# TY Sem II

HODIT

Shreet
DACIT
Mrs. B, S, Shetty

**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** | 6IT321 |
| **Course Name** | Unix Operating System |
| **Desired Requisites:** | Operating System |

| **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 design, principal and philosophy of the Unix/Linux OS. |
| **2** | To impart the architecture of Unix/Linux OS. |
| **3** | To discuss system call of Linux/Unix. |

**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** | Interpret design, principal and philosophy of the Unix/Linux OS | III | Applying |
| **CO2** | Analyze the architecture of Unix/Linux OS | IV | Analysing |
| **CO3** | Apply Linux/Unix system calls | III | Applying |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction**<br>General Overview of the System - History, System Structure, User Perspective, Operating System Services, Assumption About Hardware.<br>Introduction to the KERNEL: Architecture of UNIX OS, Introduction to system concepts, Kernel Data Structure, System Administration | 7 |
| II | **The Buffer Cache**<br>Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, advantages and disadvantages of cache. | 6 |
| III | **Internal Representation of Files**<br>Inodes, structure of the regular file, directories, conversion of a pathname to inode, super block, inode assignment to a new file, allocation of disk blocks, other file types. | 6 |
| IV | **System calls for the file System**<br>Open, Read, write, File and Record Locking, LSEEK, Close, File Creation, Creation of Special File, Change Directory and Change Root, Change Owner and Change Mode, Stat and Fstat, Pipes, Dup, Link, Unlink. | 7 |
| V | **Structure of Process**<br>Process stages and transitions, layout of system memory, the context of a Process, saving context of a process, manipulation of the process address space. | 6 |
| VI | **Process Control**<br>Process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, the shell, system Boot and the Init process, Process Scheduling, system call for time, clock. | 7 |

**Text Books**

| | |
|---|---|
| 1 | Maurice J. Bach, "*The Design of Unix Operating System*", PHI, 1994. |
| 2 | Sumitabha Das, "*Unix Concepts and Applications*", TMGH, 4th Edition, 2017. |

| References | |
|---|---|
| 1 | Beej Jorgensen , "*Beej's Guide to Unix IPC*", Brian -Beej Jorgensen Hall, Version 1.1.2, December, 2010 |
| 2 | Kay Robbins, Steve Robbins, "*UNIX Systems Programming: Communication, Concurrency and Threads*", Pearson, 2nd Edition, December, 2015 |
| 3 | Eric Raymond , "*Art of UNIX Programming*", Pearson, 1st edition, October, 2003 |

| Useful Links | |
|---|---|
| 1 | https://nptel.ac.in/courses/106/102/106102132/<br>(Intro to Unix System Calls Part 1/2, Kernel Data Structures, Process structure, Context Switching, Fork, Context-Switch, Process Control Block, Locking, File System Implementation, File System Operation) |
| 2 | https://onlinecourses.nptel.ac.in/noc19_cs50<br>(Processes, Scheduling in Linux, IPC, thread) |
| 3 | https://github.com/suvratapte/Maurice-Bach-Notes |
| 4 | https://github.com/mit-pdos/xv6-public |
| 5 | https://www.geeksforgeeks.org/introduction-to-unix-system/ |
| 6 | http://www.di.uevora.pt/~lmr/syscalls.html |

**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** | | 2 | | | 2 | | | | | | | 2 | 2 | |
| **CO3** | | | 2 | 1 | | | | | | | | | | 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 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT322 |
| **Course Name** | Image Processing and Pattern Recognition |
| **Desired Requisites:** | Data Structures, Matrix Operations |

| **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 image fundamentals and geometric transforms necessary for image processing. |
| 2 | To demonstrate the image pre-processing techniques using various tools |
| 3 | To describe pattern recognition algorithms for domain 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 | Determine fundamental requirements of digital image handling, storages and representations | II | Understanding |
| CO2 | Implement image processing steps for image enhancement and segmentation | III | Applying |
| CO3 | Differentiate image patterns for recognition and classification | IV | Analyzing |

| Module | Module Contents | Hours |
|---|---|---|
| I | **Introduction to Digital Image Processing:** Pixel Representation, Resolution, Image Formats and Storages, Intensity, Hue, Saturation, Brightness, Color Images, Connectivity, Regions, Distance Measures, Image Handling using Mathematical and Logical Operations | 7 |
| II | **Image Enhancement:** Histogram Processing, Image Quality, Image Noise, Image Aliasing , Image Sampling and Quantization, Spatial Filtering and Smoothing, Geometric Transformations, Image Aspect Ratio | 6 |
| III | **Image Transforms**: Introduction to Frequency Domain Transforms, Image Representations in Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform, Image Smoothing and Sharpening using Frequency Domain Filters – Ideal, Butterworth and Gaussian Filters | 7 |
| IV | **Image Segmentation:** Point, Line and Edge Detection Methods, Edge Based Segmentation, Region Based Segmentation, Region Split and Merge Techniques, Region Growing By Pixel Aggregation, Optimal Thresholding | 6 |
| V | **Mathematical Morphology:** Basic Morphological Concepts, Dilation, Erosion, , Opening and Closing, Hit or Miss Transformation, Boundary Extraction, Thinning and Skeleton Algorithms | 6 |



