**Walchand College of Engineering, Sangli**
*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6OE386 |
| **Course Name** | Open Elective - 1: Joy of Programming using Python |
| **Desired Requisites:** | Computer Programming |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To introduce the significance of Python in programming |
| **2** | To compare various programming paradigms in Python |
| **3** | To familiarize different libraries of Python |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | Implement the programming concepts in Python | III | Applying |
| **CO2** | Examine the data using python programming libraries | V | Evaluating |
| **CO3** | Design application using Python libraries | VI | Creating |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Python:**<br>The basic elements of python, Branching Programs, Control Structures, Strings and Input, Iteration, Functions and scoping, Specifications, Recursion, Global variables. | 6 |
| II | **Advanced features of Python:**<br>Modules, Files, System Functions and Parameters, Strings, Tuples, Lists and Dictionaries, Lists and Mutability, Functions as Objects. | 6 |
| III | **Classes and Object-Oriented Programming:**<br>Abstract Data Types and Classes, Inheritance, Encapsulation and Information Hiding. | 7 |
| IV | **Module:**<br>Importing module, Math module, Random module, Packages Composition.<br>**Data Visualization:**<br>Matplot lib, Bar Graph, Pie Chart, Box plot, Histogram, Line chart, Sub plot | 6 |
| V | **Python-Numpy Library**<br>**NumPy:** Introduction, Numpy array, Numpy array indexing, Numpy operations. | 7 |

| | | |
|---|---|---|
| VI | **Pandas Library:**<br>**Pandas:** Series, Data frames, managing missing data, groupby, merging & concatenation, operations, data input and data output. | 7 |

| | |
|---|---|
| | |
| **Text Books** | |
| 1 | R. Nageswara Rao, "*Core Python Programming*", Dreamtech Press, 2nd Edition, 2017 |
| 2 | Chun, J Wesley, "*Core Python Programming*", Pearson, 2nd Edition, 2007 Reprint 2010 |
| | |
| **References** | |
| 1 | Barry, Paul, Head *First Python,* O Rielly,2nd Edition, 2010 |
| 2 | Lutz, Mark, *Learning Python*, O Rielly, 4th Edition, 2009 |
| | |
| **Useful Links** | |
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs32/preview |
| 2 | https://docs.python.org/3/tutorial/ |
| 3 | https://www.learnpython.org/ |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | 2 | | | | | | | | | | 3 | |
| **CO2** | | 1 | | | 2 | | | | | | | | | 2 |
| **CO3** | 2 | | 1 | | | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

**Walchand College of Engineering, Sangli**
*(Government Aided Autonomous Institute)*

**AY 2024-25**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6OE385 |
| **Course Name** | Open Elective - 1: Cloud Computing System |
| **Desired Requisites:** | Computer Networks |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To introduce fundamentals of virtualization |
| **2** | To impart various service and deployment model in cloud computing |
| **3** | To acquaint the significance of virtualization in data centre |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | Comprehend the fundamentals of cloud computation | II | Understanding |
| **CO2** | Choose virtualization techniques to deploy the service on cloud infrastructure | III | Applying |
| **CO3** | Analyze service models for data centre applications | IV | Analysing |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|

| | | |
|---|---|---|
| I | **Introduction to Cloud Computing**<br>Virtualization and Cloud Computing, Cloud Reference Model: IAAS, PAA SAAS, Cloud Deployment Model: Public Cloud, Private Cloud and Hybrid Cloud, Cloud Platforms in Industry | 7 |
| II | **Virtualization**<br>Hosted and Bare-Meta, Server Virtualization, Desktop Virtualizatio n, Application Virtualization, Storage Virtualization | 6 |
| III | **Network Functions**<br>Public Cloud Networking: Route53, Content Delivery Networks, Resilience Infrastructure, Virtual Network Functions: Cloud Firewall, DNS, Load Balancers, Intrusion Detection Systems | 6 |
| IV | **Virtual Private Clouds (VPC)**<br>VPC fundamentals, Public and Private Subnets, Security Groups, Network Access Control List, Network Address Translation. | 7 |
| V | **Cloud Management**<br>Service Management in Cloud Computing, Data Management in Cloud Computing, Resource Management in Cloud | 7 |
| VI | Open Source and Commercial Clouds, Cloud Simulator, Research trend in Cloud Computing, Fog Computing | 6 |

| | |
|---|---|
| | **Text Books** |
| 1 | Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, *"Mastering cloud computing"*, Mc Graw Hill Education, 3rd Edition, 2011 |
| 2 | Thomas Erl, Zaigham Mahmood and Ricardo Puttini, *"Cloud Computing: Concepts, Technology & Architecture"*, Pearson, 1st Edition, 2010 |
| | |
| | **References** |
| 1 | Richardo Puttini, Thomas Erl, and Zaigham Mahmood, *"Cloud Computing: Concepts, Technology & Architecture"*, Pearson Prentice Hall, 2nd edition, 2013 |
| 2 | Srinivasan, J. Suresh, *"Cloud Computing: A practical approach for learning and implementation"*, Pearson, 2nd Edition, 2012 |
| | |
| | **Useful Links** |
| 1 | Module: I, II, IV, V, VI<br>https://nptel.ac.in/content/syllabus_pdf/106105167.pdf |
| 2 | https://aws.amazon.com/ |

| **CO-PO Mapping** | | |
|---|---|---|
| | **Programme Outcomes (PO)** | **PSO** |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | | 2 | | | | | | | | | | 2 | | |
| **CO2** | | | 3 | | | | | | | | | | | | |
| **CO3** | 2 | | | | | | | | | | | | | 3 | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

| Course Information | |
|---|---|
| **Programme** | B.Tech. (Computer Science and Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6OE371 |
| **Course Name** | Data Science |
| **Desired Requisites:** | Probability and Statistics |

| Teaching Scheme | | Examination Scheme (Marks) | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **ISE** | **MSE** | **ESE** | **Total** |
| **Tutorial** | - | 20 | 30 | 50 | 100 |
| **Practical** | - | | | | |
| **Interaction** | - | **Credits: 3** | | | |

| Course Objectives | |
|---|---|
| **1** | To provide the knowledge and expertise to become a proficient data scientist. |
| **2** | To critically evaluate data visualizations based on their design and use for communicating. |
| **3** | |

| Course Outcomes (CO) with Bloom's Taxonomy Level | | |
|---|---|---|
| **CO1** | Acquaint core concepts and technologies in Data Science. | Understanding |
| **CO2** | Demonstrate data collection and management using different technologies. | Applying |
| **CO3** | Analyse and interpret large data sets in the context of real-world problems. | Analyzing |

| Module | Module Contents | Hours |
|---|---|---|
| I | **Module 1: Introduction to core concepts and technologies** Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications | 4 |
| II | **Module 2 Data Collection and Management** Introduction, Sources of data, Data collection, Exploring and fixing data, Data storage and management, Using multiple data sources. | 7 |
| III | **Module 3 Data Preprocessing** Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization. | 8 |
| IV | **Module 4 Data Visualization** Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, visual encodings. | 6 |
| V | **Module 5 Data Analysis** Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Correlation, Linear Regression, Least Squares, Residuals, Regression Inference, classification, classifiers. | 8 |
| VI | **Module 6 Recent trends** Recent trends in various data collection and analysis techniques, various visualization techniques, Case Study, application development methods used in data science. | 6 |

| Text Books | |
|---|---|
| 1 | Adhikari Ani and DeNero John. Computational and Inferential Thinking, The Foundations of Data Science, UC Berkeley. |

| | |
|---|---|
| 2 | Jiawei Han, Micheline Kamber and Jian Pei. Data Mining Concepts and Techniques. Morgan Kaufmann, Third Edition. |
| | |
| **References** | |
| 1 | O'Neil Cathy and Schutt Rachel. Doing Data Science, Straight Talk From The Frontline. O'Reilly. |
| 2 | Leskovek Jure, Rajaraman Anand and Ullman Jeffrey. Mining of Massive Datasets. v2.1, Cambridge University Press. |
| 3 | |
| | |
| **Useful Links** | |
| 1 | |
| 2 | |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 3 | | | | | | | | | | | | 1 | | |
| **CO2** | 1 | 2 | | | | | | | | 1 | | | 1 | | |
| **CO3** | 1 | 2 | | | | | | | | 1 | | | 1 | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

**Assessment**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

| Assessment | Marks |
|---|---|
| ISE1 | 10 |
| MSE | 30 |
| ISE2 | 10 |
| ESE | 50 |

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Electronics Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6OE358 |
| **Course Name** | Open Elective -1: Signals and Systems |
| **Desired Requisites:** | - |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | Develop the mathematical skills to solve problems involving signals and systems in various areas of appllications |
| **2** | To Understand signals and systems in terms of both the time and transform domains with , complementary insights into tools for analysis |
| **3** | |
| **4** | |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| | | |
|---|---|---|
| **CO1** | Classify the different signals and systems | Understand |
| **CO2** | Characterize LTI systems in the time domain and frequency domain | Apply |
| **CO3** | Use MATLAB software to implement the signal processing and system analysis for different applications | Apply |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Classification of Signals and Systems:** Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids, Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals, Classification of systems- CT systems and DT systems, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable. | 6 |
| II | **Analysis of CT and DT signals** Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and properties. | 8 |
| III | **Analysis of DT signals** Baseband signal Sampling – Fourier Transform of discrete time signals (DTFT) – Properties of DTFT - Z Transform & Properties | 6 |
| IV | **Linear Time Invariant DT Systems** Impulse response – Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems- DT systems connected in series and parallel. | 8 |
| V | **Application areas of Signals and Systems** Overview of applications of Signals and Systems in the fields of Speech and audio processing.Multimedia processing (image and video),Underwater acoustic, Biological signal analysis, Biometrics, control applications | 7 |
| VI | **Analysis of Signals and Systems using Simulation Tools** Introduction to MATLAB, Use MATLAB software to implement the signal processing and system analysis. | 4 |

| | |
|---|---|
| **Textbooks** | |
| 1 | B.P. Lathi, “Signals, Systems & Communications”- BS Publications, 2003. |
| 2 | A.V. Oppenheim, A.S. Willsky and S.H. Nawab,”Signals and Systems”- PHI, 2nd Edn. |
| 3 | |
| 4 | |
| | |
| **References** | |
| 1 | Simon Haykin and Van Veen,”Signals & Systems” -,Wiley, 2nd Edition. |
| 2 | |
| 3 | |
| 4 | |
| | |
| **Useful Links** | |
| 1 | NPTEL lectures |
| 2 | https://www.mathworks.com |
| 3 | |
| 4 | |

| **CO-PO Mapping** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | | |
| **CO2** | | 2 | | | | | | | | | | | | |
| **CO3** | | | | | 3 | | | | | | | | 2 | |
| The strength of mapping is to be written as 1: Low, 2: Medium, 3: High<br>Each CO of the course must map to at least one PO. | | | | | | | | | | | | | | |

| **Assessment** |
|---|
| The assessment is based on MSE, ISE and ESE.<br>MSE shall be typically on modules 1 to 3.<br>ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.<br>ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.<br>For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing) |

