Walchand College of Engineering

(Government Aided Autonomous Institute)

Vishrambag, Sangli-416415

1947

Syllabus

F. Y. M. Tech.

(Computer Science and Information Technology)

With effect from

Academic Year
2023-24 (FY M.Tech)

Shelapur
30-8-23
PG-co-ordinator

Bharat
Mrs. B.S. Shetty
DAC

HOD(IT)
H.O.D.
Dept. of Information Technology
Walchand College of Engineering, Sangli.

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Program	M. Tech. All Branches
Class, Semester	First Year M. Tech., Semester I
Course Code	7IC501
Course Name	Research Methodology and IPR

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

Course Objectives

1	To prepare students for undergoing research, identify and formulate the research problems, state the hypothesis, design a research layout, set a research process and methodology.
2	To enable student interpret the results, propose theories, suggest possible/alternative solutions, solve, and prove the solution adapted–logically and analytically, conclude the research findings.
3	To impart knowledge to analyze critically the literature and publish research in conferences, journals and to expose students to research ethics, IPR and Patents

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Demonstrate** a research solution in respective engineering domain using appropriate Engineering research process and research methodology.	Apply
CO2	**Device** feasible solution to a research problem in respective engineering domain based on economic, social and legal aspects using appropriate research procedures and practices.	Analyze
CO3	**Write** research publication, Dissertation, IPR and patent document.	Create

Module	**Module Contents**	**Hours**
I	**Engineering Research Process** Meaning of research problem, Sources of research problem, Criteria and Characteristics of a good research problem, Errors in selecting a research problem, Definition, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.	6
II	**Research Methodology** Problem statement formulation, resources identification for solution, Experimental and Analytical modelling, Simulations, Numerical and Statistical methods in engineering research. Hypothesis and its testing by different techniques: Z-test etc.,	6
III	**Research Methods** Uni and Multivariate Analysis: ANOVA, Design of Experiments/Taguchi Method, Regression Analysis. Software tools like spreadsheets. Processing and Analysis of Data: Processing Operations, Types of Analysis-Presentation and Interpretation of Data Editing, Classification and Tabulation-	7

Solapure 25-8-2023
Dr. S.S. Solapure

Dr. R.S. Desai 23/8/2023
Mechanics De

	Interpretation. Analyse your results and draw conclusions.	
IV	**Research Practices** Effective literature studies approaches, critical analysis, Plagiarism, Research ethics, Mendeley - Reference Management Software. Research communication- Effective Technical Writing, Writing a research article for Journal/conference paper, Technical report, Dissertation/ Thesis report writing, Software used for report writing such as WORD, Latex etc. Presentation techniques for paper/report/seminar. Publishing article in Scopus/SCI/Web of science indexed journal or conference.	7
V	**Intellectual Property Rights (IPR)** Nature of Intellectual Property: Patents, Designs, Trade and Copyright, Ownership of copyright, Term of copyright, Technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. New developments in IPR, Traditional knowledge ,Various Case Studies.	7
VI	**Patents** Patent Rights: Scope of Patent Rights. Various Patent databases. Geographical Indications. Procedure for grants of patents, Patenting under PCT. Licensing and transfer of technology. Administration of Patent System. Introduction to International Scenario: WIPO, TRIPs, Patenting under PCT	6

	Textbooks
1	Kothari C. R, "Research Methodology", 2nd Edition, New Age International, 2004
2	Melville Stuart and Goddard Wayne, "Research Methodology: An Introduction for Science & Engineering Students" Juta and Company Ltd, 2000.
3	Kumar Ranjit, "Research Methodology: A Step-by-Step Guide for beginners", SAGE Publications, 4th Ed.-2014.
	References
1	Merges Robert, Menell Peter, Lemley Mark, "Intellectual Property in New Technological Age", ASPEN Publishers, 2016.
2	Ramappa T., "Intellectual Property Rights Under WTO", S. Chand, 2008
3	Mayall, "Industrial Design", McGraw Hill, 1992.
4	Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007
5	Deepak Chopra and Neena Sondhi, Research Methodology : Concepts and cases, Vikas Publishing House, New Delhi
	Useful Links
1	NPTEL :: General - NOC:Introduction to Research
2	Introduction to Research - Course (nptel.ac.in)
3	Qualitative Research Methods And Research Writing - Course (nptel.ac.in)
4	https://onlinecourses.swayam2.ac.in/ntr21_ed23/preview - Academic Research & Report Writing
5	https://www.scopus.com/search/form.uri?display=basic#basic
6	https://onlinecourses.nptel.ac.in/noc21_ge12/preview - Qualitative Research Methods And Research Writing
7	https://onlinecourses.nptel.ac.in/noc21_hs44/preview - Effective Writing
8	https://webofscienceacademy.clarivate.com/learn

Solapur
23-8-2023
Dr. S. S. Solapure
Associate Professor

9	https://onlinecourses.swayam2.ac.in/ntr21_ed23/preview - Academic Research & Report Writing
10	https://nptel.ac.in/courses/121/106/121106007/
11	https://www.wipo.int/about-wipo/en/

CO-PO Mapping

	Programme Outcomes (PO)					
	1	**2**	3	4	5	6
CO1	3		1			
CO2			2	3	2	
CO3		3		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)

Solapur
28-8-2023
Dr. S. S. Solapure
Associate Professor (IT)

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

AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT501
Course Name	Advanced Algorithms
Desired Requisites:	Computer Algorithms

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

Course Objectives

1	To exercise the Graph Algorithms
2	To classify shortest path computing techniques
3	To compare the algorithms based on performance and complexities

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Solve graph related algorithms with real world problems	Apply
CO2	Calculate the shortest path for a given distance based scenario	Analyze
CO3	Verify the solution for engineering problem using graph algorithm	Create

Module	**Module Contents**	**Hours**
I	**Elementary Graph Algorithms and MST:** Representation of Graphs, BFS and DFS, Topological Sort, Strongly Connected Components Growing a Minimum Spanning Tree, Algorithms of Kruskal and Prim	7
II	**Single Source Shortest Path Algorithms:** Bellman-Ford Algorithm, SSSP in Directed Acyclic Graphs, Dijkstra's Algorithm, Difference Constraints and Shortest Paths, Proofs of Shortest-paths Properties	6
III	**APSP and Maximum Flow:** Shortest Paths and Matrix Multiplication, Floyd-Warshall Algorithm, Johnson's Algorithm for Sparse Graphs Flow Networks, Ford-Fulkerson Method, Maximum Bipartite Matching, Push-relable algorithms	7
IV	**Multithreaded Algorithms and Matrix Operations:** Dynamic Multithreading fundamentals, Multithreaded Matrix Multiplication, Multithreaded merge sort Solving systems of linear equations, Inverting matrices, Symmetric positive-definite matrices and least-squares approximation	6
V	**NP-Completeness:** Polynomial-time verification, NP-completeness and reducibility, NP completeness proofs, NP-complete problems	7
VI	**Approximation Algorithms:** The vertex-cover problem, The traveling-salesman problem, The set-covering problem, Randomization and linear programming, The subset-sum problem	6

Text Books	
1	Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, *"Introduction to Algorithms"*, Third Edition the MIT Press Cambridge, London, England
References	
1	Horrowitz, Sahni Rajasekaran, *"Computer Algorithms"*, Computer Science, W. H. Freeman and company Press, New york
Useful Links	
1	To be declared during the course on the CMS.
2	

CO-PO Mapping

Programme Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2					
CO2		3		2	1	
CO3	3				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)

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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT502
Course Name	Unix Internal
Desired Requisites:	Operating System

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

Course Objectives

1	To interpret design principal and philosophy of the Unix/Linux OS.
2	To elaborate the architecture of Unix/Linux OS.
3	To use 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,