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| | | |
|---|---|---|
| VI | **Pattern Recognition:**<br>Pattern Classes, Pattern Recognition and Clasification, , Issues in Pattern Recognition, Design Concepts and Methodologies, Pattern Recognition Applications | 7 |

| | |
|---|---|
| | **Textbooks** |
| 1 | Millan Sonka, Vaclav Hiavac, Roger Boyle, "Image Processing Analysis and Machine Vision", CL Engineering, 3rd Edition, 2013. |
| 2 | Rafel C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education, 3rd Edition, 2008. |
| 3 | Anil K. Jain, "**Fundamentals** of Digital Image Processing", Prentice Hall, 1989. |
| | |
| | **References** |
| 1 | Julus T. Tou , Rafel C. Gonzalez, "Pattern Recognition Principles", Wesley Publishing Company, 1st Edition, 1974. |
| 2 | Earl Gose, Richard Johnsonbaugh, "Pattern Recognition and Image Analysis", Prentice Hall of India Private limited, 1st Edition, 2009. |
| 3 | S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing ", Tata McGraw Hill Publication, 3rd Edition, 2010. |
| | **Useful Links** |
| 1 | https://cse19-iiith.vlabs.ac.in/List%20of%20experiments.html |
| 2 | https://onlinecourses.nptel.ac.in/noc19_ee56/preview |
| 3 | https://www.coursera.org/learn/digital |

**CO-PO Mapping**

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

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**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6IT323 |
| **Course Name** | Artificial Intelligence |
| **Desired Requisites:** | Computer Algorithm |

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

**Course Objectives**

| | |
|---|---|
| **1** | To understand the concept of Artificial Intelligence (AI) in the form of various Intellectual tasks |
| **2** | To understand Problem Solving using various peculiar search strategies for AI |
| **3** | To acquaint with the fundamentals of knowledge and reasoning |

**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** | Apply schemes of knowledge representation. | III | Applying |
| **CO2** | Demonstrate an expert system. | III | Applying |
| **CO3** | Evaluate performance of AI systems. | V | Evaluating |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction and searching in AI:** Introduction to Artificial Intelligence, Foundations of Artificial Intelligence, History of Artificial,AI Application, Characteristics of AI, Heuristic, Problem Spaces and Search, A*,AO* algorithms | 6 |
| II | **Knowledge Representation & Logic:** Predicate calculus, Predicates and arguments, ISA hierarchy, Frames, Unification | 6 |
| III | **Logic Programming:** The Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic, Representation Revisited, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic. | 7 |
| IV | **Planning:** Introduction, Planning as problem solving, STRIPS, Forward and Backward planning, Non linear planning. | 7 |
| V | **Neural Networks:** History and Introduction to Neural network, Working of neurons , Basic components of ANN,ANN Architecture, Feedforward network, Applications of Neural Network. | 5 |
| VI | **Expert systems & Natural Language Processing:** Introduction, Functionality /components of Expert systems, Architecture of ES, Building an Expert system, NLP and Understanding. | 8 |

**Textbooks**

| | |
|---|---|
| 1 | *Elaine Rich and Kelvin Knight ,Nair," Artificial Intelligence," McGraw Hills 3rd edition* |
| 2 | *Janakiraman et al., "Foundations of Artificial Intelligence and Expert Systems", Macmilan India Ltd.* |
| 3 | *Russell and Norvig," Artificial Intelligence – A Modern Approach", Prentice-Hall, 2010 (3rd edition).* |

| | |
|---|---|
| | **References** |
| 1 | Saroj Kaushik, "Artificial Intelligence" |
| 2 | Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third edition, Pearson, 2003, ISBN :10: 0136042597 |

| | |
|---|---|
| | **Useful Links** |
| 1 | https://nptel.ac.in/courses/106/102/106102220/ |
| 2 | https://nptel.ac.in/courses/106/105/106105077/ |
| 3 | https://nptel.ac.in/courses/106/105/106105078/ |
| 4 | https://archive.nptel.ac.in/courses/112/103/112103280/ |

**CO-PO Mapping**

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

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**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT342 |
| **Course Name** | Project - 1 |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Practical** | 4 Hrs/Week | **LA1** | **LA2** | **Lab ESE** | **Total** |
| **Interaction** | - | 30 | 30 | 40 | 100 |
| | | **Credits: 2** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To plan various activities of the project and distribute the work amongst team members |
| **2** | To develop abilities of students to implement the objectives of project |
| **3** | To guide for the preparation of technical report and research paper |

**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** | Understand, plan and execute a Project with team | III | Applying |
| **CO2** | Deliver technical seminar based on the Project | IV | Analyzing |
| **CO3** | Prepare a technical report based on the project | IV | Analyzing |

**List of Experiments / Lab Activities**

**Guidelines for Project - 1:**

The project-1 is to be carried out in a group of maximum 5 to 6 students. Each group will carry out a project by developing any application software based on the following areas.

1. The project work is to be carried out on the basis of previously learned technologies.
2. Industry based problem / Sponsored application /Game/ Interdisciplinary application /socially useful application / Problem solving of previously learned complex concepts.
3. Project group should achieve all the proposed objectives of the problem statement.
4. The work should be completed in all aspects of design, implementation and testing and follow software engineering practices.
5. Project reports should be prepared and submitted in soft and hard form along with the code and other dependency documents. Preferable use online code repositories (github/bitbucket)
6. Project will be evaluated continuously by the guide/panel as per assessment plan.
7. Presentation and report should use standard templates provided by department.
8. Preferably choose DB other than taught in MySQL/MSSQL.

Project report (pre-defined template) should be prepared using Latex/Word and submitted along with soft copy on CD/DVD (with code, PPT, PDF, Text report document & reference material) or on an online repository.

Students should maintain a project log book containing weekly progress of the project.

**Text Books**

| | |
|---|---|
| 1 | Rajendra Kumbhar , "*How to Write Project Reports, Ph. D. Thesis and Research Articles*", Universal Prakashan, 2015 |

| | |
|---|---|
| 2 | Marilyn Deegan, " *Academic Book of the Future Project Report*", A Report to the AHRC & the British Library, 2017 |

| References | |
|---|---|
| 1 | https://www.youtube.com/watch?v=0oSDa2kf5l8 (report writing ) |

| Useful Links | |
|---|---|
| 1 | https://pats.cs.cf.ac.uk/wiki/lib/exe/fetch.php?media=project-report.pdf |
| 2 | http://users.iems.northwestern.edu/~hazen/Writing%20Project%20Reports%202004a.pdf |
| 3 | https://www.upgrad.com/blog/java-project-ideas-topics-for-beginners/ |
| 4 | https://www.geeksforgeeks.org/computer-science-projects/ |

**CO-PO Mapping**

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

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, and preferably to only one PO.

**Assessment**

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

| Assessment | Based on | Conducted by | Typical Schedule | Marks |
|---|---|---|---|---|
| LA1 | Lab activities, attendance, journal | Lab Course Faculty | During Week 1 to Week 8 Marks Submission at the end of Week 8 | 30 |
| LA2 | Lab activities, attendance, journal | Lab Course Faculty | During Week 9 to Week 16 Marks Submission at the end of Week 16 | 30 |
| Lab ESE | Lab activities, journal/ performance | Lab Course Faculty and External Examiner as applicable | During Week 18 to Week 19 Marks Submission at the end of Week 19 | 40 |

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

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**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT371 |
| **Course Name** | Unix Operating System Lab |
| **Desired Requisites:** | Operating System, (C/python) Programming language |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Practical** | 2 Hrs/Week | **LA1** | **LA2** | **Lab ESE** | **Total** |
| **Interaction** | - | 30 | 30 | 40 | 100 |
| | | **Credits: 1** | | | |

**Course Objectives**

| | |
|---|---|
| **1** | To get introduce and use various system call of Unix/Linux OS |
| **2** | To use the various IPC's available in OS. |
| **3** | To impart the IPC for solving the real world problems |

**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 difference between thread and process | III | Applying |
| **CO2** | Implement effective programing on Unix/Linux | III | Applying |
| **CO3** | Distinguishing various IPC's available in OS | IV | Analysing |

**List of Experiments / Lab Activities**

**List of Experiments:**

1. Processing Environment : fork, vfork, wait, waitpid,exec (all variations exec), and exit
2. IPC: Interrupts and Signals: signal(any three type of signal ), alarm, kill, signal
3. File system Internals: Stat, fstat, ustat/lock/flock.
4. Threading concept: In c language (P thread) clone, threads of java
5. IPC: Semaphore: semaphore. h-semget, semctl, semop
6. IPC: Message Queue: msgget, msgsnd, msgrcv
7. IPC: Shared memory : shmget, shmat, shmdt
8. IPC: Sockets: socket system calls in C/socket programming of Java/python.
9. IPC: Pipe/FIFO
10. Scripting writing in Linux and python

**Text Books**

| | |
|---|---|
| 1 | Maurice J. Bach, "*The Design of Unix Operating System*", PHI, 1994. |
| 2 | Sumitabha Das, "*Unix Concepts and Applications*", TMGH, 4th Edition, 2017. |

**References**

| | |
|---|---|
| 1 | Beej Jorgensen , "*Beej's Guide to Unix IPC*", Brian -Beej Jorgensen Hall, Version 1.1.2, December, 2010 |
| 2 | Kay Robbins, Steve Robbins, "*UNIX Systems Programming: Communication, Concurrency and Threads*", Pearson, 2nd Edition, December, 2015 |
| 3 | Eric Raymond , "*Art of UNIX Programming*", Pearson, 1st edition, October, 2003 |

**Useful Links**

| | |
|---|---|
| 1 | https://users.cs.cf.ac.uk/Dave.Marshall/C/ |
| 2 | https://github.com/suvratapte/Maurice-Bach-Notes |

| | |
|---|---|
| 3 | https://github.com/mit-pdos/xv6-public |
| 4 | https://www.geeksforgeeks.org/introduction-to-unix-system/ |
| 5. | https://github.com/beejjorgensen/bgipc |
| 6. | http://www.di.uevora.pt/~lmr/syscalls.html |

**CO-PO Mapping**

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

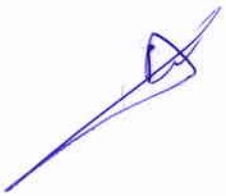
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

**Assessment**

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

| Assessment | Based on | Conducted by | Typical Schedule | Marks |
|---|---|---|---|---|
| LA1 | Lab activities, attendance, journal | Lab Course Faculty | During Week 1 to Week 8 Marks Submission at the end of Week 8 | 30 |
| LA2 | Lab activities, attendance, journal | Lab Course Faculty | During Week 9 to Week 16 Marks Submission at the end of Week 16 | 30 |
| Lab ESE | Lab activities, journal/ performance | Lab Course Faculty and External Examiner as applicable | During Week 18 to Week 19 Marks Submission at the end of Week 19 | 40 |

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.



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**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT372 |
| **Course Name** | IT Practices Lab 1 |
| **Desired Requisites:** | |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Practical** | 2 Hrs/Week | **LA1** | **LA2** | **Lab ESE** | **Total** |
| **Interaction** | - | 30 | 30 | 40 | 100 |
| | | **Credits: 1** | | | |

**Course Objectives**

| | |
|---|---|
| 1 | To demonstrate the image processing techniques using various tools |
| 2 | To illustrate various concepts of IT practices |
| 3 | To develop prototype and models using IT practices |

**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 | Identify various image processing techniques | 2 | Understanding |
| CO2 | Apply various concepts of IT practices to design model | 3 | Applying |
| CO3 | Demonstrate prototype using IT practices | 4 | Analyzing |

**List of Experiments / Lab Activities**

**List of Experiments:** IT Practices laboratory is to be carried out for professional elective 2 and Image Processing and Pattern Recognition alternately.

1. The lab assignments for professional electives are to be modified as per the course offered.
2. Approximately 6 to 7 assignment on each professional elective are to carried out in lab session
3. Distance and Connectivity - Find if two points are neighbors in some sense and quantify the distance between them.
4. Image Arithmetic - Use arithmetic operations to combine images
5. To study the effect of these operations on the dynamic range of the output image.
6. Image Pre-processing - image enhancement through point transformation
7. Neighbourhood Operations - To learn about neighborhood operations and use them for Linear filtering Non-linear filtering
8. Mathematical Morphology - To understand the basics of morphological operations which are used in analyzing the form and shape details of image structures.
9. Image Segmentation - Understand how the threshold can be selected from the image histogram and its effect on segmentation performance

**Text Books**

| | |
|---|---|
| 1 | Millan Sonka, Vaclav Hiavac, Roger Boyle, "Image Processing Analysis and Machine Vision", CL Engineering, 3rd Edition, 2013. |



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| | |
|---|---|
| 2 | Rafel C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education, 3rd Edition, 2008. |

| References | |
|---|---|
| 1 | Julus T. Tou , Rafel C. Gonzalez, "Pattern Recognition Principles", Wesley Publishing Company, 1st Edition, 1974. |

| Useful Links | |
|---|---|
| 1 | https://cse19-iiith.vlabs.ac.in/List%20of%20experiments.html |
| 2 | https://onlinecourses.nptel.ac.in/noc19_ee56/preview |

**CO-PO Mapping**

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

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, and preferably to only one PO.

**Assessment**

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

| Assessment | Based on | Conducted by | Typical Schedule | Marks |
|---|---|---|---|---|
| LA1 | Lab activities, attendance, journal | Lab Course Faculty | During Week 1 to Week 8<br>Marks Submission at the end of Week 8 | 30 |
| LA2 | Lab activities, attendance, journal | Lab Course Faculty | During Week 9 to Week 16<br>Marks Submission at the end of Week 16 | 30 |
| Lab ESE | Lab activities, journal/ performance | Lab Course Faculty and External Examiner as applicable | During Week 18 to Week 19<br>Marks Submission at the end of Week 19 | 40 |

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

# 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** | 6IT373 |
| **Course Name** | Parallel Computing Lab |
| **Desired Requisites:** | Computer Algorithms |

| **Teaching Scheme** | | **Examination Scheme (Marks)** | | | |
|---|---|---|---|---|---|
| **Lecture** | - | **LA1** | **LA2** | **ESE** | **Total** |
| **Practical** | 2 Hrs/Week | 30 | 30 | 40 | 100 |
| **Interactive** | 1 Hrs/week | **Credits: 2** | | | |

**Course Objectives**

| | |
|---|---|
| 1 | To introduce the parallel computing in open source tools. |
| 2 | To implement the process of parallelization of computer algorithms. |
| 3 | To comprehend thread and process concept in parallel computing. |

**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 | Analyze sequential code and apply parallelism | III | Applying |
| CO2 | Implement parallel code to speed-up the execution | IV | Applying |
| CO3 | Design the parallel algorithm for the engineering problem | VI | Creating |

| Module | Module Contents | Hours |
|---|---|---|
| I | Parallel Computing: Motivation and scope, Benchmarking, TOP500, Green 500, Roofline model | 3 |
| II | GPGPU: Architecture and CUDA programming basics | 2 |
| III | Parallel programming Tools | 2 |
| IV | OpenMP offloading and OpenACC | 2 |
| V | OneAPI, SYCL: Architecture and coding on Intel Dev Cloud | 2 |
| VI | Case studies: OpenCL | 2 |

**Laboratory assignment**

1. Hardware and configuration, benchmarking, profiling
2. Parallel Matrix Addition
3. Parallel Matrix multiplication
4. Parallel Quick sort
5. Parallel LUP decomposition
6. Parallel Image processing

**Textbooks**

| | |
|---|---|
| 1 | Programming Massively Parallel Processors: A Hands-on Approach, 2010, David B. Kirk , Wen-mei W. Hwu, Publisher :Morgan Kaufmann |

**References**

| | |
|---|---|
| 1 | Anath Grama, Ansul Gupta, George Karypis, Vipin Kumar, *"Introduction to parallel computing"*, Second Edition, Pearson Education, 2003 |

| Useful Links | |
|---|---|
| 1 | CPU vs GPU https://www.youtube.com/watch?v=LfdK-v0SbGI |
| 2 | GPGPU: Architecture and CUDA programming basics https://www.youtube.com/watch?v=kUqkOAU84bA |
| 3 | CUDA Teaching Center https://www.youtube.com/watch?v=4APkMJdiudU |
| 4 | OpenMP GPGPU Link https://www.youtube.com/watch?v=uVcvecgdW7g |
| 5 | OpenMP GPGPU Link https://www.youtube.com/watch?v=kaSQwnNDO_s&list=PL20S5EeApOSulLcgvbluJB-gJjls7yCsk |
| 6 | OneAPI SYCL https://www.intel.com/content/www/us/en/developer/tools/oneapi/training/dpc-essentials.html |
| 7 | OpenACC Series link https://www.youtube.com/watch?v=AHTOVCUOvQI&list=PL3xCBlatwrsX6XRQei4oC53qiBZA0mpZH |

**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** | | 2 | | | 3 | | | | | | | | 1 | |
| **CO3** | 2 | 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**

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

| Assessment | Based on | Conducted by | Typical Schedule | Marks |
|---|---|---|---|---|
| LA1 | Lab activities, attendance, journal | Lab Course Faculty | During Week 1 to Week 8 Marks Submission at the end of Week 8 | 30 |
| LA2 | Lab activities, attendance, journal | Lab Course Faculty | During Week 9 to Week 16 Marks Submission at the end of Week 16 | 30 |
| Lab ESE | Lab activities, journal/ performance | Lab Course Faculty and External Examiner as applicable | During Week 18 to Week 19 Marks Submission at the end of Week 19 | 40 |

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

| Walchand College of Engineering, Sangli<br>*(Government Aided Autonomous Institute)* | | | | | |
|---|---|---|---|---|---|
| **AY 2023-24** | | | | | |
| **Course Information** | | | | | |
| **Programme** | B.Tech. (Information Technology) | | | | |
| **Class, Semester** | Third Year B. Tech., Sem VI | | | | |
| **Course Code** | 6IT331 | | | | |
| **Course Name** | Professional Elective - 1: Soft Computing | | | | |
| **Desired Requisites:** | Artificial Intelligence, Tool like Matlab/Scilab | | | | |

| **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 various component of soft computing. |
| **2** | To impart soft computing concepts to solve engineering and optimization problems. |
| **3** | To familiarize with the swarm intelligence methods |

**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** | Classify hard and soft computing concepts | IV | Analysing |
| **CO2** | Compare the working of swarm intelligence methods | IV | Analysing |
| **CO3** | Justify the soft computing technique for real-time problem | V | Evaluating |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction**<br>History, Scope of Soft Computing, components of Soft Computing- Neural Networks, Application scope of ANN, Fuzzy Logic, Genetic algorithm, Swarm Intelligence, Hybrid System, Hard vs. Soft Computing. | 7 |
| II | **Artificial Neural Network (ANN)**<br>Fundamental Concept, Evolution of Neural network, Basic models of ANN, important terminologies of ANN, Mc-Culloch Pitts Neuron, Linear separability, AND,OR, EXOR problem solving by ANN, Supervised Learning, Unsupervised Learning, Application to ANN to real world problem. | 7 |
| III | **Genetic Algorithms (GA)**<br>Introduction, basic operators and Terminologies in GA, Genetic operators – Selection, crossover, reproduction and mutation – fitness function, traditional vs. Genetic algorithm, simple genetic algorithm, general genetic algorithm, the schema theorem, classification of GA, Genetic programming. Application to GA to real world problem. | 6 |
| IV | **Introduction to classical set and fuzzy sets**<br>Introduction, Classical set (crisp set) Fuzzy sets and their properties, Fuzzy models, Membership function, Defuzzification. Application to Fuzzy logic to real world problem. | 6 |
| V | **Swarm Intelligence (SI)**<br>Ant colony optimization (ACO), Particle Swarm Optimization (PSO), Harmony search (HS), Artificial Bee Colony algorithm (ABC), Teaching Learning Based Optimization Algorithm (TLBO). | 6 |

| | | |
|---|---|---|
| VI | **Applications of soft computing**<br>Hybrid System, optimization using GA/ANN/SI, Application of soft computing in multiple disciplines, Function Optimization. | 7 |

| | **Text Books** |
|---|---|
| 1 | Jyh-Shing Roger Jang, Chuen-Tsai Sun, and Eiji Mizutani "*Neuro Fuzzy and Soft computing: A Computational Approach to Learning and Machine Intelligence*", Prentice Hall, New Delhi, 1986. |
| 2 | Goldberg, David E, "*Genetic Algorithms in Search, Optimization and Machine Learning*", Addison Wesley, New Delhi, 1989. |
| 3 | Sivanandam S N and Deepa S N, "*Principles of Soft computing*", Wiley India Edition., 2008. |

| | **References** |
|---|---|
| 1 | Timothy J. Ross, "*Fuzzy Logic with Engineering Application*", Tata McGraw Hill, New Delhi, 2004. |
| 2 | Robert J Schalkff, "*Artificial Neural Networks*", McGraw Hill, New Delhi, 1997. |
| 3 | Sivanandam S N and Deepa S N," *Introduction to Genetic algorithms"*, Springer Verlag, Heidelberg, 2008. |

| | **Useful Links** |
|---|---|
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs11/preview (Week no 1,2,3,4,5,8)<br>Or<br>https://nptel.ac.in/courses/106/105/106105173/ (Week no 1,2,3,4,5,8) |
| 2 | https://www.urbanpro.com/online-class/cs-302-new-soft-computing/1794165 |

**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 | | 2 | | | | | | | | | 2 | |
| **CO3** | | | | | 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. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT332 |
| **Course Name** | Machine Learning |
| **Desired Requisites:** | Linear Algebra |

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

**Course Objectives**

| | |
|---|---|
| **1** | To elaborate basic concepts of knowledge, reasoning and machine learning |
| **2** | To use different linear methods of regression and classification |
| **3** | To interpret the different supervised classification methods |

**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** | Recognize the characteristics of machine learning for the real-world problems | II | Understanding |
| **CO2** | Apply the different supervised learning methods for real-world problems | III | Applying |
| **CO3** | Use different linear methods for regression and classification | IV | Analyzing |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction to ML:** History of ML Examples of Machine Learning Applications, Learning Types, ML Life cycle, AI & ML, dataset for ML, Data Pre-processing, Training versus Testing, Positive and Negative Class, Cross-validation. | 6 |
| II | **Regression Analysis:** Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning. Supervised learning and Regression, Statistical Relationship between Two variables and scatter plots, Logistic Regression. | 7 |
| III | **Decision Tree:** Introduction to Classification and Decision Tree(DT), Problem solving using Decision Tree, Basic DT Learning algorithm, classification and DT, Issues in DT, Rule based classification | 6 |
| IV | **Artificial Neural Networks:** Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation | 7 |
| V | **Unsupervised Learning** Clustering, Types of clustering, K-means, K- Medoids, Hierarchical, Agglomerative | 6 |
| VI | **Bayesian Classification:** Introduction to Baysian classification, Naive Bayes classifiers, Baysin Belief Network, KNN , Measuring classifier Accuracy | 7 |

| | |
|---|---|
| | **Textbooks** |
| 1 | Tom M. Mitchell, "Machine Learning", India Edition 2013, McGraw Hill Education. |
| | |
| | **References** |
| 1 | Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics. |
| 2 | J. Gabriel, Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine Learning), Create Space Independent Publishing Platform, First edition , 2016 |
| | |
| | **Useful Links** |
| 1 | https://onlinecourses.nptel.ac.in/noc23_cs18/unit?unit=22&lesson=23 |
| 2 | https://onlinecourses.nptel.ac.in/noc23_cs87/preview |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 2 | | | | 1 | | | | | | | | | |
| **CO2** | | 3 | | | | | | | | | | | 2 | |
| **CO3** | | 1 | | | 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 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT333 |
| **Course Name** | Artificial Neural Network |
| **Desired Requisites:** | Programming Languages |

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

**Course Objectives**

| | |
|---|---|
| 1 | To analyze the need of Artificial Neural Network(ANN) for an application |
| 2 | To decide the use of type ANN in application. |
| 3 | To compare supervised and unsupervised learning 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 | Describe the fundamental concepts of ANN, managing and organizing the data for ANN | II | Understanding |
| CO2 | Experiment the use of ANN for simple applications | III | Applying |
| CO3 | Compare the simple perceptron and mutli-layer ANN | IV | Analysing |

| Module | Module Contents | Hours |
|---|---|---|
| I | **Introduction:** Introduction to Neural Networks, History and background, Biological inspiration, Basic components of a neural network. | 6 |
| II | **Artificial Neurons and Activation Functions:** Perceptron and McCulloch-Pitts models, Capacity of the Simple Perceptron, Activation functions (sigmoid, ReLU, etc.), Threshold Units, Proof of Convergence of the Perceptron Learning Rule, Linear Units , Nonlinear Units, Stochastic Units, Bias and weights. | 6 |
| III | **Learning rules:** Supervised and Unsupervised Learning, Neural Network Learning Rules, Hebbian Learning Rule , Perceptron Learning Rule, Delta Learning Rule, Widrow-Hoff Learning Rule, Correlation Learning Rule , Winner-Take-All Learning Rule, Outstar Learning Rule, Summary of Learning Rules. Comparison of learning rules | 7 |
| IV | **Feed forward Neural Networks:** Architecture and topology, Forward propagation, Loss functions and optimization. | 7 |
| V | **Training Neural Networks:** Backpropagation algorithm, Gradient descent and variants, Regularization techniques (dropout, weight decay). | 5 |
| VI | **Deep Neural Networks:** Introduction to deep learning, Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs) and LSTMs. | 8 |

| Textbooks | |
|---|---|
| 1 | Jacek M. Zurada, *"Introduction to artificial neural systems"*, West Publishing Company, NewYork, 1995 |
| 2 | Krogh, and R. G. Palmer, *"Introduction to the theory of neural computation"*, Addison Wesley, 2018 |
| 3 | S. N. Sivanandam & M. Paulraj, *"Introduction to Artificial Neural Networks"*, Wiley, 2016 |

| References | |
|---|---|
| 1 | Charu C. Aggarwal, *"Neural Networks and Deep Learning"*, Springer, 2018 |
| 2 | Simon Haykin, *"Neural Networks and Learning Machines"*, Pearson, 1999 |

| Useful Links | |
|---|---|
| 1 | https://nptel.ac.in/courses/117105084 |
| 2 | https://onlinecourses.nptel.ac.in/noc19_ee53/preview |
| 3 | https://www.shiksha.com/online-courses/introduction-to-machine-learning-by-nptel-course-nptel38?enModal=Y&regFlow=N |

**CO-PO Mapping**

| | Programme Outcomes (PO) | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 2 | | | | 1 | | | | | | | | | |
| **CO2** | | 3 | | | | | | | | | | | 2 | |
| **CO3** | | 1 | | | 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 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem V |
| **Course Code** | 6IT334 |
| **Course Name** | Professional Elective - 2: Cloud Computing |
| **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** Virtualization and Cloud Computing, Cloud Reference Model: IAAS, PAAS, SAAS, Cloud Deployment Model: Public Cloud, Private Cloud and Hybrid Cloud, Cloud Platforms in Industry | 7 |
| II | **Virtualization** Hosted and Bare-Meta, Server Virtualization, Desktop Virtualization, Application Virtualization, Storage Virtualization | 6 |
| III | **Network Functions** 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)** VPC fundamentals, Public and Private Subnets, Security Groups, Network Access Control List, Network Address Translation. | 7 |
| V | **Cloud Management** Service Management in Cloud Computing, Data Management in Cloud Computing, Resource Management in Cloud | 7 |
| VI | **Cloud Computing and Micro-Services:** Docker, Kubernetes, Application Deployment on Docker and Kubernetes, Open Source Cloud | 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 | | | | | | | | | 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. (Information Techology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT335 |
| **Course Name** | Professional Elective - 2: Advance Database Engineering |
| **Desired Requisites:** | Database Engineering |

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

**Course Objectives**

| | |
|---|---|
| **1** | To introduce parallel and distributed databases architectures. |
| **2** | To deliver application oriented appropriate database system. |
| **3** | To develop design and implementation skills for database systems |

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

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

| | | |
|---|---|---|
| **CO1** | Differentiate parallel and distributed database architectures. | Understand |
| **CO2** | Selection of appropriate database system for an application. | Apply |
| **CO3** | Build a database for an application | Creating. |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Parallel and Distributed Databases:** Architectures for parallel database, Parallel query Evaluation, Parallelizing individual operation, Parallel Query Optimization, Distributed DBMS, Architecture, Storing data in distributed DBMS, Distributed Catalog Management, Distributed query processing, Updating distributed data, Distributed concurrence control, Distributed recovery. | 8 |
| II | **Data Warehousing and Data Mining:** Introduction to decision support, OLAP, Implementation Techniques for OLAP, Data Warehousing, Views and decision support, view materialization. Data Mining: Introduction, Counting Co-occurrences, Mining for rules, Tree structured rules, Clustering, Similarity search over sequences. | 7 |
| III | **Object Database Systems:** Structured data types, Operations, inheritance, Objects, OID and Reference types, design for ORDBMS, Comparing RDBMS with OODBMS and ORDBMS. | 5 |
| IV | **Web Databases:** Database, information retrieval. Indexing for text search. Web search engines, web search architecture, Inverted indexes the IR way, Inverted indexes for web search engines, web crawling, web search statistics. Data model for XML. XML Quires | 7 |
| V | **Spatial Database:** Types of Spatial Data, Spatial Queries, Application, spatial Indexes, space filling Curves, Grid files, R trees. | 6 |



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|---|---|---|
| VI | **Deductive Database:** Recursive Queries, datalog programs, least model semantics, fixpoint operator, Recursive Queries with Negation, stratification, evaluation of Recursive Queries. | 6 |

| | **Text Books** |
|---|---|
| 1 | Raghu Ramakrishnan, Johannes Gehrke, *"Database Management Systems"*, 3rd Edition, McGraw-Hill Higher Education, 2014 |

| | **References** |
|---|---|
| 1 | Carlos Coronel, Steven Morris, *"Database Systems: Design, Implementation, & Management"*, 13th Edition, Cengage Learning, 2018. |
| 2 | Shio Kumar Singh, *"Database Systems: Concepts, Design and Applications"*, 2nd Edition, Pearson Education India, 2011 |

| | **Useful Links** |
|---|---|
| 1 | https://nptel.ac.in/courses/106/104/106104021/ |
| 2 | https://nptel.ac.in/courses/106/106/106106093/ |

**CO-PO Mapping**

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



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**AY 2023-24**

**Course Information**

| | |
|---|---|
| **Programme** | B.Tech. (Information Technology) |
| **Class, Semester** | Third Year B. Tech., Sem VI |
| **Course Code** | 6IT336 |
| **Course Name** | Professional Elective - 2: Spatial Data Analysis |
| **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 interpret and communicate effectively the results of spatial data analysis. |
| **2** | To demonstrate competency in the use of spatial data analysis tools. |
| **3** | To explain design and implement a spatial data analysis |

**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** | Understand the concepts and nature of spatial data analysis. | III | Applying |
| **CO2** | Apply different approaches to spatial data exploration | III | Applying |
| **CO3** | Analyze spatial statistics, spatial patterns and processes | IV | Analysing |

| **Module** | **Module Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Spatial Data:** Spatial Database: Basic Concepts, Traditional and Spatial DBMS (SDBMS), GIS and SDBMS, Query Processing, Indexing, Storage, Mining | 7 |
| II | **GML and Spatial Web Services :** Interoperability Issue, GML – Introduction, Spatial Web services, GML Visualization | 6 |
| III | **Spatial Query Processing** Spatial Query Language, Spatial Query Optimization, Location-aware Query, Spatial Indexing: Concepts, Types of Spatial Indexing | 6 |
| IV | **Spatial Network** Spatial Network: Basic Concepts, SDBMS on Spatial Networks, Query Processing for Spatial Networks, Storage and Access Methods | 7 |
| V | **Spatial Analysis:** Data Warehousing & Data Mining – Basics, Spatial Datamining, Spatial Autocorrelation, Spatial Computing | 7 |
| VI | **Remote Sensing and GIS** Remote Sensing (RS) Technology –Fundamental, Electromagnetic (EM) Spectrum, Geographical/ Geospatial Information Systems (GIS), RS data and GIS, RS Data Classification. Spatial Data Science – Use cases, Spatial Cloud, Geo-Visualization | 6 |



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|---|---|
| | **Text Books** |
| 1 | Ian HeyWood, Sarah Cornelius and Steve Carver, *"An Introduction to Geographical Information Systems"*, Pearson Education, 2nd Edition, 2006. |
| 2 | Kang-tsung Chang, *"Introduction to Geographic Information Systems"*, Tata McGrawHill, 4th Edition, 2007. |
| | |
| | **References** |
| 1 | Peter A. Burrough, Rachael A. McDonnell and Christopher D. Lloyd, *"Principles of Geographical Information System"*, Oxford University Press, 2016 |
| 2 | Keith C. Clarke, Bradley O. Parks, and Michael P. Crane, *"Geographical Information Systems and Environmental Modeling"*, Prentice-Hall India, 2001. |
| | |
| | **Useful Links** |
| 1 | https://archive.nptel.ac.in/courses/130/106/130106115/ |
| 2 | https://onlinecourses.nptel.ac.in/noc19_cs76/preview |

**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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**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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**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**
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**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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