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

| **Course Information** | |
|---|---|
| **Programme** | B.Tech. (Electronics Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem. -V |
| **Course Code** | 6OE357 |
| **Course Name** | Open Elective-1: Introduction to Electronic Systems |
| **Desired Requisites:** | Basic Electronics Engineering |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

| **Course Objectives** | |
|---|---|
| **1** | To illustrate the concept behind electronics systems and its application. |
| **2** | |
| **3** | |
| **4** | |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| | | |
|---|---|---|
| **CO1** | Explain the working of components used in the electronic systems. | Understand |
| **CO2** | Develop a digital circuit for a given logic and build circuit for given specifications. | Apply |
| **CO3** | Analyze the performance of Data Acquisition System and Power Electronics Circuits. | Analyze |
| **CO4** | Test embedded system applications using Arduino board. | Apply |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Electronic System Components**<br>Transducers-Types, Classification, Characteristics: Signal Conditioning of inputs, Instrumentation Amplifiers, Capacitive type, Inductive type sensors, Limit switches, Temperature sensors:RTD, thermistor, Thermocouple, semiconductor diode sensor, piezoelectric transducer photovoltaic cell, LDR, Speed measurement using magnetic photoelectric pickup. Distance measurement: LVDT, capacitive transducers, Resistive, Glass scales, Magnetic scales. Concept of Quadrature output and index pulse.PH Sensors, ProximitySensors, Motion Sensors. | 7 |
| II | **Operational Amplifier**<br>Differential amplifier, Basic op-Amp configuration, Ideal op-amp analysis, Op-amp characteristics, Inverting and Non inverting amplifiers, Adder, Subtractor, voltage to current converters, current to voltage converters, instrumentation amplifiers, Active filters. Voltage comparator, Comparator application, waveform generators: multivibrators, oscillators. | 8 |
| III | **Digital Systems**<br>Flip-flops, Counters, Up-counters, Down Counters, Mod-N counters, State diagram. | 5 |
| IV | **Data Acquisitions System**<br>Digital to Analog Converter (DAC), Analog to Digital converter (ADC), Data Acquisition System (DAS): introduction, objectives of DAS, single and multichannel, data conversion, sample and hold circuit, elements of DAS, interfacing of transducers-multiplexing. | 7 |
| V | **Power Semiconductor Devices and its Applications**<br>SCR, TRIAC, DIAC, UJT, AC voltage regulator, Controlled rectifiers, Inverters, Speed control of AC and DC motors, SMPS,UPS, Electronics lamp ballast. | 5 |

| | | |
|---|---|---|
| VI | **Embedded Systems**<br>Introduction to microcontroller based system: Arduino board, Arduino based systems, Simple Arduino program, interfacing display board to Arduino, Speed control of DC motor, motor driver IC: L293D. | 8 |

| | |
|---|---|
| | |
| **Textbooks** | |
| 1 | R. Boylestad and L. Nashelsky, “Electronics Devices and Circuits”, 8th Edition, Prentice Hall International, 2005. |
| 2 | Anand Kumar, "Fundamentals of Digital circuits", 2nd Edition, PHI, 2009. |
| 3 | A. K. Sawhney, “Measurements and Instrumentation”, Dhanpat Rai and Sons, 2013 |
| 4 | |
| | |
| **References** | |
| 1 | R. P. Jain, "Modern Digital Design", Mc-Graw-Hill, 2008 |
| 2 | Ramakant Gaikwad, “Op-amps and Linear Integrated Circuits”, Pearson Education, 2011. |
| 3 | M.D. Singh and KB Khanchandani, “Power Electronics”, 2nd Edition, McGraw-Hill, 2007. |
| 4 | |
| | |
| **Useful Links** | |
| 1 | www.spoken-tutorial.org ---IIT Bombay. |
| 2 | |
| 3 | |
| 4 | |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | | 2 |
| **CO2** | 3 | | 2 | | | | | | | | | | | 2 |
| **CO3** | | 3 | | | | | | | | | | | | 3 |
| **CO4** | 3 | | 2 | | | | | | | | | | | 3 |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

| **Course Information** | |
|---|---|
| **Programme** | B.Tech. (Electrical Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6OE343 |
| **Course Name** | Open Elective I : Electrical Machine Technology |
| **Desired Requisites:** | Basic Electrical Engineering |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

| **Course Objectives** | |
|---|---|
| **1** | To make students understand operation and performance of ac and dc machines. |
| **2** | To make students learn characteristics of ac and dc machines. |
| **3** | To develop skills to choose ratings of ac and dc machines for various applications. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | **Explain** the construction and working principle of A.C. and D.C. Machines. | II | Understand |
| **CO2** | **Examine** the various characteristics of A.C. and D.C. machines. | III | Apply |
| **CO3** | **Analyze** the performance of A.C. and D.C. machines for various applications. | IV | Analyze |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Module 1: DC Motors**<br>Review of Construction, Working and Types, Back emf, Speed equation, Armature Reaction, Torque equation, Speed torque characteristics, Applications, Power losses in d.c. motors. Need of starter speed control of D.C. shunt and series motor, Reversal of rotation, Electric braking of shunt and series motor. | 7 |
| II | **Module 2: Single Phase Transformer**<br>Construction and type, EMF equation phasor diagram, equivalent circuit, efficiency, losses, regulation, Experimental determination of equivalent circuit parameters and calculation of efficiency and regulation, Introduction to three Phase Transformer, Connection of three Phase Transformer, Applications of Transformers. | 7 |
| III | **Module 3: Single-Phase Induction Motor**<br>Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, capacitor run, and shaded pole motors. Comparison of single-phase motors and applications. | 6 |
| IV | **Module 4: Three Phase Induction Motor**<br>Construction, Types, Working, Speed equation, Torque equation, Starting torque, Concept of full load torque, torque speed characteristics, Power stages in motor, Induction Generator. | 6 |

| | | |
|---|---|---|
| V | **Module 5: Synchronous Machines**<br>Alternator, Construction of Alternator, Synchronous Motor, Equivalent Circuit, Motor on load, Pull-Out Torque, Motor Phasor Diagram, Mechanical Power Developed by Motor, Power Factor of Synchronous Motor, Application of Synchronous Motor, Comparison of Synchronous Motor with Induction Motor. | 6 |
| VI | **Module 6: Special-Purpose Electric Machines**<br>Stepper motor-Variable-Reluctance Motor, Permanent Magnet Motor, Hybrid Stepper Motor, Servomechanism, D.C. Servomotors, A.C. Servomotors, Switched Reluctance Motor, Permanent Magnet D.C. Motor, Brushless D.C.Motor. Selection and Sizing of Motors based on applications. | 4 |

| **Textbooks** | |
|---|---|
| 1 | S. J. Chapman, "Electric Machinery Fundamentals", Tata Mc Graw Hill publication, 4th Edition,<br>2011, ISBN: 9780071070522 |
| 2 | M. G. Say. "Performance Design of AC Machines", CBS Publishers, 3rd Edition, 2017, ISBN: 9788123910277 |

| **References** | |
|---|---|
| 1 | SK Bhattacharya, "Electrical Machines", Tata Mc Graw Hill, 3rd Edition, 2010, ISBN: 9789332902855 |
| 2 | J. B. Gupta, "Electrical Machines", SK Kataria and Sons, 2013, ISBN: 9789350140550 |

| **Useful Links** | |
|---|---|
| 1 | https://nptel.ac.in/courses/108/102/108102146/ |
| 2 | https://nptel.ac.in/courses/108/105/108105155/ |
| 3 | https://nptel.ac.in/courses/108/105/108105131/ |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | | |
| **CO2** | | 2 | | | | | | | | | | | | |
| **CO3** | | 2 | | | | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B. Tech. (Mechanical Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem. V |
| **Course Code** | 6OE329 |
| **Course Name** | OE 1-Non Conventional Machining Processes |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3Hrs/week | MSE | ISE | ESE | Total |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| **Practical** | - | - | | | |
| **Interaction** | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To learn about various nonconventional machining processes the various techniques, performance characteristics and their applications |
| **2** | To introduce students with various machine tools and their peculiars used for nonconventional machining. |
| **3** | To train the students to identify main variables of nonconventional machining processes and to judge their effect on developed products. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| | | |
|---|---|---|
| **CO1** | Explain various nonconventional machining processes, tooling and equipment's required for various manufacturing applications. | understanding |
| **CO2** | Exploit the capabilities and applications of nonconventional machining processes. | Apply |
| **CO3** | Analyze effect of different parameters influencing on nonconventional machining processes and compare with other technique applications. | Analyze |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction:** Introduction to nontraditional machining methods -Need for non -traditional machining -Sources of metal removal, Classification on the basis of energy sources -Parameters influencing selection of process. | 6 |
| II | **Mechanical Type AMPs:** Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining – Ultrasonic Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters– MRR- Applications | 7 |

| | | |
|---|---|---|
| III | **Thermal Type AMPs:**<br>Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications- Micro-EDM, Micro-WEDM. | 7 |
| IV | **Chemical Type AMPs:**<br>Principles of Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants – Maskant -techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications- equipments-Surface Roughness and MRR, Electrical circuit-Process Parameters- ECG and ECH – Applications | 7 |
| V | **Medium Assisted AMPs:**<br>Laser Beam Machining: Material removal mechanism, types of Lasers, LBM equipment, process characteristics, applications. Electron Beam Machining: Basic equipment and metal removal mechanism, process characteristics, applications. Plasma Beam Machining: Machining systems, material removal rate, accuracy and surface quality, applications. Ion Beam Machining: Introduction, material removal rate, accuracy and surface effects, applications | 7 |
| VI | **Advanced MPs:**<br>Basics and definitions: Principle of layer-based technology, advantages, classification. Rapid Prototyping Process Chain: 3D Modeling, Data Conversion and Transmission, Checking and Preparing, model building, post processing. Rapid prototyping techniques: Stereo lithography, Solid Ground Curing (SGC), Fused Deposition Modeling (FDM) | 6 |

| **Text Books** | |
|---|---|
| 1 | Jagadeesha T., "Nontraditional Machining Processes", Wiley India-Dreamtech Presss ,2020 |
| 2 | Jagadeesha T., "Unconventional Machining Processes", Wiley India-Dreamtech Presss ,2020 |
| 3 | Mishra P. K., "Non-Conventional Machining", The Institution of Engineers (India), Text Book Series, New Delhi, 1997 |
| 4 | Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd, New Delhi, 2009. |

| **References** | |
|---|---|
| 1 | Hassan El-Hofy, "Advanced Machining Processes: Nontraditional and Hybrid Machining Processes", McGraw-Hill Co, New York (2005). |
| 2 | Benedict, Gary F., "Non-Traditional Manufacturing Processes", Marcel Dekker Inc., New York (1987) |
| 3 | Garry F. Benedict, "Unconventional Machining Process", Marcel Dekker Publication, New York, 1987 |

| **Useful Links** | |
|---|---|
| 1 | https://www.youtube.com/watch?v=oI3RIAvyVxc&list=PLbMVogVj5nJSzoQXmu7dsj9ZKJyZ1P4O8 |
| 2 | https://www.youtube.com/watch?v=P8zdXuIxQt4 |
| 3 | https://www.youtube.com/watch?v=Hc6mfNWT8oQ&t=5s |
| 4 | https://nptel.ac.in/courses/112/105/112105212/ |
| 5 | https://nptel.ac.in/courses/112/103/112103202/ |
| 6 | https://www.youtube.com/watch?v=yWBGnkhGKz8 |

| | |
|---|---|
| 7 | https://www.youtube.com/watch?v=Cz-KsEBLWNI |
| 8 | https://www.youtube.com/watch?v=r4Qws2G3f8E |
| 9 | https://youtu.be/Sfj8_9oRCNk |
| 10 | https://www.youtube.com/watch?v=cxU1zUOpGLk |
| 11 | https://www.youtube.com/watch?v=PaYInS9axxw&list=PLzCSUZGIUJkaSyCzPiQMWynGyxmC8hrpl |
| 12 | https://www.youtube.com/watch?v=QJ-kKIdALRk |

**Civil**

| CO-PO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 | | | 2 | 2 | | | | | | | | | | |
| **CO2** | 2 | 2 | | | 1 | | | | 1 | 1 | | | | | |
| **CO3** | 2 | 2 | | | 1 | 1 | 1 | | | | | 1 | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | | | | | | |

**Electronics**

| CO-PO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 | | | | 2 | 2 | | | | | | | | | |
| **CO2** | 2 | 1 | | | 1 | 1 | 1 | | | | | 1 | | | |
| **CO3** | 2 | 2 | 2 | 2 | 1 | | | | | | | 1 | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | | | | | | |

**Electrical**

| CO-PO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 | | | 2 | | | | | | | | 1 | | | |
| **CO2** | 2 | 2 | | | 2 | | | | 1 | | | 1 | | | |
| **CO3** | 2 | 2 | | 2 | 2 | | | | | | | 1 | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | | | | | | |

**Computer Science**

| CO-PO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 | | | 1 | 1 | 1 | | | | | | | | | |
| **CO2** | 2 | 2 | 1 | | 2 | | | | | | | 1 | | | |
| **CO3** | 2 | 1 | 2 | | 2 | | | | | | | 1 | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | | | | | | |

**Information Technology**

| CO-PO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 | | | | | | | | | | | | | | |
| **CO2** | 2 | 1 | | | 2 | | | | 1 | | | | | | |
| **CO3** | 1 | 2 | 2 | | 2 | | | | 1 | | | | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | | | | | | |

| Assessment (for Theory Course) |
|---|
| The assessment is based on MSE, ISE and ESE.<br>MSE shall be typically on modules 1 to 3.<br>ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.<br>ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.<br>For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing) |

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2024-25**

**Course Information**

**Multidisciplinary Minor in Structural Engineering**

| | |
|---|---|
| **Programme** | B. Tech. (All branches except Civil Engineering) |
| **Class, Semester** | Third Year B. Tech, Sem VI |
| **Course Code** | 6OE307 |
| **Course Name** | Rehabilitation of Concrete Structures |
| **Desired Requisites:** | Strength and Mechanics of Materials – I & II |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| | | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To impart knowledge of concrete and their advances in modern construction. |
| **2** | To make conversant with the techniques for Retrofitting and strengthening of structures. |
| **3** | To Identify various NDT methods and select the appropriate technique for different materials and inspection scenarios. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Levels** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | **Examine** properties of fresh concrete for given grade with help of code provision. | III | Applying |
| **CO2** | **Determine** the different properties of given grade of cement and aggregates. | III | Applying |
| **CO3** | **Analyse** the various admixture based on their applications to achieve advancement in concrete. | IV | Analysing |
| **CO4** | **Test** different non-destructive testing for finding the properties of concrete. | V | Evaluating |
| **CO5** | **Assess** the different types of concrete used for repair and rehabilitation of structures based of its characteristics. | V | Evaluating |
| **CO6** | **Select** suitable rehabilitation and retrofitting systems based on different types of deteriorations in concrete structures. | VI | Creating |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Properties of concrete ingredients**<br>Properties of coarse and fine aggregates and their influence on concrete, types of cement and their use, Grades of ordinary Portland cement, Portland pozzolana cement, rapid hardening Portland cement, hydrophobic cement, low heat Portland cement and sulphate resisting Portland cement as per relevant I.S. codes. Types of aggregates and their properties. Testing of aggregates as per relevant IS Codes | 4 |
| II | **Properties of different types of concrete**<br>Concrete for structural work, light weight concrete, high density concrete, workability, durability and strength requirements, effect of w/c ratio on properties of fresh and hardened concrete, acceptability criteria, laboratory testing of fresh and hardened concrete, Fire resistant properties of hardened | 4 |

| | | |
|---|---|---|
| | concrete. | |
| III | **Advances in Concrete**<br>**Admixtures -** Plasticizers, Retarders, Accelerators and other Admixtures, Test on Admixtures, Chemistry and Compatibility with concrete. GGBS fly Ash, Metakaolin, Silica Fumes, crush sand.<br>**Ready Mix Concrete -** Requirements of ready mix concrete, properties of RMC, transit mixer details, Automation, instrumentation and Layout of RMC plant. | 5 |
| IV | **Non-destructive testing of concrete**<br>Rebound hammer test, Ultrasonic pulse velocity test, Magnetic particle testing, Liquid penetration testing, Visual testing, Laser Testing methods, Impact echo test, carbonation test, Half-cell potentiometer and corrosion of steel, Core test and relevant provisions of I.S. codes. | 5 |
| V | **Concrete for repairs and rehabilitation of structures**<br>High Performance concrete, Polymer Concrete, Fiber Reinforced Concrete, Light weight concrete and its manufacture, Polymer Impregnated Cement Concrete, Polymer Modified cement concrete and Ferro Cement, Special Tests for concrete used for repairs and rehabilitation. | 4 |
| VI | **Rehabilitation and Retrofitting Methods**<br>Grouting & crack repair, patch repair, replacement of structurally weak concrete, replacement of spalled, and/or delaminated concrete, replacement of carbonated concrete surrounding steel reinforcement, repairs using mortars, portland cement mortars, polymer modified cement mortars, epoxy mortars, pre-placed aggregate concrete, shotcrete, concrete replacement epoxy bonded concrete, silica fume concrete, polymer concrete system. | 4 |
| | | |
| **Textbooks** | | |
| 1 | M.L. Gambhir, Concrete Technology, McGraw Hill Book Company, Fifth Edition, 2017. (ISBN-1259062554, 978-1259062551). | |
| 2 | M.S. Shetty, Concrete Technology, Theory and Practice, S. Chand Publication, Sixth Edition, 2018. (ISBN- 9788121900034,978-8121900034) | |
| 3 | P.K. Guha, “Maintenance and Repairs of Buildings”, New Central book Agencies Publications, 5 th Edition, 2015. | |
| 4 | Nayak B. S., “Maintenance Engineering For Civil Engineers” Khanna Publication, 2 nd Edition, 2011. | |
| | | |
| **References** | | |
| 1 | B.L. Gupta and A. Gupta, Concrete Technology, Jain Book Agency, 2013. (ISBN8180140407, 978-8180140402). | |
| 2 | Neville A.M., and Brooks J.J., Concrete Technology, Pearson Education, Indian reprint, Chennai, 2002. | |
| 3 | Hutchin B. D., “Maintenance and Repairs of Buildings”, Newnes Butterworth Publications, 6 th edition, 1975. | |
| 4 | CPWD hand book on Repairs and Rehabilitation of RCC buildings published by DG (Works), CPWD, Government of India (Nirman Bhawan), | |
| 5 | Campbell D., Allen and Roper H., Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991. | |
| | | |
| **Useful Links** | | |
| 1 | https://archive.nptel.ac.in/courses/105/106/105106202/# | |
| 2 | https://iitb.vlabs.co.in/discipline.html?discipline=Civil_Engineering | |

| CO-PO Mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | | | | | | | | | | | | | | |
| **CO2** | | | | | | | | | | | | | | |
| **CO3** | | | | | | | | | | | | | | |
| **CO4** | | | | | | | | | | | | | | |
| **CO5** | | | | | | | | | | | | | | |
| **CO6** | | | | | | | | | | | | | | |
| The strength of mapping is to be written as 1: Low, 2: Medium, 3: High<br>Each CO of the course must map to at least one PO. | | | | | | | | | | | | | | |

| Assessment |
|---|
| The assessment is based on MSE, ISE, and ESE.<br>MSE shall be typically on modules 1 to 3.<br>ISE shall be taken throughout the semester in the form of a teacher's assessment. Mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO.<br>ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.<br>For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing). |

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

| **Course Information** | |
|---|---|
| **Programme** | B. Tech. (Other than Civil Engg.) |
| **Class, Semester** | Third Year, Semester II |
| **Course Code** | |
| **Course Name** | Building Planning and Construction |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

| **Course Objectives** | |
|---|---|
| **1** | To impart Necessary knowledge and concepts in Building Planning and functional design. |
| **2** | To impart Necessary knowledge and concepts in the utilization of building materials, their properties and their applications in construction of building. |

| **Course Outcomes (CO) with Bloom's Taxonomy Level** | | |
|---|---|---|
| At the end of the course, the students will be able to, | | |
| **CO1** | Grasp the principles of planning, building bye laws to apply in the planning of residential/public buildings in relation to functional planning. | Understand |
| **CO2** | Classify the various components and their relationships in buildings and identify the materials and building services to be adopted for different buildings. | Apply |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Site, Building and Building Drawings**<br>Categories of buildings, Types of Residential buildings, Site selection, Factors influencing selection of site, guidelines for planning and drawing of buildings, Positions of various building components, types of drawings and relevant scales. | 6 |
| II | **Principles of Building Planning and Building Bye laws**<br>Principles of planning: Aspects, prospect, Privacy, Furniture, Roominess, Grouping, Circulation, Sanitation, Lighting, Ventilation, Flexibility, Elegance, Sanitation, Economy.<br>Bye laws: Minimum plot size, building frontage, open spaces, standard dimensions in buildings, Provision for light & ventilation, FSI, Height of Building. | 7 |
| III | **Planning concepts in Buildings**<br>Requirements in different types of buildings, Integrated approach to planning in various aspects like aesthetics, landscape, interior, etc. Guidelines for planning & drawing residential and public buildings. | 6 |
| IV | **Components of building**<br>Sub structure, Foundations, Bearing Capacity of Soils, Types of Shallow and Deep foundations, Conditions for their applications, masonry, Bonds, Doors, Windows, Staircases, Roofs and Floors, Flooring and their Applications | 7 |
| V | **Construction Materials**<br>Types, Engineering properties and Uses of Bricks, Stones, Aggregate, Lime, Cement, Steel, Aluminium, PVC, Glass.<br>Concrete: Ingredients, Preparation, Properties of concrete, Types of concrete and their applications | 7 |

| | | |
|---|---|---|
| VI | **Building Services and Finishes**<br>Plumbing services for water supply, plumbing services for drainage, symbols, Electrification, symbols of electrical fixtures, Types of Plastering and Pointing, Defects, Paints and Varnishes Types, Application, Methodology on various surfaces, Defects. | 7 |

| **Textbooks** | |
|---|---|
| 1 | R.K.Rajput S. 'Building Materials' S. Chand Publications. |
| 2 | Bindra and Arora, "Building Construction", Dhanpat Rai and Sons |
| 3 | Kumarswamy and Kameshwar Rao., "Building Planning and Design," Tata McGraw Hill Pvt. ltd, 1995. |
| 4 | Civil Engineering Drawing - V. B. Sikka, S. K. Kataria and Sons. |

| **References** | |
|---|---|
| 1 | Punmia, Jain, Jain, "Building Construction", Laxmi Publications ltd. 2005 |
| 2 | Mantri Institute's 'The A to Z of Practical Building Construction and its Management' Mantri Institute of Devp. and Research. Pune, 1994. |
| 3 | Building drawing with Integrated approach – Shah, Kale & Patki, Tata Mc Graw Hill Pub. |
| 4 | National Building Code of India and SP- 7. |

| **Useful Links** | |
|---|---|
| 1 | https://www.youtube.com/watch?v=pYLKA4YQMyI&list=PL46yD-wnVQqxZ8f-_g1PZaFjJIxnJWyFE |
| 2 | https://www.youtube.com/watch?v=4kLXfCGB_RI&list=PL46yD-wnVQqxZ8f-_g1PZaFjJIxnJWyFE&index=5 |
| 3 | https://www.youtube.com/watch?v=2tb1heySCx0 |
| 4 | https://www.youtube.com/watch?v=Y0Y8zuETHOQ |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 2 | | | | | | | | | | | | | |
| **CO2** | 2 | | | | | | | | | | | | 1 | |

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2024-25**

| **Course Information** | |
|---|---|
| **Programme** | B.Tech. All Branches |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6OE388 |
| **Course Name** | Biology for Engineers |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 03 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | 00 Hrs/week | 30 | 20 | 50 | 100 |
| | | **Credits: 03** | | | |

| **Course Objectives** | |
|---|---|
| **1** | To familiarize the students to gain a comprehensive understanding of the fundamental principles governing biological systems, including cellular biology, genetics, and physiology, to appreciate the complexities involved in biological processes. |
| **2** | To foster collaboration between engineering and biology disciplines by engaging in interdisciplinary projects, discussions, and case studies |
| **3** | To explore the intersections between biology and engineering disciplines, focusing on how engineering principles can be applied to understand, manipulate, and design biological systems and technologies. |
| **4** | To motivate the students to develop interdisciplinary vision of biological engineering. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Descriptor** |
|---|---|---|---|
| **CO1** | Perceive the fundamental principles of biology and its relevance to engineering disciplines. | II | Understanding |
| **CO2** | Demonstrate effectively with other interdisciplinary team members to address challenges of biology and engineering. | III | Applying |
| **CO3** | Inspect the interactions between biological systems and engineered technologies, considering ethical implications. | III | Applying |
| **CO4** | Execute innovative biobased solutions for socially relevant problems. | III | Applying |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **CELL BIOLOGY AND IMMUNOLOGY.** Structure and functions of Prokaryotic and Eukaryotic cell. Introduction to Immunity, Types of Immunities and Antigens. Immunoglobulins: Structure and functions, different classes of immunoglobulins. | 7 |
| II | **INFECTIOUS DISEASES IN HUMAN BODY.** Viral Infections, Bacterial Infections, Fungal Infections, Parasitic Infections, Emerging and Re-emerging Infections. | 4 |
| III | **HUMAN ORGAN SYSTEMS AND BIO DESIGNS 1** Brain as a CPU system. Eye as a Camera system. Heart as a pump system, Pacemaker. | 7 |
| IV | **HUMAN ORGAN SYSTEMS AND BIO-DESIGNS - 2** Lungs as purification system, Kidney as a filtration system and Muscular and Skeletal Systems as scaffolds | 7 |
| V | **TRENDS IN BIOENGINEERING** Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Self- healing Bioconcrete, Bioremediation and Biomining. | 7 |

| | | |
|---|---|---|
| VI | **APPLIED BIOLOGY AND BIOTECHNOLOGY**<br>Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology). Transgenics.<br>• Application of Biotechnology in Health and Agriculture<br>• Introduction to transgenics: Gene therapy, Biosafety issues– Bio piracy | 7 |

| **Textbooks** | |
|---|---|
| 1 | T. S. Ranganathan, Text book of Human Anatomy, S. Chand and Company Ltd, 2002. |
| 2 | P. S. Verma and V. K. Agarwal, Concept of Cell Biology, S. Chand and Company Ltd, 2002. |
| 3 | R. D. Vidyarthi and P. N. Pandey, A Text book of Zoology, S. Chand and Company Ltd, 2004. |

| **References** | |
|---|---|
| 1 | Bruce Alberts and Alexander Johnson, Molecular Biology of the Cell Garland Science, Taylor & Francis Group, 6th Edition, 2015. |
| 2 | Peter H. Raven, George B. Johnson, Biology, McGraw hill, 11th edition, 2017. |
| 3 | Laurence A. Cole, Biology of Life - Biochemistry, Physiology and Philosophy, Elsevier, 2016. |

| **Useful Links** | |
|---|---|
| 1 | https://www.youtube.com/watch?v=yaQhH9iKY0M |
| 2 | https://www.youtube.com/watch?v=V6s0xOTNmT4 |
| 3 | https://www.youtube.com/watch?v=5Q9LgvQs5Nw |
| 4 | https://www.youtube.com/watch?v=nzJXq4YMPYE |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | **2** | | | | | | | | | | | | | |
| **CO2** | | **2** | | | | | | | | | | | | |
| **CO3** | | | **3** | | | | | **2** | | | | | | |
| **CO4** | | **2** | **2** | | | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2022-23**

**Course Information**

| | |
|---|---|
| **Programme** | B. Tech. (Other than Civil Engg.) |
| **Class, Semester** | Third Year, Semester II |
| **Course Code** | 6OE309 |
| **Course Name** | Open Elective 2: Solid Waste Management |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs./week | **ISE** | **MSE** | **ESE** | **Total** |
| **Tutorial** | - | 20 | 30 | 50 | 100 |
| **Practical** | - | | | | |
| **Interaction** | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | Provide knowledge on functional elements, rules and Government initiatives for SWM. |
| **2** | Provide knowledge about different waste processing and disposal methods. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

| | | |
|---|---|---|
| **CO1** | ***Explain*** fundamental elements of SWM and associated rules and government initiatives regarding solid waste disposal. | Understand |
| **CO2** | ***Identify*** proper method of collection, transportation, and processing of Solid Waste. | Analyse |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Fundamentals of Solid Waste Management**<br>Sources, Types, Composition, Physical, Chemical and Biological properties. Impact of solid waste on environment, Solid waste management hierarchy, Factors affecting solid waste generation rate. | 7 |
| II | **Storage, Collection and Transportation of Municipal Solid Waste**<br>Storage and collection: General considerations for waste storage at source, Collection components, Types of collection systems and its design, Transportation of solid waste: Means and methods, Routing of vehicles. | 7 |
| III | **Waste Processing techniques & Material recovery**<br>Waste Processing Techniques: Purpose, Mechanical volume and size reduction, component separation techniques.<br>Material recovery and recycling: Objectives, recycling program elements,<br>commonly recycled materials and processes, energy recovery from solid waste | 7 |
| IV | **Thermal Processing**<br>Fundamentals of thermal processing, combustion, effects of combustion, pyrolysis, incineration, refuse derived fuels, energy recover | 7 |
| V | **Biochemical Processes**<br>Factors affecting, properties, benefits, aerobic and anaerobic digestion, composting, vermi-composting and other biochemical processes | 5 |
| VI | **Landfills and solid waste management rules**<br>Landfills: Site selection, Types, Processes, Land filling methods, Leachate and landfill gas management, Waste Management legislation in India, Solid waste management and handling rule 2016 | 7 |

**Text Books**

| | |
|---|---|
| 1 | Bhide. A. D. and Sundaresan. B. B., "Solid Waste Management", Indian National Scientific Documentation Centre, 1st Edition, 1983. |
| 2 | CPHEEO, "Manual on Municipal Solid waste management", Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000 |

| | |
|---|---|
| 3 | Tchobanoglous G., “Integrated Solid Waste Management”, Tata McGraw-Hill Publishing Company Limited, 1st Edition, 1993. |
| | |
| **References** | |
| 1 | Vesilind, Worrell and Reinhart, “Solid Waste Engineering”, Cengage Learning India Pvt. Ltd., |
| 2 | Masters G., “Introduction to Environmental Engineering and Science”, Pearson Education, 2004 |
| 3 | Peavy, Rowe and Tchobanoglous, “Environmental Engineering”, Tata McGraw-Hill Publishing Company Limited, 1st Edition, 1985. |
| 4 | “SWM Rules 2016”, Swachh Bharat Mission and Smart Cities Program of India. |
| | |
| **Useful Links** | |
| 1 | https://www.youtube.com/channel/UCCDzHkpuIuD1ZC0wsCXUuPQ |
| 2 | https://www.youtube.com/watch?v=STcFSthSJWo&list=PL3MO67NH2XxIYoUFN8csPPnEiYVyR0TO |
| 3 | https://www.youtube.com/watch?v=ri9Op5vQfA&list=PLL9jm6CAGn2UzZZfZzSycEANAQUkc5E_e |

| **CO-PO Mapping** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | | |
| **CO2** | | 2 | | | | | | | | | | | 1 | |

| **Assessment** |
|---|
| The assessment is based on 1 in-semester evaluations (ISE) of 20 marks, 1 mid-semester examination (MSE) of 30 marks and 1 end-semester examination (ESE) of 50 marks.<br>MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE. |

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2024-25**

**Course Information**

| | |
|---|---|
| **Programme** | B. Tech. (Mechanical Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem. VI |
| **Course Code** | 6ME336 |
| **Course Name** | Basics of Automobile Engineering |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs./week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To make students familiar with various basic of Engine and modern automobile. |
| **2** | To introduce the mathematical treatments required for vehicle performance and for some of important systems such as steering system and brake system. |
| **3** | To make students aware about latest trends in transportation towards a safe, pollution free and fully automatic vehicle. |
| **4** | To empower students to face the real life automotive usage with greater confidence. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | Comprehend about I C Engines, various automotive systems, components and recent trends in automotive systems. | II | Understand |
| **CO2** | Apply vehicle dynamics concepts to investigate influence of various parameters in automotive system. | III | Applying |
| **CO3** | Analyze acceleration, barking and steering performance of a vehicle in different driving conditions. | IV | Analyze |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction, classification, Types of I C Engine.** Engine cycles, Combustion in SI & CI engines, Supercharging & emission control techniques, Engine performance parameters. | 6 |
| II | **Introduction, classification and Automotive power plants** Introduction, Broad classification of Automobiles. Major components and their functions. Types of vehicle layouts, Types of bodies. Requirements of automotive power plants, Comparison and suitability considerations. Engine cycles. | 6 |
| III | **Vehicle Performance** Resistance to vehicle motion, Air, Rolling and Gradient resistance, Acceleration, | 8 |

| | | |
|---|---|---|
| | Gradeability and draw bar pull, Traction and Tractive effort, Distribution of weight, Power required for vehicle propulsion, Selection of gear ratio, Rear axle ratio. | |
| IV | **Electric and Hybrid Electric vehicles**<br>Classification and working of Electric and Hybrid vehicles, Design considerations, Electric and Hybrid vehicles- Layout, advantages and limitations. Present scenario of Electric vehicles, issues and challenges in the Electric Vehicle. | 6 |
| V | **Transmission System ,Suspension, Steering, Braking and Electrical System**<br>Automobile clutch requirements, Types & functions - clutches, gearboxes, construction and Working, Principle of operation of automatic transmission, Torque converter, Epicyclic gear train, Propeller shaft, Universal joint, Final drive, Differential, Rear axles. Suspension requirements, Sprung and Unsprung mass, Types of automotive suspension systems. Function of steering, Steering system layout, Automotive steering mechanism, Types of steering gear boxes, , Types of braking mechanism, Calculation of braking force required, stopping distance and dynamic weight transfer Automotive batteries, Automotive electric systems, Engine electronic control modules, Safety devices. | 8 |
| VI | **Recent trends in Automotive Development**<br>NVH and crashworthiness of vehicles, Emission norms and control, Testing and certification of vehicles. Introduction to Electric and Hybrid power trains. | 5 |

| **Text Books** | |
|---|---|
| 1 | V Ganesan, “Internal combustion Engine”, McGraw Hill Education ,4th Edition, 2012 |
| 2 | Kripal Singh, “Automobile Engineering Vol. II”, Standard Publishers Distributors, Tenth Edition , 2007 |
| 3 | P S Gill, “Automobile Engineering II”, S K Kataria and Sons, Second Edition, 2012 |
| 4 | R K Rajput, “Automobile Engineering”, Laxmi Publications, First Edition, 2007 |

| **References** | |
|---|---|
| 1 | John B Heywood, “Internal Combustion Engines fundamentals”, McGraw-Hill, Revised 2nd Edition, 2017 |
| 2 | Newton, Steeds and Garrett, “The Motor Vehicle”, Butterworths International Edition, 11th Edition, 1989 |
| 3 | Crouse and Anglin, “Automotive Mechanics”, McGrawhill Publication, Tenth Edition, 2007 |
| 4 | P W Kett, “ Motor Vehicle Science Part - 2, “ Chapman & Hall” , 2nd Edition, 1982 |

| **Useful Links** | |
|---|---|
| 1 | https://onlinecourses.nptel.ac.in/noc21_me69/preview |
| 2 | https://nptel.ac.in/courses/107/106/107106088/ |
| 3 | https://nptel.ac.in/courses/107/106/107106080/ |
| 4 | https://ed.iitm.ac.in/~shankarram/Course_Files/ED5160/ED5160_Journal_Complete_Notes.pdf |

| **CO-PO Mapping** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Programme Outcomes (PO) Civil** | | | | | | | | | | | | **PSO** | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| **CO1** | | 1 | 1 | | | | | | | | 1 | | | | |
| **CO2** | 1 | 1 | | 1 | | | | | | | | | | | |
| **CO3** | | 1 | | 2 | | | | | | | | 1 | | | |
| | **Programme Outcomes (PO) Electrical** | | | | | | | | | | | | **PSO** | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | 2 | | | | | | | | 1 | | | | |
| **CO2** | 3 | | | 2 | | | | | | | | | | | |
| **CO3** | | 3 | | 2 | | | | | | | | 1 | | | |
| | **Programme Outcomes (PO) Electronics** | | | | | | | | | | | | **PSO** | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| **CO1** | | 2 | 2 | | | | | | | | 1 | | | | |
| **CO2** | | | | 1 | | | | | | | | | | | |
| **CO3** | | 1 | | 2 | | | | | | | | 1 | | | |
| | **Programme Outcomes (PO) Information technology** | | | | | | | | | | | | **PSO** | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| **CO1** | | 1 | | | | | | | | | 1 | | | | |
| **CO2** | | 1 | | 1 | | | | | | | | | | | |
| **CO3** | | | | 1 | | | | | | | | 1 | | | |
| | **Programme Outcomes (PO) Computer science and engineering** | | | | | | | | | | | | **PSO** | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| **CO1** | | 1 | 1 | | | | | | | | 1 | | | | |
| **CO2** | | 1 | | 1 | | | | | | | | | | | |
| **CO3** | | | | | | | | | | | | 1 | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | | | | | | |

| **Assessment** |
|---|
| The assessment is based on MSE, ISE and ESE.<br>MSE shall be typically on modules 1 to 3.<br>ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.<br>ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.<br>For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing) |

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2022-23**

| **Course Information** | |
|---|---|
| **Programme** | B.Tech. (Electrical Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6OE350 |
| **Course Name** | Open Elective 2: Industrial Automation |
| **Desired Requisites:** | Basic Electrical Engineering, Basic Mechanical Engineering |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

| **Course Objectives** | |
|---|---|
| **1** | This course intends to develop basics of ladder logic programming for PLC. |
| **2** | It provides the foundation level knowledge of SCADA System. |
| **3** | It gives overview of various types of controller for closed loop control. |
| **4** | It provides the applications of variable speed drives in industries. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | **Explain** the working of various types of measuring instruments, controllers and actuators for implementation in industrial automation. | II | Understanding |
| **CO2** | **Identify** the use of various actuators in industrial automation | III | Applying |
| **CO3** | **Apply** the knowledge of PLC and SCADA for Industrial Automation. | III | Applying |
| **CO4** | **Explore** the use of variable speed drives for Industrial Automation. | III | Applying |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Measurement of Various Process Parameters**<br>Measurement of quantities such as temperature, pressure, force, displacement, speed, flow, level, humidity, pH etc., signal conditioning, estimation of errorsand calibration. | 6 |
| II | **Process Control and Various Controllers**<br>Introduction to process control, PID controller and tuning, various control configurations such as cascade control, feed forward control, split range control, ratio control, override control and selective control. | 6 |
| III | **Actuators**<br>Introduction to various actuators such as flow control valves, Hydraulic andpneumatic, servo motors, symbols and characteristics. | 6 |
| IV | **PLC**<br>Introduction to sequence control and relay ladder logic, basic PLC system, I/O modules, scan cycle, programming of timers, counters and I/O programming. | 7 |

| | | |
|---|---|---|
| V | **SCADA for Industrial Automation**<br>Components of SCADA systems, functions, classification of SCADA, networking and communication protocols. | 7 |
| VI | **Variable Speed Drives**<br>Role of variable speed drives in automation, DC drives, AC drives and synchronous motor drives applications of variable speed drives. | 7 |

| | |
|---|---|
| | |
| **Textbooks** | |
| 1 | John W. Webb, Ronald A. Reis "Programmable logic controllers, principles & applications" by PHI publication, Eastern Economic Edition. |
| 2 | C. D. Johnson, "Process control & instrumentation techniques".Pearson Education |
| | |
| **References** | |
| 1 | George Stephanopoulos, "Chemical Process Control - An introduction to Theory and Practice", Prentice-Hall of India, 1st Edition 1984. |
| 2 | "Fundamentals of Electrical Drives", G. K. Dubey, Narosa publication, 2nd edition. |
| | |
| **Useful Links** | |
| 1 | https://nptel.ac.in/courses/108105063 |
| 2 | https://archive.nptel.ac.in/courses/108/106/108106022/ |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | | 2 | | | | | | | | | | | | | |
| **CO2** | | 2 | | | 2 | | | | | | | | | | |
| **CO3** | | | | | | 2 | | | | | | | | 2 | |
| | | | | | | | | | | | | | | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISEshall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B. Tech. (Electronics Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem-VI |
| **Course Code** | 6OE365 |
| **Course Name** | Biomedical Engineering |
| **Desired Requisites:** | Electronics Measurement and Instrumentation |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To explain the basics body cell structure and different types of transducers |
| **2** | To explain the different types of patient monitoring system |
| **3** | Understand the design concept of different Medical instruments |
| **4** | To demonstrate different medical instruments |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| | | |
|---|---|---|
| **CO1** | Understand CNS-PNS and Cardio pulmonary system | Understand |
| **CO2** | Apply proper sensors for sensing biomedical signals to biomedical instrumentation setup | Apply |
| **CO3** | Design ECG,EEG and EMG amplifier | Create |
| **CO4** | Explain block diagram of patient monitoring systems, X-ray machine, CT scan and Ultrasonography machine. | Understand |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Fundamentals of Medical Instrumentation** Physiological Systems of the body, Sources of Biomedical signals, Basic Medical Instrumentation system, Micro-Electro-Mechanical System (Mems), Wireless Connectivity in Medical Instruments, General Constraints in design of Medical Instrumentation Systems | 8 |
| II | **The Origin of Bio potentials, Bio potential Electrodes & Biosensors** Electrical activity of Excitable Cells, Functional Organization of the Peripheral NervousSystem,Electrocardiogram(ECG),Electromogram(EMG), Electroencephalogram(EEG), Electroretinogram(ERG) and their recording system, Biomedical signal Analysis and Processing Techniques. | 4 |
| III | **Patient Monitoring Systems** System Concepts, Cardiac Monitor, Bedside patient Monitoring Systems, Central Monitors, Measurement of Heart rate, Measurement of Temperature, Measurement of respiration Rate, Biomedical Telemetry Systems | 4 |
| IV | **Modern Imaging Systems** X-ray machines And Digital Radiography, X-ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems and Thermal Imaging Systems. | 8 |
| V | **Assisting and Therapeutic Equipment's** Cardiac Pacemakers, Defibrillators, Diathermy, Hemodialysis Machines, Ventilators | 8 |
| VI | **Laser Application in Biomedical Field** The Laser, Types of Lasers, Laser Application, Laser Safety | 7 |

**Textbooks**

| | |
|---|---|
| 1 | John. G. Webster, "Medical Instrumentation", John Wiley, 2009 |
| 2 | Goddes& Baker, "Principles of Applied Biomedical Instrumentation", John Wiley, 2008 |
| 3 | Carr & Brown, "Biomedical Instrumentation & Measurement", Pearson, 2004 |
| 4 | |

| **References** | |
|---|---|
| 1 | R.S. Khandpur, "Hand book of Medical instruments", TMH, New Delhi, 1987. |
| 2 | Sanjay Guha,"Medical Electronics and Instrumentation", University Publication, 200. |
| 3 | Edwand J. Bukstein, "Introduction to Biomedical electronics" , Sane and Co. Inc, 1973 |
| 4 | |

| **Useful Links** | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | 2 | |
| **CO2** | | | | | 3 | 2 | | | | | | | 2 | |
| **CO3** | | | 3 | | | | | | | | | | 2 | |
| **CO4** | | | | | | | | | 3 | | | | 2 | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

| **Course Information** | |
|---|---|
| **Programme** | B. Tech. (Electronics Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem-VI |
| **Course Code** | 6OE364 |
| **Course Name** | Cyber Physical Systems |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

| **Course Objectives** | |
|---|---|
| **1** | To illustrate the fundamental concepts of Cyber Physical Systems |
| **2** | To explain design of Cyber Physical Systems. |
| **3** | To enable the students for the design and development of CPS |
| **4** | |

| **Course Outcomes (CO) with Bloom's Taxonomy Level** | | |
|---|---|---|
| At the end of the course, the students will be able to, | | |
| **CO1** | Explain fundamentals and components of CPS | Understand |
| **CO2** | Analyze the components of CPS | Analyze |
| **CO3** | Design the CPS Systems for given Applications | Create |
| **CO4** | | |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction**<br>Introduction of Cyber Physical Systems, various components of CPS, Applications of Cyber Physical System, Design aspects of Cyber Physical system, Introduction to Real Time System | 7 |
| II | **Sensing**<br>Types of sensors, Classifications of sensors, Different selection criteria of sensors, Sensor Instrumentation, Concept of Smart sensors, Wireless sensors | 8 |
| III | **Sensor Network and Protocol**<br>Sensor Network, Wireless Sensor Network, working of WSN, routing in wireless sensor network, Gateway functions, Data Aggregations, design issues of WSN Short distance protocols : Bluetooth, BLE ( Bluetooth Smart ), Zigbee, and Industrial protocol Modbus, Mbus, 6LoWPAN, IEC68XX | 5 |
| IV | **Embedded system computing**<br>Introduction to Embedded system, Architecture, Programming aspects, peripherals and system design | 7 |
| V | **CPS Security**<br>CPS security, Holistic Approach to Security, Overview of Security Technologies Principal security requirements,Security Issues, Types of attacks to CPS. | 5 |
| VI | **CASE Study**<br>Industry Automation, Smart Grid, SCADA, general case study of any CPS. | 8 |

| **Textbooks** | |
|---|---|
| 1 | Olivier Hersent, David B. Omer Elloumi, "The Internet of Things key applications and Protocols", Wiley publications |
| 2 | |
| 3 | |

| | |
|---|---|
| 4 | |
| | |
| **References** | |
| 1 | Lars T Berger K Iniewski, “Smart Grid Applications, Communications, and Security”, Wiley Publications |
| 2 | |
| 3 | |
| 4 | |
| | |
| **Useful Links** | |
| 1 | http://www.cyphylab.ee.ucla.edu |
| 2 | |
| 3 | |
| 4 | |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 2 | | | | | | | | | | | | | |
| **CO2** | | 2 | | | | | | | | | | | | |
| **CO3** | | | | 3 | | | | | | | | | | |
| **CO4** | | | | | | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Computer Science & Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6OE378 |
| **Course Name** | Open Elective II - Soft Computing |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **ISE** | **MSE** | **ESE** | **Total** |
| **Tutorial** | - | 20 | 30 | 50 | 100 |
| **Practical** | - | | | | |
| **Interaction** | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | Understand comparative performance of soft and hard computing approaches. |
| **2** | Provide to students a sound foundation of mathematical, scientific and engineering principles to formulate, solve and analyse learning problems using soft computing. |
| **3** | Imbibe capability for innovation in soft computing. |
| **4** | Understand hybrid applications of ANN, Fuzzy and GA |
| | |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| | | |
|---|---|---|
| **CO1** | describe soft computing techniques. | Understand |
| **CO2** | illustrate different Artificial Neural Network processes. | Apply |
| **CO3** | illustrate different fuzzy logic and genetic algorithm techniques. | Apply |
| **CO4** | Compare and analyse soft computing schemes. | Analyse |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Module 1 Introduction to Soft Computing and Fundamentals of Neural Networks:**<br>Introduction: Soft Computing, Soft Computing Vs. Hard Computing. Neural Networks, Fuzzy Logic, Genetic Algorithms.<br>Artificial Neural Network: Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs | 7 |
| II | **Module 2 Supervised Learning Network:** Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network, Radial Basis Function Network, Time Delay Neural Network, Functional Link Networks, Tree Neural Networks. | 7 |
| III | **Module 3 Unsupervised Learning Networks:** Fixed Weight Competitive Nets, Kohonen Self- Organizing Feature Maps, Learning Vector Quantization, Counter propagation Networks, Adaptive Resonance Theory<br>Network Stability Analysis of a Class of Artificial Neural Network Systems: Stability Conditions of a Class of Non-Linear Systems | 5 |
| IV | **Module 4 Introduction to Fuzzy Logic and Fuzzy Logic Controller:** Classical Sets and Fuzzy Sets, Fuzzy Relations, Membership Functions, Operations on Fuzzy sets, Fuzzification Methods, Defuzzification Methods<br>**Fuzzy Rule Base and Approximate Reasoning:** Truth Values and Tables in Fuzzy Logic, Fuzzy Propositions, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert System, Fuzzy Decision Making<br>**Fuzzy Logic Control Systems:** Control System Design, Architecture and Operation of FLC System, FLC System Models, Application of FLC | 8 |

| | | |
|---|---|---|
| | Systems | |
| V | **Module 5 Genetic Algorithm**<br>Fundamentals: Biological background, Creation of Offsprings, Working Principle, Encoding, Reproduction ; Mathematical Foundations; Data Structure: Mutation, Crossover, Selection; Applications | 7 |
| VI | **Module 6 Hybrid Systems**<br>Integration of neural networks, fuzzy logic and genetic algorithms: Hybrid Systems; Neuro-Fuzzy hybrids, Neuro-Evolutionary Hybrids, Fuzzy-Evolutionary Hybrids, GA-based BPN, Simplified Fuzzy ARTMAP. Applications of Soft Computing to different engineering systems. | 5 |

| **Text Books** | |
|---|---|
| 1 | "Neural Networks, Fuzzy Logic and Genetic Algorithms",S. Rajasekaran, G.A.VijayalakshmiPai, PHI (ECE). |
| 2 | Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa, John Wiley & Sons, 2018, 3rdEdition. |

| **References** | |
|---|---|
| 1 | Hertz, Krogh, Palmer"Introduction to the Theory of Neural Computation" |
| 2 | B. Yegnanarayana, PHI, "Artificial Neural Networks" |
| 3 | David E. Goldberg, Addison Wesley, "Genetic Algorithms" |
| 4 | Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms: Industrial Applications, Lakshmi C. Jain, N. M. Martin, CRC Press, 1998. |

| **Useful Links** | |
|---|---|
| 1 | https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 1 | 2 | | | | | | | | 1 | | | | |
| **CO2** | 1 | 3 | 2 | | | | | | | 1 | | | | |
| **CO3** | 1 | 3 | 2 | | | | | | | 1 | | | | |
| **CO4** | | 1 | 1 | | | | | | | 1 | | | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

**Walchand College of Engineering, Sangli**
*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6OE392 |
| **Course Name** | Open Elective 2: Web Development and Applications |
| **Desired Requisites:** | Computer Programming |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To introduce fundamentals of web design |
| **2** | To compare client side scripting and static web page design |
| **3** | To explain server side scripting language for dynamic page development |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | Use web and multimedia elements in web pages | III | Applying |
| **CO2** | Implement static and dynamic scripting for web applications | III | Applying |
| **CO3** | Compare various web services for web deployment | IV | Analysing |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Internet and Web:** Internet, Web, Server Client model, Internet vs. web, Web Browsers, Web Page Addresses (URLs), Anatomy of a web page, Defining web design, the medium of the web, Types of web sites, Web Design themes. Web Page Hosting | 7 |
| II | **HTML and CSS :** HTML: Elements, Attributes, , Adding text, adding images, Table markup, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, simple HTML forms, CSS: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS | 6 |
| III | **XML** Introduction to XML, uses of XML, simple XML, and XML key components, DTD and Schemas, Well formed, using XML with application. XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSL | 6 |
| IV | **PHP** Introduction to PHP, Using variables and operators, controlling program flow, Working with arrays, Using functions and classes, PHP Forms, Content management system: WordPress, Drupal, Joomla | 7 |
| V | **JavaScript:** The Basic of JavaScript: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching ,Positioning Moving and Changing Elements | 7 |



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|---|---|---|
| VI | **Web Services And Web application**<br>Introduction to Web Service, Web Services Basics – Creating. Publishing, WSDL, SOAP, RSS, Web Application, examples of web applications. | 6 |

| | **Text Books** |
|---|---|
| 1 | Jennifer Niederst Robbins "*Learning Web Designing"*, O'Reilly Publications", 5th Edition,2018 |
| 2 | Thomas A. Powell "*Web Design: The Complete reference*" Mc Graw Hill/ Osborne, 1st Edition, 2000 |
| 3 | Robin Nixon, "*Learning PHP, MySQL, JavaScript, and CSS: A Step-by-Step Guide to Creating Dynamic Websites*", O'Reilly Publications, 3rd Edition, 2014 |

| | **References** |
|---|---|
| 1 | Erik T. Ray "*Learning XML*" O'Reilly Publications, 1st Edition, 2001 |
| 2 | Chris Bates, "*Web Programing Building Internet Applications*", WILEY, Dreamtech 2nd Edition, 2000 |

| | **Useful Links** |
|---|---|
| 1 | https://www.coursera.org/learn/web-development#syllabus |
| 2 | https://www.coursera.org/learn/duke-programming-web#syllabus |
| 3 | https://www.javatpoint.com/php-tutorial |
| 4 | https://www.javatpoint.com/xml-tutorial |
| 5 | https://www.softwaretestinghelp.com/web-services-tutorial/ |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 2 | | | | | | | | | | | | 2 | |
| **CO2** | | | 2 | | 2 | | | | | | | | | 2 |
| **CO3** | | | 2 | | 3 | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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**Walchand College of Engineering, Sangli**
*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6OE393 |
| **Course Name** | Open Elective - 2: Fundamentals of Machine Learning & Application |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| 1 | To explain the concept supervised and unsupervised machine learning techniques. |
| 2 | To introduce various machine learning algorithms |
| 3 | To discuss problem solving approaches using appropriate machine learning techniques |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| CO | Course Outcome Statement/s | Bloom's Taxonomy Level | Bloom's Taxonomy Description |
|---|---|---|---|
| CO1 | Compare various machine learning algorithms for Regression and Classification | IV | Analysing |
| CO2 | Apply appropriate learning algorithm for a problems | III | Applying |
| CO3 | Evaluate Machine Learning algorithms with performance parameters | V | Evaluating |

| Module | Module Contents | Hours |
|---|---|---|
| I | **Introduction and Regression Analysis** Machine Learning concepts, Supervised learning, Unsupervised learning, linear regression in one variable, cost function, gradient descent, linear regression with multiple variables: gradient descent | 7 |
| II | **Logistic Regression** Classification, hypothesis representation, decision boundary, cost function, simplified cost function and gradient descent, optimization, one v/s all | 6 |
| III | **Artificial Neural Networks:** Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation. | 6 |
| IV | **Support Vector Machine:** Optimization objective, mathematics behind large margin classification, kernels using as SVM | 7 |
| V | **Learning Theory:** Regularization, bias/ Variance trade-off, error analysis, ensemble methods, practical advice on how to use learning algorithms, precision/recall trade-off | 7 |
| VI | **Unsupervised Learning** Clustering, k-means, EM, principal component analysis, outliers detection | 6 |

**Text Books**

| | |
|---|---|
| 1 | Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, *"The Elements of Statistical Learning"*, Springer, 2nd Edition, 2009. |

| References | |
|---|---|
| 1 | Christopher Bishop, *"Pattern Recognition and Machine Learning"*, Springer, 1st Edition, 2006. |

| Useful Links | |
|---|---|
| 1 | https://www.classcentral.com/course/swayam-introduction-to-machine-learning-5288 |
| 2 | https://web.stanford.edu/~hastie/Papers/ESLII.pdf |
| 3 | http://users.isr.ist.utl.pt/~wurmd/Livros/school/Bishop%20-%20Pattern%20Recognition%20And%20Machine%20Learning%20-%20Springer%20%202006.pdf |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | 2 | |
| **CO2** | | 1 | 2 | | | | | | | | | | | 2 |
| **CO3** | | | | 1 | 2 | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

**Walchand College of Engineering, Sangli**
*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6OE394 |
| **Course Name** | Open Elective - 2: Remote Sensing and Geographic Information System |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| **Interaction** | - | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To elaborate the concepts of different phases of remote sensing |
| **2** | To interpret and use image enhancement and interpretation on remote sensing |
| **3** | To carryout operations on GIS data, storage, analysis and uses. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| | | |
|---|---|---|
| **CO1** | Understand the remote sensing process to collect data | Understand |
| **CO2** | Apply image enhancement and interpretation techniques on image data | Apply |
| **CO3** | Collect, examine and process GIS data set for application | Analyze |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Remote sensing:** Satellite based remote sensing, Development of remote sensing technology and advantages, Different platforms of remote sensing, EM spectrum, atmospheric scattering, absorption and emission. | 6 |
| II | **Image interpretation:** Spectral response curves, Principles of image interpretation, Multi-spectral scanners and imaging devices, Image interpretation of different geological landforms. | 6 |
| III | **Image enhancement:** Image characteristics and different resolutions in Remote Sensing, Remote Sensing, integration with GIS and GPS, Georeferencing Technique, Basic image enhancement techniques, Spatial filtering techniques, Limitations of Remote Sensing Technique. | 7 |
| IV | **Geographic Information Systems:** Different components of GIS, Different types of vector data, Raster data models and their types, TIN data model | 6 |
| V | **GIS Data formats:** Advantages and disadvantages associated with vector, raster and TIN, Non-spatial data (attributes) and their type, Raster data compression techniques, Different raster data file formats, Spatial database systems and their types | 7 |
| VI | **GIS maps and Models:** Different map projections, Different types of resolutions, Digital Elevation Model (DEM), Quality assessment of freely available DEMS, GIS analysis, Errors in GIS, Key elements of maps | 7 |

**Text Books**

| | |
|---|---|
| 1 | Lillesand, T. M., Kiefer, R. W. and Chipman, J. W., *"Remote sensing and image interpretation"*, 7th Edition, Wiley, 2008. |



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| | |
|---|---|
| 2 | Schowengerdt, R. A., *"Remote Sensing: Models and Methods for Image Processing"*, Academic Press, 2007. |
| 3 | Ian HeyWood, Sarah Cornelius and Steve Carver, *"An Introduction to Geographical Information Systems"*, Pearson Education, 2nd Edition, 2006. |
| 4 | Kang-tsung Chang, *"Introduction to Geographic Information Systems"*, Tata McGrawHill, 4th Edition, 2007. |

| | |
|---|---|
| | **References** |
| 1 | Joseph, G. and Jeganathan, C., *"Fundamentals of Remote Sensing"*, 3rd Edition, Universities Press, 2018. |
| 2 | Rees, W. G., *"Physical Principles of Remote Sensing"*, 3rd Edition, Cambridge University Press, 2012. |
| 3 | Peter A. Burrough, Rachael A. McDonnell and Christopher D. Lloyd, *"Principles of Geographical Information System"*, Oxford University Press, 2016 |
| 4 | Keith C. Clarke, Bradley O. Parks, and Michael P. Crane, *"Geographical Information Systems and Environmental Modeling"*, Prentice-Hall India, 2001. |

| | |
|---|---|
| | **Useful Links** |
| 1 | https://nptel.ac.in/courses/121/107/121107009/ (Module 1,2,3) |
| 2 | https://nptel.ac.in/courses/105/107/105107155/ (Module 4,5,6) |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | 2 | |
| **CO2** | | 1 | 2 | | | | | | | | | | | 2 |
| **CO3** | | | | 1 | 2 | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)



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# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | Applied Mechanics |
| **Class, Semester** | Third Year B. Tech. Semester VI |
| **Course Code** | 6OE322 |
| **Course Name** | Open Elective 2 – Maintenance and Rehabilitation of Structures |
| **Desired Requisites:** | Concrete Technology |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

**Course Objectives**

| | |
|---|---|
| 1 | The Degree holder enables to inspect and identifies the damages of civil engineeringstructures. |
| 2 | To make conversant with the techniques for Retrofitting and strengthening of structures. |
| 3 | Prepare the plan for maintenance, rehabilitation and strengthening of structure. |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| | | |
|---|---|---|
| **CO1** | **Distinguish** between different types of causes of damage and decide the appropriate technique of repair according to failure. | Analyzing |
| **CO2** | **Assess** the concrete structure cracks and deteriorations according to essential parameters. | Evaluating |
| **CO3** | **Select** suitable rehabilitation and repair systems and materials that are currently in use, how they work, their limitations and why some are more effective than others | Creating |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Maintenance Repairs, Rehabilitation & Retrofitting of Structures**<br>Introduction to Maintenance, repair and rehabilitation, Distress Identification, Repair Management, causes of deterioration and durability aspects, Holistic Model of Deterioration of RCC: Model I, Model II, Model III, Permeability of concrete Durability Aspects, Intrinsic & extrinsic causes and stages of distress. | 7 |
| II | **Condition Survey & Non-Destructive Evaluation**<br>Condition survey: objective, stages, flow chart, preliminary inspection, planning stage, visual inspection, field/laboratory testing, principal test methods, considerations for repair strategy. | 6 |
| III | **Structural Deterioration Analysis**<br>Requirement of analysis, residual strength, reserve strength, Identification of Critical Section, Active and Passive Repair, Modeling of Repaired Composite Structure, Structural System & Its Validation, Mechanical Properties of Materials, Evaluation of Damage to Concrete/Reinforcement, Evaluation of Building Configuration, Load Tests | 6 |
| IV | **Repair Materials**<br>Essential parameters for repair materials, materials for surface preparation, premixed cement concrete/mortars (modified with non-polymeric admixtures/additives), polymer modified mortars and concrete, properties of polymer latexes, fields of application, epoxies and epoxy systems including epoxy mortars/concretes, surface coatings. | 6 |

| | | |
|---|---|---|
| V | **Rehabilitation and Retrofitting Methods**<br>Grouting & crack repair, patch repair, replacement of structurally weak concrete, replacement of spalled, and/or delaminated concrete, replacement of carbonated concrete surrounding steel reinforcement, concrete removal and surface preparation, form work, repairs using mortars, portland cement mortars, polymer modified cement mortars, epoxy mortars, dry pack and epoxy bonded dry pack, pre-placed aggregate concrete, shotcrete, concrete replacement epoxy bonded concrete, silica fume concrete, polymer concrete system. | 7 |
| VI | **Corrosion Protection for Reinforcement**<br>Mechanism of corrosion, preventive measures, types of corrosion resistant reinforcement, repair methods, materials. Repair of damaged water retaining structures, hydraulic structures, underwater repair. | 7 |

| **Textbooks** | |
|---|---|
| 1 | P.K. Guha, "Maintenance and Repairs of Buildings", New Central book Agencies Publications, 5th Edition, 2015. |
| 2 | Nayak B. S., "Maintenance Engineering For Civil Engineers" Khanna Publication, 2nd Edition, 2011. |
| 3 | Hutchin B. D., "Maintenance and Repairs of Buildings", Newnes Butterworth Publications, 6th edition, 1975. |

| **References** | |
|---|---|
| 1 | Allen R. T. and Edwards S. C., Repair of Concrete Structures, Blakie and Sons, UK, 1987. |
| 2 | Raikar R. N., Learning from Failures Deficiencies in Design, Construction and Service - R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987. |
| 3 | Campbell D., Allen and Roper H., Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991. |
| 4 | Santhakumar A. R., Training Course notes on Damage Assessment and Repair in Low Cost Housing , RHDC-NBO, Anna University, July 1992. |
| 5 | CPWD hand book on Repairs and Rehabilitation of RCC buildings published by DG (Works), CPWD, Government of India (Nirman Bhawan), |

| **Useful Links** | |
|---|---|
| 1 | https://archive.nptel.ac.in/courses/105/106/105106202/# |
| 2 | https://iitb.vlabs.co.in/discipline.html?discipline=Civil_Engineering |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | | | 1 | | 1 | | | | | | | | | 2 |
| **CO2** | | | 2 | 2 | 2 | | | | | | | | | 2 |
| **CO3** | | | 2 | | 2 | | | | | | | | | 2 |

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2024-25**

## Course Information

| | |
|---|---|
| **Programme** | B.Tech. |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6OE397 |
| **Course Name** | Sanskrit |
| **Desired Requisites:** | Basic knowledge of any Devnagari scripted language |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | 0 Hrs/week | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

## Course Objectives

| | |
|---|---|
| **1** | Students will learn how to determine the etymology of words |
| **2** | Students will learn about the ancient Indian educational advancements |
| | Students will gain knowledge of the major traditions of Sanskrit literature. They will also learn about the literary styles of individual authors. |
| | |

## Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | Students should learn to read, write and understand Sanskrit texts, recognize scripts and fonts, and understand the structure of the language. | I | Remember |
| **CO2** | Students should learn to read and understand Sanskrit texts, recognize scripts and fonts, and understand the structure of the language. | II | Understanding |
| **CO3** | Students should learn the basics of Sanskrit grammar, including rules and examples | III | Apply |
| | | | |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Module 1**. **Introduction**<br>a) Sanskrit Alphabets- Devanagari Script<br>b) Rules to identify- words and gender | 7 |
| II | **Module 2.** pronouns and verbs | 6 |
| III | **Modules 3.** past/ present/future tense- simple tenses | 7 |
| IV | **Module 4 :** order and roots | 7 |
| V | **Module 5:** a) Sanskrit literature and science<br>b)Technical information for engineers | 6 |
| VI | **Module 6:** conversation- simple (Introduction) | 6 |

## References

| | |
|---|---|
| 1 | Teach yourself Sanskrit- Prathama Deeksha- Rashtriya Sanskrit Sansthanam, New Delhi. |
| 2 | India's glorious Scientific Tradition- Suresh Soni, Ocean Books (P) ltd, New Delhi |
| 3 | Sanskrit Primer by Edward Delavan Perry- Ginn and Company publication, Boston |
| | |

| **CO-PO Mapping** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | | |
| **CO2** | 3 | | | | | | | | | | | | | |
| **CO3** | 3 | | | | | | | | | | | | | |
| **CO4** | 3 | | | | | | | | | | | | | |
| The strength of mapping is to be written as 1: Low, 2: Medium, 3: High<br>Each CO of the course must map to at least one PO. | | | | | | | | | | | | | | |

| **Assessment** |
|---|
| The assessment is based on MSE, ISE and ESE.<br>MSE shall be typically on modules 1 to 3.<br>ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments, surprise or declared test etc.<br>ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.<br>For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing) |

# Walchand College of Engineering, Sangli

*(Government Aided Autonomous Institute)*

**AY 2024-25**

| **Course Information** | |
|---|---|
| **Programme** | B.Tech. (all branches) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6OE396 |
| **Course Name** | Biotechnology |
| **Desired Requisites:** | Basic biology knowledge at Secondary level |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | 3 Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | 0 Hrs/week | 30 | 20 | 50 | 100 |
| | | **Credits: 3** | | | |

| **Course Objectives** | |
|---|---|
| **1** | Provide foundation in basic biology principles and knowledge |
| **2** | Have an overview of biological sciences and engineering and should be aware of current developments in biochemistry and allied subjects. |
| **3** | Exposure to various research fields and thrust areas in biotechnology. |
| | |
| | |

**Course Outcomes (CO) with Bloom's Taxonomy Level**

At the end of the course, the students will be able to,

| **CO** | **Course Outcome Statement/s** | **Bloom's Taxonomy Level** | **Bloom's Taxonomy Description** |
|---|---|---|---|
| **CO1** | Students will understand fundamental concepts in core areas of biotechnology, such as molecular biology, genetics, and plant and animal biotechnology. | I | Remembering |
| **CO2** | Students learn about the principles and applications of microscopy, the structure and characteristics of microorganisms, and the immune system. They also learn about cell biology, the regulation of the cell cycle, and biomolecules. | II | Understanding |
| **CO3** | Students will be able to use their knowledge to solve problems in a variety of settings, including industry, government, and entrepreneurship. | III | Applying |
| | | | |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Understanding Basics of Biology:**<br>a) Biomolecues: water, vitamins and minerals, biopolymers-cabohydrates, lipids, proteins, nucleicacids (DNA and RNA)<br>b) Organization of life: Cells (prokarypotic, eukaryotic, plantand animals) structure and function of cell organelles, tissues, organs, organ systems and organism | 7 |
| II | **Bioenergetics:**<br>a) Metabolism: thermodynamics of biology<br>b) energy dynamics with respect to chloroplast (photosynthesis) and mitochondria (respiration) | 6 |

| | | |
|---|---|---|
| III | **Transport and communication:**<br>a) In plants: xylem and phloem; in animals: blood andlymph. transport of gases, cell-cell communication<br>Defence mechanism in plants and animals. Immunological concepts- antigen, antibody, humoral and cell mediated immune system, cells and organs of immune system, vaccines. | 7 |
| IV | **Techniques and devices:**<br>a) introduction to Recombinant DNA Technology, Monoclonal antibodies, fermentation technology, plantand animal tissue culture<br>Techniques and instruments of analysis- microscope, centrifuge, electrophoresis, chromatography, tracer techniques and biomedical instruments. | 7 |
| V | **Trends in Bioengineering:**<br>a) Introduction to Microbiology and nanotechnology: diagnostics and therapeutics, Biocomputing, bioinstrumentation, bioimaging and biosensors<br>Biomimatics: nature inspired designs and processes | 6 |
| VI | **Future scope and ethics:**<br>a) Future of biotechnology associated with engineers- medical, agricultural and environmental perspectives<br>Ethics in bioengineering. | 6 |
| | | |
| | | |

| **References** | |
|---|---|
| 1 | P. S. Verma and V. K. Agrawal, Concept of cell biology S. Chand and Co. Ltd 2002 |
| 2 | T. S. Ranganathan, Textbook of Human Anatomy, S. Chand and Co. Ltd 2004 |
| 3 | V. Sree Krishna, comprehensive biotechnology I- cell biology and genetics, New age, 2005 |
| 4 | |
| 5 | |
| | |

**CO-PO Mapping**

| | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 | | | | | | | | | | | | | |
| **CO2** | 3 | | | | | | | | | | | | | |
| **CO3** | 3 | | | | | | | | | | | | | |
| **CO4** | 3 | | | | | | | | | | | | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High

Each CO of the course must map to at least one PO.

**Assessment**

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
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