CO1	Interpret design principal and philosophy of the Unix/Linux OS	Apply
CO2	Analyze the architecture of Unix/Linux OS	Analyze
CO3	Compare various IPCs Linux OS	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction to Unix Internals** General Overview of the System - History, System Structure, User Perspective, Operating System Services, Assumption About Hardware.	7
II	**Introduction to the Kernel** Architecture of UNIX OS, Introduction to system concepts, Kernel Data Structure, System Administration Architecture of UNIX OS, Introduction to system concepts, Kernel Data Structure, System Administration	6
III	**Internal Representation of Files** 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.	7
IV	**Structure of Process** Process stages and transitions, layout of system memory, the context of a Process, saving context of a process, manipulation of the process address space.	7
V	**Process Control** 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.	6
VI	**Inter Process Communication** Types of IPCs, Importance of IPC and IPS (Inter process Synchronization), Shared Memory, Massage Queue, Semaphore, MPI, Open MP, Threads Vs Process, Comparison of various IPCs	6

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/ (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 (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)						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2				
CO2			1			
CO3	3			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)

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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT503
Course Name	Database Design and Performance Tuning (Theory)
Desired Requisites:	Database

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

Course Objectives

1	Preparing to interpret database design, constructing and tuning according to the specifications.
2	To impart database security and administrative and performance monitoring Tasks.
3	To apprise about the requirements, data structures, retrieval techniques of complex database systems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Comprehend the database design cycle and administration	Understanding
CO2	Evaluating database performance and tuning on the basis of guidelines and KPI's	Analyze
CO3	Devising optimized query plans and analyzing parallel and distributed transactions	Create

Module	**Module Contents**	**Hours**
I	Concepts of Database Design and administration Introduction, Software Development cycle (SDLC), Database Development cycle (DDLC),Automated Design tools, Normalization concepts Database Administration DBA Tasks, Defining the Organization's DBMS Strategy, Managing User access, Database performance management	7
II	Query Processing and Optimization Introduction, Query processing, syntax analyzer, query decomposition, query optimization (cost estimation), pipelining and materialization, Heuristics in Query Optimization, structure of query evaluation plans	6
III	Parallel and distributed transaction processing Parallel and distributed database architectures, Distributed transactions, Optimization of Distributed Queries, Multi-database Query Processing, Distributed concurrency control and recovery	7
IV	Database security Introduction, database security issues, Access control in database systems (DAC, MAC, RAC), Inference control, multilevel database security, statistical database recovery, Intrusion tolerant database systems, SQL injection	7

RR Rathod

V	Physical Database Design and Tuning Physical DB Design, Index selection, Guidelines for Index Selection, Clustering and Indexing, Overview of Database Tuning, Choices in Tuning the Conceptual Schema, Choices in Tuning Queries, DBMS Benchmarks	6
VI	Complex database systems Introduction to Spatial Databases: Spatial Data Structures, Spatial Storage and Indexing, spatial queries, Multimedia databases, Temporal and sequential databases	6

	Text Books
1	S.K.Singh, "Database systems: Concepts, Design and Application ",2nd Edition, Pearson Education, 2011
2	Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Second Edition, Tata McGraw Hill Inc, 2008.
	References
1	IBM DB2 Universal Database- Administration Guide: Performance, V. 8, 2002.
2	Craig S. Mullins, Database Administration: The Complete Guide to Practices and Procedures, Addison-Wesley Professional, 2002.
3	Dennis Shasha and Philippe Bonnet, Database Tuning, Principles, Experiments and Troubleshooting Techniques, Elsevier Reprint 2005.
	Useful Links
1	

CO-PO Mapping

Programme Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3				
CO2	3	1	2			
CO3	3	2	1	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
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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT551
Course Name	Advanced Algorithms Lab
Desired Requisites:	Data Structures, Computer Algorithms

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

Course Objectives

1	To demonstrate the concepts of Graph Algorithms.
2	To implement shortest path computing techniques.
3	To compare the algorithms based on complexities.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Demonstrate graph related algorithms with real world problems	Apply
CO2	Implement the shortest path for a given distance based scenario	Apply
CO3	Design approximation algorithms in graph	Create

List of Experiments / Lab Activities

List of Experiments:

Activities are to be carried out individually.

Each student will perform the activity based on course on following areas.

1. Implement the Elementary Graph Algorithms and MST
2. Demonstrate the Single Source Shortest Path Algorithms
3. Implement the Multithreaded Algorithms and Matrix Operations
4. Study NP-Completeness and Polynomial-time verification
5. Demonstrate the Approximation Algorithms in graph theory

Student should perform the activities on the basis of the real-time applications in the subjects and submit the work with code, PPT, PDF, Text report document & reference material or on online GitHub. Students should maintain activity log book containing weekly progress

Text Books

1	Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Third Edition the MIT Press Cambridge, London, England.

References

1	Horrowitz, Sahni Rajasekaran, "Computer Algorithms", Computer Science, W. H. Freeman and company Press, New york

Useful Links

1	https://nptel.ac.in/courses/106/101/106101060/

CO-PO Mapping						
Programme Outcomes (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		1			
CO2		2				
CO3			3		1	

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 13 Marks Submission at the end of Week 13	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
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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem-1
Course Code	7IT552
Course Name	Unix Internal lab
Desired Requisites:	Operating System, (C/python) Programming language

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

Course Objectives

1	To use various system call of Unix/Linux
2	To elaborate the various inter process communications
3	To impart the inter process communications 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,

CO1	Illustrate the difference between thread and process	Apply
CO2	Identify different system calls for Linux/Unix programming	Analyze
CO3	Implement various inter process communications available in operating system	Apply

List of Experiments / Lab Activities

List of Experiments:

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

Student should perform the activities on the basis of the real-time applications in the subjects and submit the work with code, PPT, PDF, Text report document & reference material or on online GitHub. Students should maintain activity log book containing weekly progress

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)

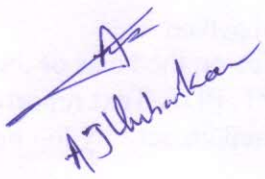
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		3			
CO2		2				1
CO3	1			2		

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 13 Marks Submission at the end of Week 13	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
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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem-1
Course Code	7IT553
Course Name	Database Design and Performance Tuning (Lab)
Desired Requisites:	Database Engineering or Database Management System (DBMS)

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

Course Objectives

1	To provide students with an understanding of the practices of database design, query processing, transaction processing.
2	To provide students with hands- on database recovery and security.
3	To provide students with hands- on database tuning to improve DBMS performance.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Demonstrating the database design cycle and administration.	Apply
CO2	Evaluating database performance and tuning on the basis of guidelines and KPI's	Analyze
CO3	Devising optimized query plans and analyzing parallel and distributed transactions.	Create

List of Experiments / Lab Activities

List of Experiments:

1. Database Design and administration DBMS software's (e.g. DB2,Oracle)
2. Query Processing and Optimization 10
3. Study of performance tuning parameters.
4. Study of providing security to DBMS. 8
5. Study of recovery of DBMS.
6. Study of Transaction Processing in DBMS.

Text Books

1	IBM DB2 Universal Database- Administration Guide: Performance, Vol. 8, 2002.
2	Oracle 10g Administration study Guide, Sybex Publisher, 2005

References

1	IBM DB2 Universal Database- Administration Guide: Performance, V. 8, 2002.
2	Craig S. Mullins, Database Administration: The Complete Guide to Practices and Procedures, Addison-Wesley Professional, 2002.
3	Dennis Shasha and Philippe Bonnet, Database Tuning, Principles, Experiments and Troubleshooting Techniques, Elsevier Reprint 2005.

RR Rathod

Useful Links	
1	

CO-PO Mapping						
Programme Outcomes (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	3	3			
CO2	3	2				1
CO3	1	2		2		

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 13 Marks Submission at the end of Week 13	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	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT511
Course Name	Professional Elective - 1: Cloud and Virtualization Techniques
Desired Requisites:	Computer Networks

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

Course Objectives

1	To elaborate fundamentals of virtualization
2	To integrate service and deployment model in cloud computing
3	To illustrate the significance of virtualization in data center

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Use service model of cloud computing	Apply
CO2	Choose virtualization techniques to deploy the services on cloud infrastructure	Apply
CO3	Analyze service models for data center applications	Analyze

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	**Advances in Cloud Computing** 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 https://nptel.ac.in/content/syllabus_pdf/106105167.pdf
2	https://aws.amazon.com/

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1					
CO2			2		2	
CO3		3		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
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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT512
Course Name	Professional Elective - 1: Ruby & Go Programming Language
Desired Requisites:	C & CPP Programming

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

Course Objectives

1	To use various paradigm of Ruby and Go Programming Language
2	To choose features of Ruby for file handling and error handling
3	To demonstrate the features of Go language for process synchronization

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Implement object oriented programming concepts using Ruby	Apply
CO2	Demonstrate the concept of File handling using Ruby and Go language	Apply
CO3	Analyze the Synchronization problem using Go Language	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction to Ruby Programming** Brief history of Ruby, Installing & running Ruby, Command Line Arguments, Numbers, Text & Strings, Arrays & Hashes, Symbols, Expressions (True, False, Nil) Classes, Modules & Objects: Objects, Classes, Variables	7
II	**Flow Control & Statements and Properties** Conditionals, Loops, Error & Exception Handling, Threads & Fibers Classes, Modules & Objects : Simple Ruby Classes, Object Instances, Attributes, Inheritance, Persistence Methods, Attributes & Variables: Setter & Getter methods, Method Visibility (Access Control), Instance Variables	7
III	**Meta- programming & File Handling:** Meta-programming :Exceptions, Types, Modules & Classes, Blocks & Strings, Variables, Missing Methods & Constants, Custom Structures, Dynamically adding methods, Threads, I/O Objects, Reading file, writing file.	6
IV	**Introduction to Go Language** Introduction, Program Structure: names, declaration, variables, assignments, types, files, scope, number, string variables, arrays, slice	6
V	**Data Types and operations:** Basic data types, composite data types, functions, control statements, methods, interface, pointers, structs	6
VI	**Concurrency with Shared variables:** Race condition, mutual exclusion, memory synchronization ,package implementation	7

Text Books

1	Davd Flanagan, Yukihiro Mataumoto, "*The Ruby Programming Language: Everything You Need to Know*", O'Reilly; 1st edition (12 February 2008)
2	Alan A. A. Donovan, Brian W. Kernighan, "*The Go Programming Language*", Pearson Education; First edition (1 February 2016)

References	
1	Yukihiro Matsumoto, David Flanagan , "*The Ruby Programming Language*", Shroff,1st Edition, 2008.
2	Caleb Doxsey, "*An Introduction to Programming in Go"*, CreateSpace Independent Publishing Platform (3 September 2012)

Useful Links	
1	https://onlinecourses.swayam2.ac.in/aic20_sp37/preview
2	https://www.javatpoint.com/ruby-tutorial
3	https://www.ruby-lang.org/en/documentation/quickstart/
4	https://gobyexample.com/
5	https://www.javatpoint.com/go-tutorial
6	https://www.coursera.org/specializations/google-golang

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3			1		
CO2		2				2
CO3			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)

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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT514
Course Name	Professional Elective – 1: Artificial Intelligence
Desired Requisites:	Probability and Linear Algebra

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To compare various techniques in Artificial Intelligence
2	To elaborate methodologies for various application areas of Artificial Intelligence
3	To illustrate various applications in Artificial Intelligence

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply fundamental concepts of Artificial Intelligence	Apply
CO2	Compare the architectural and functional structures of Artificial Intelligence	Analyse
CO3	Build an expert system in Artificial Intelligence	Create

Module	**Module Contents**	**Hours**
I	**AI and Problem Solving by Search** Introduction to AI, Problem solving as state space search, Uninformed search, Heuristic search, CSP problems	7
II	**Knowledge Representation** Introduction, to Knowledge representation, First order logic-I	7
III	**Knowledge Reasoning** First order logic-II, Inference in First order logic-I, Bayesian network, decision network	6
IV	**Planning** Introduction to Planning, Plan space planning, Planning graph and Graphplan	6
V	**Machine Learning** Introduction to ML, Learning decision tress, Reinforcement learning, Learning in neural network, Deep Learning: A review.	7
VI	**Expert systems** Introduction, Functionality /components of Expert systems, Architecture of ES, Building an Expert system	6

Text Books

1	Rich Elaine and Kelvin Knight ,Nair,*" Artificial Intelligence"*, McGraw Hills 3rd edition,1991
2	Janakiraman et al., *"Foundations of Artificial Intelligence and Expert Systems",* MacMillan India Ltd., 2007.

References

1	Russell and Norvig," *Artificial Intelligence – A Modern Approach*", Prentice-Hall, 2010 (3rd edition).

2	course on NPTEL/SWAYAM by **Prof. Shyamanta M Hazarika** , IIT Guwahati-" Fundamentals Of Artificial Intelligence"
Useful Links	
1	Module I,II,III https https://onlinecourses.nptel.ac.in/noc19_me71/unit?unit=7&lesson=8
2	Module IV,V https://onlinecourses.nptel.ac.in/noc19_me71/unit?unit=16&lesson=17
3	Module VI Vlabs,iitb.ac.in

CO-PO Mapping						
Programme Outcomes (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1		3			
CO2		2				2
CO3	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).

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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	6IT513
Course Name	Professional Elective - 2: Advanced Distributed Computing
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	5	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To illustrate the various aspects of modern distributed systems
2	To compare various distributed architecture
3	To evaluate parallel and distributed computing applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Distinguish between various big data analytics techniques	Analyze
CO2	Study the various approach to implement distributed environment	Analyze
CO3	Evaluate the reliability and performance of various algorithms of distributed system	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to Distributed Systems:** Task Creation and Termination (Async, Finish), Tasks in Java's Fork/Join Framework, Computation Graphs, Work, Span, Multiprocessor Scheduling	6
II	**Distributed System with Parallelism:** Parallel Speedup , Amdahl's Law, Reciprocal Array Sum using Async- Finish, Reciprocal Array Sum using Recursive Action's in Java's Fork/Join Framework	7
III	**Functional Parallelism:** Futures: Tasks with Return Value, Futures in Java's Fork/Join Framework, Memorization, Java Streams, Data Races and Determinism	6
IV	**Data flow Synchronization and Pipelining:** Split-phase Barriers with Java Phasers, Point-to-Point Synchronization with Phasers, One-Dimensional Iterative Averaging with Phasers, Pipeline Parallelism, Data Flow Parallelism	7
V	**Distributed Map Reduce:** Introduction to Map-Reduce, Hadoop Framework, Spark Framework, TF-IDF Example, Page Rank Example, Demonstration: Page Rank Algorithm in Spark	7
VI	**Client-Server Programming:** Introduction to Sockets, Serialization/Deserialization, Remote Method Invocation, Multicast Sockets, Publish-Subscribe Mode, Demonstration: File Server using Sockets	6

Text Books

1	Andrew S. Tanenbaum and Maarten Van Steen, "*Distributed Systems: Principles and Paradigms*", 2nd edition, Pearson Education, 2007.
2	George Coulouris, Jean Dollimore, Tim Kindberg, *"Distributed Systems: Concepts and Design"*, 4th Edition, Pearson Education, 2005.
References	
1	A. S. Tanenbaum and M. V. Steen, *"Distributed Systems: Principles and Paradigms"*, Second Edition, Prentice Hall, 2006
Useful Links	
1	Module I, II, III, IV https://www.coursera.org/learn/parallel-programming-in-java?specialization=pcdp#syllabus Module V, VI https://www.coursera.org/learn/distributed-programming-in- java?specialization=pcdp#syllabus

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		1			
CO2		1			2	
CO3	1			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).

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Course Information

Programme	M. Tech (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT515
Course Name	Professional Elective – 2: Parallel Algorithms
Desired Requisites:	Computer Algorithm

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

Course Objectives

1	To experiment the parallel architecture in Parallel Algorithms
2	To use the process of parallelization in computer algorithms
3	To compare the thread and process parallel architecture

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Implement the sequential and parallel algorithms	Apply
CO2	Compare the speedup factor of sequential and parallel algorithms	Analyze
CO3	Design the parallel algorithm to improve the performance parameters	Create

Module	**Module Contents**	**Hours**
I	Parallel Computing: Motivation and scope	6
II	GPGPU Programming : OpenACC, CUDA, OpenCL	6
III	Trends in processor architecture and limitations of memory systems	6
IV	Dichotomy and organization of parallel platforms	7
V	Communication costs in parallel machines	7
VI	Routing mechanism and processor mapping techniques	7

Text Books

1	Anath Grama, Ansul Gupta, George Karypis, Vipin Kumar, *"Introduction to parallel computing"*, Second Edition, Pearson Education, 2003
2	Jaegeun Han, Bharatkumar Sharma, *"Learn CUDA Programming"*, First Edition, Packt publishing, 2019

References

1	Horrowitz, Sahni Rajasekaran, "Computer Algorithms", Computer Science, W. H. Freeman and company Press, New york

Useful Links

1	https://nptel.ac.in/courses/106/102/106102114/
2	https://nptel.ac.in/courses/106/102/106102163/

CO-PO Mapping						
Programme Outcomes (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2			3		
CO2		2			1	
CO3			1	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)

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AY 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT516
Course Name	Professional Elective – 2: Software Reliability and Testing
Desired Requisites:	Software Engineering

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

Course Objectives

1	To elaborate Software Reliability and Testing.
2	To illustrate project management cycle for software development.
3	To use Agile development techniques for software development.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply concepts of Software Reliability and Testing	Understand
CO2	Analyze Software Reliability Growth Models in Software Development	Analyze
CO3	Evaluate the Software system to detect fault tolerance	Analyze

Module	**Module Contents**	**Hours**
I	**Basic of Software Testing:** Software Testing, Testing types, Flow graph, Cyclomatic complexity, Graph Matrices, Debugging & Test Case Strategies	7
II	**Software Quality:** Software Quality Assurance, Software Reuse, Documentation Requirements, Standards, Software Configuration Management, Version Control, Baselines	7
III	**Software Reliability:** Software Reliability, Software Reliability Issues, Statistical Testing and Software Quality Management, ISO 9000, Case Tools, Characteristics of Case Tools	7
IV	**User Interface and Design**: Concept of user Interface and Design, Types of user Interface, Component Based GUI Development	7
V	**Software Fault Detection:** Basic terminology of Fault tolerant, Fault detection using fault tree, Fault tolerant in SRE, Techniques for Fault tolerant: Recovery blocks, N- version programming	5
VI	**Software Fault Analysis:** Fault tree modelling, Fault tree analysis, Analysis of fault tolerant software system, Quantitative analysis of fault tolerant system	6

Text Books

1	Jalote Pankaj, *"An Integrated Approach to Software Engineering"*, Narosa Publication, 3rd Edition, 2010.
2	Sommerville, *"Software Engineering"*, Pearson Education India, New Delhi,2nd Edition, 2006

References	
1	Musa John D., *"Software Reliability Engineering"*, Tata McGraw Hill, 2nd Edition, 1999
2	Lyu, *"Software Reliability Engineering"*, IEEE Computer Society Press, 1st Edition, 1996
Useful Links	
1	Module I, II, III, IV, V - https://onlinecourses.nptel.ac.in/noc21_cs15/preview

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	1		
CO2	1					2
CO3		2		3		

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	MTech. (CS & IT)
Class, Semester	First year M. Tech., Sem I
Course Code	7IT517
Course Name	Professional Elective - 2: IoT Systems and Applications
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 infer the concept of Internet of Things (IoT).
2	To apply basic WSN protocols for IoT systems.
3	To create IoT based applications in different paradigms.

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 IoT concept in real time scenario	III	Applying
CO2	Analyze use of WSN protocols in IoT applications	III	Applying
CO3	Develop IoT enabled services	VI	Creating

Module	**Module Contents**	**Hours**
I	**Introduction to IoT:** Sensing, Actuation, Basics of Networking, Communication Protocols	7
II	**Sensor Networks:** Machine-to-Machine Communications, Interoperability in IoT	7
III	Introduction toIoT Programming: Integration of Sensors and Actuators with Arduino, Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi	7
IV	**Introduction to SDN:** SDN for IoT, Data Handling and Analytics, Cloud Computing, Sensor-Cloud, Fog Computing	6
V	**IOT Application:** Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT	6
VI	**Case Study:** Agriculture, Healthcare, Activity Monitoring	6

Text Books

1	Arshdeep Bahga and Vijay K. Madisetti, *"Internet of Things: A Hands-on Approach"*, VPT, 1st Edition, 2014
2	Samuel Greengard, *"The internet of things"*, MIT Press, 1st Edition, 2015

References

1	Pethuru Raj and Anupama C. Raman, *"The Internet of Things: Enabling Technologies, Platforms, and Use Cases"*, CRC Press, 1st edition, 2017

2	Adrian McEwen, Hakim Cassimally, *" Designing the Internet Of Things"*, Wiley, 1st Edition, 2013

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc19_cs65/preview

CO-PO Mapping

	Programme Outcomes (PO)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		2			
CO2			3			
CO3	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
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AY 2023-24

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem I
Course Code	7IT518
Course Name	Professional Elective - 2: Image Processing and Pattern Recognition
Desired Requisites:	Mathematics-(Matrix, Fourier Transformation)

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

Course Objectives

1	To describe mathematical transformation under image processing
2	To demonstrate image enhancement techniques
3	To elaborate image processing applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Discuss essentials of image processing and related terms	Understand
CO2	Implement image segmentation and representation techniques	Apply
CO3	Design prototype of an image processing & pattern recognition	Create

Module	**Module Contents**	**Hours**
I	**Introduction and Pixel Relationship** Need for Image Processing ,Some Applications of Image Processing-Fundamental steps in DIP, Components of digital image processing, sampling, quantization, Pixel Relationships in images, Distance measurements, Data structure for image representation	7
II	**Image Operations and Interpolations** Arithmetic operations, Logical operations, Geometrical operations , Image interpolation techniques	7
III	**Image Transformation** Need of transformation, DFT and properties, convolution Theorem, DCT	6
IV	**Image Enhancement** Point operations ,Spatial filtering techniques, Frequency domain filtering	6
V	**Image Segmentation** Classification of Image segmentation, Edge detection, Thresholding techniques, Region growing techniques	7
VI	**Pattern Recognition Fundamentals** Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model	6

30-8-23

Text Books	
1	S.Shridhar, *"Digital Image Processing"*, Oxford Unversity Press,2nd Edition,2016.
2	Millan sonka,Vaclav Hiavac, Roger Boyle, *"Image Processing Analysis and Machine Vision"*, CL Engineering,3rd Edition,2013.
References	
1	S. Jayraman, S Esakkiarajan , Veerakumar, *"Digital image processing"*, 1st Edition ,MGH,2017.
2	Rafel C. Gonzalez, Richard E. Woods, *"Digital Image Processing"*, 3rd Edition, Pearson Education, 2008
Useful Links	
1	Module I,II,III https://nptel.ac.in/courses/117/105/117105079/
2	Module IV,V https://nptel.ac.in/courses/106/105/106105223/
3	Module VI Vlabs,iitb.ac.in

CO-PO Mapping						
Programme Outcomes (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2			1
CO2	2		3	1		
CO3	1			3		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)

30-8-23

SEMESTER –II

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., **Sem II**
Course Code	7IT521
Course Name	Data Mining Methods and Applications
Desired Requisites:	Database Engineering

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

Course Objectives

1	To exercise advanced data mining techniques
2	To compare various algorithm for real-time application
3	To propose a novice solution for real world problem

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Implement techniques and algorithms of Data Mining	Apply
CO2	Apply data mining techniques and algorithms for solving real life problems	Apply
CO3	Analyse various clustering and classification techniques in data mining	Analyse

Module	Module Contents	Hours
I	**Introduction :** Data Mining, Kinds of Data, Kinds of Patterns, Technologies, Major Issues in Data Mining. Getting to Know Your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring DataSimilarity and Dissimilarity	7
II	**Data Pre-processing:** Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization	6
III	**Mining Frequent Patterns:** Basic Concepts, Frequent Item set Mining Methods, Pattern Evaluation Methods.	7
IV	**Classification** Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy	6
V	**Cluster Analysis** Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering.	7

RRRathod

VI	**Outlier Detection** Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches, Clustering-Based Approaches, Classification-Based Approaches, Mining Contextual and Collective Outliers, Outlier Detection in High-Dimensional Data	6

	Text Books
1	Han Jiawei and Kamber Micheline *"Data Mining – Concepts and Techniques"* The Morgan Kaufmann Series in Data Management Systems ,3rd Edition, 2011
2	Dunham M. H, *"Data Mining: Introductory and Advanced topics"*, Pearson, 2nd Edition, 2003
	References
	Chattamvelli Rajan, *"Data Mining Methods: Concepts & Applications"*, Narosa Publishing House, 2nd Edition, 2010
2	Mitra Sushmita, Acharya Tinku, *"Data Mining Multimedia, Soft Computing and Biometrics"*, WILEY Publication, 3rd Edition, 2003
	Useful Links
1	https://onlinecourses.nptel.ac.in/noc20_cs12/preview
2	https://www.javatpoint.com/data-mining
3	https://data-flair.training/blogs/data-mining-tutorial/

CO-PO Mapping

Programme Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3				1	
CO2		2		2		
CO3	1		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 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT522
Course Name	Scientific Computing
Desired Requisites:	Programming experience in C, C++, Java

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 use different programming paradigms in scientific computing.
2	To apply appropriate programming language for solving the problem
3	To demonstrate report writing using LATEX tool.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Compare functional and logical programming.	Analyze
CO2	Use Python programming language for solving the problem	Apply
CO3	Implement scripts to automate data formatting and analysis	Apply

Module	**Module Contents**	**Hours**
I	**Introduction to Data Science and Scientific Computing-** Overview of the Data Science process, Scientific Computing Technologies, Regressions, Classification, Clustering	7
II	**Python-Numpy and Pandas:** **NumPy:** Introduction, Numpy array, Numpy array indexing, Numpy operations. **Pandas:** Series, Data frames, managing missing data, groupby, merging & concatenation, operations, data input and data output.	6
III	**Python for Data Visualization:** Data Visualization through libraries like: Matplotlib, Seaborn, Plotly and Cufflinks, Geographical Plotting.	6
IV	**Working with Data in R –** Variables , Vectors, Matrices, lists & Data frames , Logical vectored operators Image data type, Image representation, categorical data using Factors in R	7
V	**Data/Image Visualization using libraries –** Using graphs to visualize data, Basic plotting in R, Manipulating the plotting window, Advanced plotting using lattice library in R. Image visualization in using Image processing tools	7
VI	**Data Reporting using LaTeX –** LATEX Software installation, LATEX typesetting basics, LATEX math typesetting, Tables and matrices, Mathematics in Latex	6

Text Books

1	Samir Madhavan, *"Mastering Python for Data Science"*, August 2015, Packt Publishing, ISBN: 9781784390150

References

1	Gilbert Strang, *"Introduction to linear algebra"* ,Wellesley-Cambridge Press, 5th Edition, August 2016
2	Douglas Montgomery, *"Applied statistics and probability for engineers"*, 6th Edition, Wiley Publications, January 2016

	Useful Links
1	https://onlinecourses.nptel.ac.in/noc20_cs36/course
2	https://spoken-tutorial.org/watch/Python+3.4.3/Plotting+Data/English/

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2			1
CO2					2	
CO3		1	3			

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 2022-23

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT523
Course Name	Agile Development (Theory)
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 define basics of Software Testing and techniques.
2	To elaborate project management for software development.
3	To illustrate Agile development techniques for software development.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Demonstrate use of automation testing tools	Apply
CO2	Implement project management techniques like planning, risk analysis, scheduling.	Apply
CO3	Evaluate software development life cycle using Agile tools and DevOps.	Evaluate

Module	**Module Contents**	**Hours**
I	**Software Testing Introduction:** Introduction, Importance of Software testing, How to conduct Software testing, Basic terminology of Software testing, Manual Testing Process, Difference between Manual and Automated Testing, Software testing Roles and Responsibilities, V Model of Software Development	7
II	**Test Case Design Techniques** Static Techniques, Dynamic Techniques, Black-box Test Techniques, White-box Test Techniques, Experience-based Test Techniques, Levels of Software Testing	6
III	**Types of Software Testing** **i) Functional Testing:** Unit Testing, Integration Testing, System Testing, User Acceptance Testing, Sanity/Smoke Testing, Regression Testing. **ii) Non Functional Testing:** Performance Testing. (Load, Stress, Spike and Endurance Testing), Usability Testing, Compatibility Testing, Reliability Testing, Security Testing	6
IV	**Project Management** Software Product Management, Requirements Analysis/Design, Planning and Scheduling, Monitoring, Risk Analysis, Project Leadership, Teamwork, Project Organization and Team Structures, Resource Allocation, Software Quality Management Software Testing Standards	7

V	**Agile Testing** The Fundamentals of Agile Software Development, Extreme Programming, Aspects of Agile Approaches, The Differences between Testing in Traditional and Agile Approaches, Status of Testing in Agile Projects, Role and Skills of a Tester in an Agile Team, Agile Testing Methods, Assessing Quality Risks and Estimating Test Effort, Techniques in Agile Projects, Tools in Agile Projects	7
VI	**DevOps Testing** DevOps, Version control with Git, Git, Jenkins, Maven, Integration with Jenkins, Continuous Integration and Continuous Delivery CI/CD: Jenkins Creating pipelines, Setting up runners Containers and container orchestration (Dockers and Kubernetes) or application development and deployment.	6

Text Books

1	Glenford J. Myers, Corey Sandler, Tom Badgett, "*The Art of Software Testing*", Third edition, Wiley, 2011, ISBN: 978-1-118-13315-6
2	Ron Patton, Corey Sandler, Tom Badgett, "*Software Testing*", Second edition, Sams, 2005
3	Lisa Crispin and Janet Gregory, "*Agile Testing: A Practical Guide for Testers and Agile Teams*", First edition, Addison-Wesley Signature Series, 2009
4	Teresa Luckey, Joseph Phillips, "*Software Project Management For Dummies*", First edition, Wiley, 2006, ISBN: 9780471749349

References

1	Lee Copeland, "*A Practitioner's Guide to Software Test Design*", First edition, Artech House, 2003, ISBN-13: 978-1580537919.
2	Joakim Verona · "*Practical DevOps*", First edition, Artech House, 2016, ISBN-13: 9781785886522, 1785886525.
3	Henry· "*Software Project Management: A Real-World Guide To Success*", First edition, Pearson Education, 2004, ISBN- 9788131717929, 8131717925

Useful Links

1	https://www.javatpoint.com/software-testing-tutorial
2	https://www.guru99.com/software-testing.html
3	https://www.getzephyr.com/insights/developing-devops-testing-strategy-benefits-best-practices-tools
4	https://www.softwaretestinghelp.com/agile-scrum-methodology-for-development-and-testing/

CO-PO Mapping

	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2			1
CO2					2	
CO3		1	3			

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	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT571
Course Name	Data Mining Methods and Applications Lab
Desired Requisites:	Data Mining

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

Course Objectives

1	To introduce student with concept of data mining
2	To provide knowledge applications of Data Mining applications.
3	To help students to address real-world challenges using Data mining algorithms.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Implement the software application using for data mining algorithm.	Apply
CO2	Write & explain a detailed project report for submission and evaluation.	Evaluate
CO3	Design and validate system for Data mining	Create

List of Experiments / Lab Activities

List of Experiments:

Activities are to be carried out individually.

Each student will perform the activity based on course on following areas.

1. Design system for data analysis using data mining algorithms.
2. The system work on data set with different algorithm like classification, clustering, association, etc.
3. Industry Problem Statement(Sponsored Project)
4. Problem statements based on current or previously learned Technology.
5. At the end of the semester project group should achieve all the proposed objectives of the problem statement.
6. The work should be completed in all aspects of design, implementation and testing and follow software engineering practices.
7. Project report should be prepared and submitted in soft and hard form along with all the code and other dependency.

Student should perform the activities on the basis of the real-time applications in the subjects and submit the work with code, PPT, PDF, Text report document & reference material or on online GitHub.

Students should maintain activity log book containing weekly progress.

Text Books

1	Han Jiawei and Kamber Micheline "*Data Mining – Concepts and Techniques*" The Morgan Kaufmann Series in Data Management Systems ,3rd Edition, , 2011
2	Dunham M. H, "*Data Mining: Introductory and Advanced topics*", Pearson, 2ndEdition, 2003

RR Rathod

References	
1	Chattamvelli Rajan, "*Data Mining Methods: Concepts & Applications*", Narosa Publishing House, 2nd Edition, 2010
2	Mitra Sushmita, Acharya Tinku, *"Data Mining Multimedia, Soft Computing and Biometrics"*, WILEY Publication, 3rd Edition, 2003
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_cs12/preview
2	https://www.javatpoint.com/data-mining

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1		2		1	
CO2		1				
CO3	3			3		

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 13 Marks Submission at the end of Week 13	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	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT572
Course Name	Scientific Computing lab
Desired Requisites:	Programming experience in C,C++,Java

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

Course Objectives

1	To use different programming paradigms in scientific computing.
2	To apply appropriate programming language for solving the problem
3	To demonstrate report writing using LATEX tool.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Perform numerical computation using python libraries	Analyze
CO2	Implement statistical computation using R libraries	Apply
CO3	Compose the journal paper, reports using Open source tool (LATEX)	Create

List of Experiments / Lab Activities

Activities:

Activities are to be carried out individually.

Each student will perform the activity based on course on following areas.

1. Exercise programs on Lists.
2. Exercise programs on Tuples.
3. Exercise programs on sets and dictionaries
4. Exercise programs on files.
   a) Write Python script to display file contents.
   b) Write Python script to copy file contents from one file to another.
5. Data visualization – plots in R
6. Exercise programs on Vectors, Matrices, lists in R
7. Exercise programs on Data frames and factors in R
8. Exercise program on image libraries using R
9. Create a journal paper using open source tool LATEX
10. Create a seminar/project report using open source tool LATEX

Student should perform the activities on the basis of the real-time applications in the subjects and submit the work with code, PPT, PDF, Text report document & reference material or on online GitHub.
Students should maintain activity log book containing weekly progress.

Text Books

1	Douglas Montgomery, *"Applied statistics and probability for engineers"*, 6th Edition, Wiley Publications, January 2016
2	Samir Madhavan, *"Mastering Python for Data Science"*, August 2015, Packt Publishing, ISBN: 9781784390150

References	
1	Gilbert Strang, *"Introduction to linear algebra"* ,Wellesley-Cambridge Press, 5th Edition, August 2016
Useful Links	
1	https://docs.python.org
2	https://www.docs.rstudio.com
3	https://www.overleaf.com

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3			3		
CO2						
CO3	1	2	2			1

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 13 Marks Submission at the end of Week 13	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
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AY 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT545
Course Name	Pre-dissertation Work / Seminar
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 Review and increase students' understanding of the specific topics.
2	To induce Learning management of values.
3	To teach how research papers are written and read such papers critically and efficiently and to summarize and review them to gain an understanding of a new field, in the absence of a textbook.
4	To teach how to judge the value of different contributions and identify promising new directions in specified area.

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 the existing knowledge on real life problems	III	Applying
CO2	Investigate the selected topic/ system.	IV	Analysing
CO3	Verify the outcomes of the work have solved the specified problems.	V	Evaluating

List of Experiments / Lab Activities/Topics

Contents:

The pre-dissertation work will start in semester II and should preferably be a problem with research potential and should involve scientific research review, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Seminar should be based preferably on the area in which the candidate is interested to undertake the dissertation work. The candidate has to be in regular contact with their guide and the topic of seminar/dissertation must be mutually decided. The examination shall consist of the preparation of report consisting literature review, detailed problem statement, case studies, etc,

according to type of work carried out. The work has to be presented in front of the examiners panel formed by DPGC for evaluation.

Textbooks

1	Suitable books based on the contents of the dissertation/seminar topic selected.

References

1	Suitable books based on the contents of the dissertation/seminar topic selected and research papers

	from reputed national and international journals and conferences.

Useful Links	
1	As per the need of the dissertation/seminar topic.

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	2	3	4	5	6
CO1	2	2	1			
CO2	3				1	
CO3		3			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

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 13 Marks Submission at the end of Week 13	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	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT531
Course Name	Professional Elective – 3: Distributed Operating System
Desired Requisites:	Operating Systems, Distributed Network

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

Course Objectives

1	To elaborate fundamental characteristics of distributed operating systems.
2	To compare distributed operating system
3	To interpret the communication, process, naming, synchronization in distributed operating systems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Analyze the characteristics of distributed operating systems	Analyze
CO2	Use distributed operating systems for distributed application	Apply
CO3	Compare various distributed operating systems	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction to distributed Systems :** Definition and goals, Hardware and Software concepts, Design issues	6
II	**Communication & Synchronization in distributed systems:** Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems	6
III	**Processes and processors & Distributed File Systems:** Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues. Introduction, features & goal of distributed file system,	7
IV	**Distributed Shared Memory :** Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing	6
V	**Naming & Distributed Web-based Systems :** Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication: Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications	7

VI	**Security &Case Study :** Google FS/BigTable, Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management ,Java RMI, Sun Network File System, Google case study	7

	Text Books
1	Pradeep K. Sinha *"Distributed Operating Systems Concepts and Design"*, Eastern Economy Edition, PHI, 1998.
2	George Coulouris, Jean Dollimore,Tim Kindberg *"Distributed Systems: Concepts and Design"*, Fifth Edition, Pearson, 2012.
	Reference s
1	Sunita Mahajan & Seema Shah, *"Distributed Computing"*, Second Edition, OXFORD, 2013
	Useful Links
1	https://nptel.ac.in/courses/106/106/106106107/
2	https://nptel.ac.in/courses/106/106/106106168/

CO-PO Mapping

	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1		3			2
CO2		1		2		
CO3	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
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AY 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT532
Course Name	Professional Elective – 3: System Programming
Desired Requisites:	Data Structures and Operating Systems

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives

1	To elaborate the concepts in systems programming.
2	To analyze the structure and design of assemblers, linkers and loaders.
3	To interpret high level programming languages executions using system programs

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Analyze the working of system programs	Analyze
CO2	Study the working of parsers of compilers	Analyze
CO3	Compare the static and dynamic linking	Analyze

Module	**Module Contents**	**Hours**
I	**Overview of System Software:** Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Levels of System Software, Overview of Language Processors Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables	6
II	**Assemblers:** Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86 , Algorithm of Single Pass Assembler, Multi-Pass Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler,	6
III	**Macro and Macro Processors:** Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design Of a Macro Pre-processor, Design of a Macro Assembler, Functions of a Macro Processor, Basic Tasks of a Macro Processor, Design Issues of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors	7
IV	**Linkers and Loaders:** Introduction, Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders	7

V	**Scanning and Parsing**: Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatic Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC, **Compilers**: Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization	7
VI	**Interpreters & Debuggers:** Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger	6

	Text Books
1	D M Dhamdhere, "*System Programming*", McGraw Hill Publication, second revised edition, 2009
2	Srimanta Pal, "*System Programming*", Oxford University Press, 2011
3	R.K. Maurya & A. Godbole, "*System Programming and Compiler Construction*", Dreamtech Press, 2014

	References
1	Leland L. Beck, "*System Software – An Introduction to Systems Programming*", Pearson Education Asia,3rd edition, 2000
2	Santanu Chattopadhyay, „*System Software*", Prentice-Hall India, 2007
3	R K Maurya and Anand A Godbole "*System Programming and Compiler Construction (Includes Labs)*", Dreamtech Press, 2014

	Useful Links
1	www.cs.jhu.edu/~scott/pl/lectures/parsing.html
2	www.en.wikipedia.org/wiki/System_programming
3	https://nptel.ac.in/courses/106/106/106106197/

CO-PO Mapping

	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3			
CO2	1	2		1		
CO3			1			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.

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Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT533
Course Name	Professional Elective - 3: Mathematics for Machine Learning
Desired Requisites:	Mathematics

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

Course Objectives

1	To use linear algebra and calculus for machine learning.
2	To elaborate matrix theory for machine learning.
3	To compare optimization and probability for real applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply the concepts of linear algebra and calculus for machine learning algorithms	Apply
CO2	Compare different algorithms for dimensionality reduction	Analyse
CO3	Evaluate the optimization & probabilistic algorithms	Evaluate

Module	**Module Contents**	**Hours**
I	**Linear Algebra Basics:** Vector spaces and subspaces, basis and dimensions, linear transformation, four fundamental subspaces.	6
II	**Matrix Theory:** Norms and spaces, eigenvalues and eigenvectors, Special Matrices and their properties, least squared and minimum normed solutions. SVD: Properties and applications, low rank approximations, Gram Schmidt process, polar decomposition	7
III	**Dimensions Reduction Algorithms:** Principal component analysis, linear discriminant analysis, minimal polynomial and Jordan canonical form.	6
IV	**Calculus:** Basic concepts of calculus: partial derivatives, gradient, directional derivatives, Jacobian, hessian, convex sets, convex functions and its properties.	6
V	**Optimization:** Unconstrained and Constrained optimization, Numerical optimization techniques for constrained and unconstrained optimization: Newton"s method, Steepest descent method, Penalty function method. Introduction to SVM, Error minimizing LPP, concepts of duality, hard and soft margin classifiers.	7
VI	**Probability:** Basic concepts of probability: conditional probability, Bayes" theorem, independence, theorem of total probability, expectation and variance, few discrete and continuous distributions, joint distributions and co-variance.	7

Text Books	
1	W. Cheney, *"Analysis for Applied Mathematics"*, New York: Springer Science+Business Medias, 2001.
2	S. Axler, *"Linear Algebra Done Right"*, Springer International Publishing, 3rd edition, 2015

References	
1	All Modules taken from below link course. https://onlinecourses.nptel.ac.in/noc21_ma38/

Useful Links	
1	https://nptel.ac.in/courses/111/107/111107137/

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2			2		
CO2		3	3		2	
CO3	1			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 2020-21

Course Information

Programme	M.Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT 534
Course Name	Professional Elective – 3-Soft Computing and applications
Desired Requisites:	Basic knowledge of mathematics

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

Course Objectives

1	To foster student's abilities to implement soft computing based solutions for real-world problems
2	To impart knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms
3	To discuss hybrid applications of ANN, Fuzzy and GA

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	analyze soft computing techniques and their roles in building intelligent machines	Analyze
CO2	evaluate fuzzy logic and neural networks techniques to solve various engineering problems	Evaluate
CO3	build prototyping applications using genetic algorithms and hybrid approaches	Create

Module	**Module Contents**	**Hours**
I	**Introduction:** Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence, Characteristics of Neuro Computing and Soft Computing, Difference between Hard Computing and Soft Computing, Concepts of Learning and Adaptation	6
II	**Fuzzy Logic:** Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making	7
III	**Neural Networks:** Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance Architectures, Advances in Neural Networks	7
IV	**Genetic Algorithms:** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition	7

V	**Hybrid Systems:** Introduction to Hybrid Systems, Adaptive Neuro Fuzzy Inference System(ANFIS)	6
VI	**Deep Learning:** Spark auto encoder, Convolutional neural networks, Recurrent neural networks, Deep belief networks	7

	Text Books
1	Rajasekaran S., Vijayalakshmi Pai G.A., "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003
2	Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press e-book
3	
4	

	References
1	Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2003
2	George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", PHI, 1995
3	
4	

Useful Links

CO-PO Mapping

Programme Outcomes (PO)

	1	2	3	4	5	6
CO1	2			3		
CO2			2	2		2
CO3	2		2	2		2

The strength of mapping is to be written as 1,2,3; Here, 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	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT535
Course Name	Professional Elective - 4: Big Data Computing
Desired Requisites:	Data Mining

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

Course Objectives

1	To elaborate the fundamental concepts of big data analytics
2	To analyze the big data using various techniques
3	To represent big data using visualization tools

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Elaborate the fundamentals of various big data analytics techniques	Apply
CO2	Study the various approach to implement distributed environment	Analyze
CO3	Evaluate the performance of algorithms on advanced distributed system	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to Big Data:** Big Data and its Importance, Four V"s of Big Data, Drivers for Big Data – Introduction to Big Data Analytics, Big Data Analytics applications.	6
II	**Big Data Technologies:** Hadoop"s Parallel World, Data discovery, Open source technology for Big Data Analytics, Cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics	7
III	**Processing Big Data:** Detecting Patterns in Complex Data with Clustering and Link Analysis, Identifying previously unknown groupings within a data set, Segmenting the customer market with the K–Means algorithm, Defining similarity with appropriate distance measures, Constructing tree–like clusters with hierarchical clustering, Clustering text documents and tweets to aid understanding	7
IV	**Hadoop Mapreduce:** Introduction to Map-Reduce, Hadoop Framework, Spark Framework	6
V	**Distributed Map Reduce:** TF-IDF Example, Page Rank Example, Demonstration: Page Rank Algorithm in Spark	6
VI	**Analytic Tools:** PIG overview, SQL vs. PIG, PIG Latin, User Defined Functions, Data Processing Operators, Overview of Hive, Hive QL, Tables, Querying Data	7

Text Books

1	Prajapati Vignesh, *"Big Data Analytics with R and Hadoop"*, Packt Publishing, 1st Edition, 2013
2	Minelli Michael, Chambers Michehe, *"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business"*, Ambiga Dhiraj, Wiely CIO Series, 1st Edition, 2013

References	
1	Franks Bill, *"Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics"*, Wiley and SAS Business Series,1st Edition , 2012
Useful Links	
	Module I, II, III, IV, V, VI https://nptel.ac.in/courses/106/104/106104189/

CO-PO Mapping						
Programme Outcomes (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1		1			
CO2		1		2		
CO3	3		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 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT536
Course Name	Professional Elective - 4: High Performance Computing
Desired Requisites:	Operating System

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

Course Objectives

1	To elaborate the concepts of process and thread in high performance computing
2	To evaluate the performance of parallel programs with sequential program
3	To compare multi-core and many-core architectures

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply parallel computing algorithm for solving the problem.	Apply
CO2	Analyse the parallel implemented algorithms for performance parameters.	Analyze
CO3	Design the appropriate parallel algorithm for the given problem.	Create

Module	**Module Contents**	**Hours**
I	**Basic Parallel Algorithm** Introduction to Parallel Computing, Parallelism on the JVM, Running Computations in Parallel, Monte Carlo Method to Estimate Pi, First-Class Tasks	6
II	**Basic Task in Parallel Algorithms** Parallel Sorting, Data Operations and Parallel Mapping, Parallel Fold (Reduce) Operation Associativity, Parallel Scan (Prefix Sum) Operation	7
III	**Data-Parallelism** Data-Parallel Programming, Data-Parallel Operations, Scala Parallel Collections Splitters and Combiners	7
IV	**Data Structures for Parallel Computing** Implementing Combiners, Parallel Two-phase Construction, Conc-tree Data Structure, Amortized, Constant-time Append Operation, Conc-Tree Combiners	7
V	**Sorting** Issues, sorting network, Bubble sort	6
VI	**Graph Algorithms** MST, SSSP, APSP	6

Text Books

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

References

1	Horrowitz, Sahni, Rajasekaran, *"Computer Algorithms"*, Computer Science, W. H. Freeman and company Press, New York, 1997

Useful Links	
1	Module I, II, III, IV https://www.coursera.org/learn/parprog1?ranMID=40328&ranEAID=*GqSdLGGurk&ranSiteID=.GqSdLGGurk-ntwHfWI_xX32aIgZXdr9Ug&siteID=.GqSdLGGurk-ntwHfWI_xX32aIgZXdr9Ug&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=*GqSdLGGurk#syllabus

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1		1		1		
CO2	2		2		1	
CO3		2		3		

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	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT537
Course Name	Professional Elective - 4: Deep Learning
Desired Requisites:	

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

Course Objectives

1	To elaborate the models of Deep Learning
2	To compare the applications of Deep Learning with performance parameters
3	To interpret the problem to solve using Deep Learning

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply the fundamentals of Deep Learning for suitable applications	Apply
CO2	Compare the optimization techniques pertaining to Deep Learning	Analyze
CO3	Build and compare various Deep Learning model for solving real world application	Create

Module	**Module Contents**	**Hours**
I	**Fundamentals of Neural Networks:** McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward Neural Networks, Representation Power of Feedforward Neural Networks. Backpropagation algorithm.	7
II	**Optimizations in Gradient Descent:** Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Bais correction in Adam.	6
III	**Regularization:** Regularization: Bias Variance Trade off, L2 regularization, Early stopping, Data-set augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout. Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization.	7
IV	**Deep Learning for word encoding-Natural Language Processing:** Eigen values and eigen vectors, Basis, Principal Component Analysis and its interpretations, Singular Value Decomposition, Learning Vectorial Representations Of Words: One hot representation of words, SVD for learning word representation.	7
V	**Convolutional Neural Networks for Computer Vision:** Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks	6

VI	**Recurrent Neural Networks**: Recurrent Neural Network, Back Propagation through time(BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTM.	6

	Text Books
1	Aurelien Geron , " *Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems*", 2nd Edition, O'Reilly,2019
2	Eugene Charniak, *"Introduction to Deep Learning, The MIT Press Cambridge"*, 1st Edition, 2019
	References
1	Ian Goodfellow, Yoshua Bengio and Aoron Courville *"Deep Learning"*, The MIT Press Cambridge, Massachusetts London, England, 2017
	Useful Links
1	All Modules taken from below link https://www.classcentral.com/course/swayam-deep-learning-iitropar-43579

CO-PO Mapping						
	Programme Outcomes (PO)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1		1			1	
CO2		2		2		
CO3	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
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AY 2023-24

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7IT538
Course Name	Professional Elective - 4: Geographical Information System & Remote Sensing -Interdisciplinary
Desired Requisites:	Fundamentals of Image processing

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives

1	To impart knowledge of the fundamentals of Remote Sensing (RS) and geographical information systems (GIS)
2	To make students familiar with Data and Data Products in RS and GIS.
3	To acquaint students advantages and applications of RS and GIS
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Understand and summarize fundamental concepts in RS and GIS	Understand
CO2	Interpret and Apply various satellite RS data and demonstrate GIS data and GIS database management system	Apply
CO3	Compare and examine data and data Products of RS and GIS	Analyse
CO4	Select and Verify RS and GIS data and data products to design solution for various interdisciplinary problems	Evaluate

Module	**Module Contents**	**Hours**
I	**Concepts and Foundation of Remote Sensing** Introduction, Remote Sensing System, Electromagnetic Energy, Electromagnetic Spectrum and its Characteristics, Energy Interaction in the Atmosphere and with the Earth's Surface, Resolution in Remote Sensing, Broad Classifications of Sensors and Platform, Earth Observation Satellite and Sensors, Data Reception, Transmission and Processing, Remote Sensing Data and Data Products.	7
II	**Satellite Image Interpretation and Processing** Interpretation Procedure and Elements, Interpretation strategies and keys, Digital Image processing and Image Analysis steps, Image Rectification and Restoration, Image Enhancement, Spatial Filtering, Image Transformation, Image Classification and Analysis.	7
III	**Applications of Remote Sensing** Land use Land Cover Mapping, Crop Inventory, Ground Water Mapping, Urban Growth, Flood Plain Mapping, Disaster Management.	6
IV	**GIS – An Overview** Introduction, Geographical concepts and Terminology, Difference between Image Processing system and GIS, Various GIS packages and their salient features, Essentials components of GIS, Utility of GIS, GPS	7

RR Rathod

V	**GIS Data** GIS Data types and Data Representation, Data Acquisition, Georeferencing of GIS Data, Raster and Vector data, Raster to Vector conversion, Remote Sensing Data in GIS, GIS Database and Database Management System	7
VI	**GIS Spatial Data Analysis and Applications** Measurements in GIS-Lengths, Perimeters, and Areas, Queries, Reclassification, Buffering and Neighborhood Functions, Map Overlay, Spatial Interpolation, Analysis of Surfaces, Network Analysis, GIS Applications	6

	Text Books
1	Chandra, A.M. and Gosh, S.K., "Remote Sensing and GIS", Narosa Publishing House. 2008
2	Lo, C.P. and Young, A.K.W., "Concepts and Techniques of Geographical Information System", Prentice Hall India. 20012

	References
1	Lillesand, T.M. and Kieffer, "Remote Sensing and Image Interpretation", John Wiley and Sons, 6th Edition. 2012
2	Chang, K, "Introduction to Geographical Systems", Tata McGraw-Hill, 4th Edition. 2010

	Useful Links
1	NPTEL: https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ce08 https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce10
2	https://www.usgs.gov
3	https://bhuvan.nrsc.gov.in/bhuvan_links.php#

CO-PO Mapping

	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			2			
CO2			2			
CO3	2			2		
CO4	3			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 2022-23

Course Information

Programme	M. Tech. (CS and IT)
Class, Semester	First Year M. Tech., Sem II
Course Code	7OE510
Course Name	Open Elective -: Machine Learning & Applications
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	
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

Dr. U.B Chavan

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)					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1			1			
CO2	2	1		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)