compendium on Value Engineering – H.G. Tufty – Indo American Society
Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: VIII
Subject: Disaster Management
Total Theory Periods: 40
Total Marks in End Semester Exam: 80
Minimum number of class tests to be conducted: 2

Branch: Common to All Branches
Code: 300895 (20)
Total Tutorial Periods: 12

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.

Name of Text Books:
Design of Earthquake Resistant Buildings – Minoru Wakabayashi (McGraw Hill Publication)
Dynamics of Structures: Theory and Application to Earthquake Engineering (2nd edition) – Anil K Chopra (Pearson Education Publication)

Name of Reference Books:
Fundamentals of Vibrations – Anderson, R.A. (Mc Millan)
Earth quake engineering damage assessment and structural design – S.F. Borg
Disasters and development – Cuny F (Oxford University Press Publication)
Unit 1
The Owner's Perspective
Introduction-The project life cycle-Major Types of Construction-Selection of Professional Services-Construction contractors-Financing of constructed facilities-Legal and regulatory Requirements-The changing Environment of the construction Industry-The Role Project Managers

Unit 2
Organizing for Project Management
What is 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-Build-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

Name of Text Books:
Project Management: A systems Approach to Planning, Scheduling and Controlling – Harold Kerzner (CBS Publishers & Distributors, Delhi, 1988)
Name of Reference Books:
Construction Project Management – Frederick E.Gould (Wentworth Institute of Technology, Vary E.Joyce, Massachusetts Institute of Technology, 2000)
Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: VIII  Branch: Common to All Branches
Subject: Ecology and Sustainable Development  Code: 300897 (20)
Total Theory Periods: 40  Total Tutorial Periods: 12
Total Marks in End Semester Exam: 80
Minimum number of class tests to be conducted: 2

Unit 1
Nature of ecology and sustainable development
Definition, scope of ecology an 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.

Name of Text Books:
Energy and environment – Fowler (McGraw Hill, New Delhi)
Restoration Ecology and sustainable development – Krystyna M. Urbanska et.al. (Cambridge University Press, U.K.)

Name of Reference Books:
Reuniting Economy and Ecology in Sustainable Development – Russ Beaton et.al. (-----)
Theory and implementation of economic models for sustainable development – Jeroen C.J.M. Van Den Bergh (----------)
Economy and Ecology: Towards sustainable development – F. Archibugi et.al. (--------)
Evaluating Sustainable Development: Giving People a voice in their destiny – Okechukwu Ukaga et.al. (-------)
**Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)**

Semester: VIII  
Branch: Common to All Branches  
Subject: Non Conventional Energy Sources  
Code : 300898 (19)  
Total Theory Periods: 50  
Total Tutorial Periods: 00  
Total Marks in End Semester Exam: 80  
Minimum number of class tests to be conducted: 02  
Note: Internal Choice may be given in any three units.

**Unit I**

**Unit II**

**Unit III**

**Unit IV**

**Unit V**

**Name of Text Books:**
1. John A Duffie & William A Beckman: Solar Energy Thermal processes Wiley Inter science publication  

**Name of Reference Books:**
UNIT I:

UNIT II:

UNIT III:

UNIT IV:

UNIT V:

Text Books:

Reference Books: