Walchand College of Engineering

(Government Aided Autonomous Institute)

Vishrambag, Sangli. 416 415

Credit System for

T.Y. B.Tech. (Information Technology)

Sem-V and VI

AY 2023-24

Walchand College of Engineering

(Government Aided Autonomous Institute)

Credit System for T.Y. B.Tech. (Information Technology) Sem-V AY 2023-24

Sr.No.	Category	Course Code	Course Name	L	T	P	I	Hrs	Cr	MSE/LA1	ISE/LA2	ESE	Ext
			Professional Core (Theory)										
01	PC	6IT301	Database Engineering	3	0	0	0	3	3	30	20	50	
02	PC	6IT302	Operating System	3	0	0	0	3	3	30	20	50	
03	PC	6IT303	Computer Algorithm	3	0	0	0	3	3	30	20	50	
			Professional Core (Lab)										
05	PR	6IT341	Mini-Project-2	0	0	2	0	2	1	30	30	40	POE
06	PC	6IT351	Database Engineering Lab	0	0	2	0	2	1	30	30	40	POE
07	PC	6IT352	Web Technology Lab	0	0	2	1	3	2	30	30	40	POE
08	PC	6IT353	Computer Algorithm Lab	0	0	2	0	2	1	30	30	40	
			Professional Elective (Theory)										
09	PE	Refer List	Professional Elective-1	3	0	0	0	3	3	30	20	50	
			Open Elective										
10	OE	Refer List	Open Elective-1	3	0	0	0	3	3	30	20	50	
			Humanities										
11	HS	6IT354	IT Project Management	0	0	0	2	2	2	30	30	40	
12	HS	6HS301	Integrated/ Employability Skills-1	0	0	0	2	2	2	30	30	40	
			Total	**15**	**0**	**8**	**5**	**28**	**24**				

Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (LA1, LA2, ESE). The ESE is a separate head of passing. The POE/OE indicates external component for ESE.

For further details, refer to Academic and Examination rules and regulations.

28/7/23
Prof. B. S. Shetty
DAC/Secretary, BoS

28.7.23
Dr. R. R. Rathod
Head, Information Technology Dept./
Chairman, BoS

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Dr. Mrs. S. P. Sonavane
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Walchand College of Engineering

(Government Aided Autonomous Institute)

Elective Course List for T.Y. B.Tech. (Information Technology) Sem-V AY 2023-24

Sr.No.	Track	Course Code	Course Name
		Professional Elective-1	
01	Data Science	6IT311	Graph Theory
		6IT312	Blockchain Technology and Applications
02	Network Technology	6IT313	Wireless Networks
03	Interdisciplinary	6IT314	Natural Language Processing
		6IT315	Geographical Information System

Sr.No.	Offering Dept.	Course Code	Course Name
		Open Elective-1	
01	Civil Engg.	6OE301	Building Planning and Design
02	Civil Engg.	6OE302	Disaster Management
03	Applied Mechanics Dept	6OE315	Theory of structures
04	Mechanical Engg.	6OE329	Non-Conventional Machining Processes
05	Electrical Engg.	6OE343	Electrical Machine Technology
06	Electronics Engg.	6OE357	Introduction to Electronic Systems
07	Electronics Engg.	6OE358	Signals and Systems
08	Computer Science and Engg.	6OE371	Data Science
09	Information Technology*	6OE385	Cloud Computing System
10	Information Technology*	6OE386	Joy of Python Programming
11	Information Technology*	6OE387	Data Science for Engineers

* Open Elective-1 offered by Information Technology Dept. is allowed for students of all other departments (Except Information Technology & Computer Science & Engineering Dept.

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Credit System for T.Y. B.Tech. (Information Technology) Sem-VI AY 2023-24

Sr.No.	Category	Course Code	Course Name	L	T	P	I	Hrs	Cr	MSE/LA1	ISE/LA2	ESE	Ext
Professional Core (Theory)													
01	PC	6IT321	Unix Operating System	3	0	0	0	3	3	30	20	50	
02	PC	6IT322	Image Processing and Pattern Recognition	3	0	0	0	3	3	30	20	50	
03	PC	6IT323	Artificial Intelligence	3	0	0	0	3	3	30	20	50	
Professional Core (Lab)													
04	PC	6IT342	Project-1	0	0	4	0	4	2	30	30	40	POE
05	PC	6IT371	Unix Operating System Lab	0	0	2	0	2	1	30	30	40	POE
06	PC	6IT373	IT Practices Lab-1	0	0	2	0	2	1	30	30	40	POE
07	PC	6IT372	Parallel Computing Lab	0	0	2	1	3	2	30	30	40	
Professional Elective (Theory)													
08	PE	Refer List	Professional Elective-2	3	0	0	0	3	3	30	20	50	
Open Elective													
09	OE	Refer List	Open Elective-2	3	0	0	0	3	3	30	20	50	
Humanities													
10	HS	Refer List	Humanities-II	0	0	0	2	2	2	30	30	40	
11	HS	6HS302	Integrated/ Employability Skills-2	0	0	0	2	2	2	30	30	40	
			Total	15	0	10	5	30	25				

Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (LA1, LA2, ESE). The ESE is a separate head of passing. The POE/OE indicates external component for ESE.

For further details, refer to Academic and Examination rules and regulations.

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Elective Course List for T.Y. B.Tech. (Information Technology) Sem-VI AY 2023-24

Sr.No.	Track	Course Code	Course Name
Professional Elective-2			
01	Data Science	6IT331	Soft Computing
		6IT332	Machine Learning
		6IT333	Artificial Neural Network
02	Network Technology	6IT334	Cloud Computing
03	Database Technology	6IT335	Advance Database Engineering
04	Interdisciplinary	6IT336	Spatial Data analysis

Sr.No.	Offering Dept.	Course Code	Course Name
Open Elective-2			
01	Civil Engg.	6OE308	Ecology
02	Civil Engg.	6OE309	Solid Waste Management
03	Applied Mechanics Dept	6OE322	Maintenance and Rehabilitation of Structures
04	Mechanical Engg.*	6OE336	Basics of Automobile Engineering
05	Electrical Engg.	6OE350	Industrial Automation
06	Electronics Engg.	6OE364	Cyber Physical Systems
07	Electronics Engg.	6OE365	Biomedical Engineering
08	Computer Science and Engg.	6OE378	Soft Computing
09	Information Technology*	6OE392	Web Development and Applications
10	Information Technology*	6OE393	Fundamentals of Machine Learning
11	Information Technology*	6OE394	Remote Sensing and Geographical Information Systems

Sr.No.	Course Code	Course Name
Humanities-II		
01	6HS303	German Language
02	6HS304	French Language
03	6HS305	Japanese Language
04	6HS306	Introduction to Entrepreneurship

* Open Elective-2 offered by Information Technology Dept. is allowed for students of all other departments (Except Information Technology & Computer Science & Engineering Dept.)

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TY Sem I

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

AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT301
Course Name	Database Engineering
Desired Requisites:	

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

Course Objectives

1	To introduce basic concepts of database management systems
2	To impart conceptual designs for databases
3	To describe issues associated with transaction management

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	Manipulate the relational databases	III	Applying
CO2	Inspect databases using Query languages	V	Evaluating
CO3	Evaluate transaction processing techniques	V	Evaluating

Module	Module Contents	Hours
I	**Introduction:** Database Systems, Types of Database Systems, Data abstraction, Data Models, Architecture of Database Systems.	6
II	**Relational Model:** Structure of Relational Databases, database schema, keys, Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus **Integrity Constraints and Design:** Domain Constraints, Referential Integrity, Triggers, Normal forms, Functional Dependencies, Decomposition.	7
III	**Query Processing:** Query processing, Query Cost, measures of query cost, Evaluation of expression, Equivalence of Expressions. Structured Query Language (SQL), Unstructured Query Language (MongoDB, MariaDB, NoSQL)	7
IV	**Indexing and Hashing:** Ordered and secondary Indices, B+ Tree Index Files, Static Hashing, Dynamic hashing, Comparison of Indexing, Grid files, Bitmap indices.	6
V	**Transactions:** Properties and states, Concurrent execution, Serializability. **Concurrency Control:** Lock-Based Protocols, 2 phase locking protocol, Graph based protocols, Time stamp based protocols, Dead lock handling	6
VI	**Crash Recovery:** Failure Classification, storage Structure, Log-Based Recovery, Shadow Paging, recovery with concurrent transactions, buffer management, backups.	7

Text Books

1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "*Database System Concepts*", McGraw-Hill Education, 6th Edition, 2010.

2	Raghu Ramakrishnan, "*Database Management Systems*", McGraw-Hill Education, 3rd Edition, 2003.

References	
1	J.D. Ullman, "*Principles of Database Systems*", Galgotia Publications, 2nd Edition, 1999
2	Wiederhold, "*Database Design*", McGraw Hill Inc, 2nd Edition, 1983
3	C.J.Date, A.Kannan, S.Swamynathan, "*An Introduction to Database Systems*", Pearson Education, 8th Edition, 2006.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105175/
2	http://www.nptelvideos.in/2012/11/database-management-system.html
3	https://www.tutorialspoint.com/mongodb/mongodb_overview.htm
4	https://www.tutorialspoint.com/mariadb/mariadb_introduction.htm

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT302
Course Name	Operating System
Desired Requisites:	Computer Architecture

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

Course Objectives

1	To introduce various system calls and system programs
2	To describe OS functionalities
3	To comprehend the services provided by operating system

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	Distinguish between different types of OS	II	Understanding
CO2	Illustrate the concept of process and synchronization	III	Applying
CO3	Analyse deadlocks and memory management challenges in system	IV	Analysing

Module	Module Contents	Hours
I	**Introduction :** Notion of operating systems, Computer system organization, Computer System architecture, Computer System Structure, Operating System Operations, Process Management, Memory Management, Storage Management, protection and security. **System Structure:** Operating system services, user operating system interface, system calls, types of system calls, system programs, operating system design and implementation, operating system structure.	5
II	**Process** Process Concept, Process Scheduling, Operation on process, Cooperating process, Threads, Inter-process Communication (Algorithms evaluation). **Process Scheduling:** Basic concept, Scheduling Criteria, Scheduling Algorithms, Multiple processor scheduling, Real time scheduling.	8
III	**Inter-process Synchronization** Background, Classical problems of synchronization, Critical Region, The critical section problem, Synchronization Hardware, Monitors, Semaphores.	6
IV	**Deadlocks** System modes, Deadlock characterization, Methods for handling deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	5

V	**Memory Management** Background, Logical Versus Physical Address space, Swapping Contiguous Allocation, Paging, Segmentation, Segmentation with paging. **Virtual Memory:** Background, Demand paging, Page replacement, Page replacement algorithms, Allocation of frames, thrashing (Only concept), Demand segmentation. Virtualization concept and case studies	8
VI	**File System Management** File concept, access methods, directory and disk structure, file-system mounting, file sharing, protection. **Implementing File System :** File system structure, file-system implementation, directory implementation, allocation methods, free-space management	6

	Text Books
1	James. L. Peterson and A. Silberchatz ,"*Operating System Concepts*", Addison Westley Publication, 9th Edition,2018
2	Milan Milenkovic ,"*Operating System – Concept and Design*", TMGH,1st Edition,2001

	References
1	William Stallings," *Operating Systems : Internals and Design Principles*",Peterson Publication,7th Edition,2013
2	Crowley Charles ," *Operating Systems : A Design-Oriented Approach*",Mc Graw Hill Publication,1st Edition,2017

	Useful Links
1	https://www.gatevidyalay.com/operating-system/
2	https://www.javatpoint.com/os-tutorial
3	https://www.geeksforgeeks.org/operating-systems/

CO-PO Mapping

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

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

Assessment

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

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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT303
Course Name	Computer Algorithm
Desired Requisites:	Data Structures

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

Course Objectives

1	To comprehend the logic of algorithm and its complexity
2	To introduce parallel algorithms
3	To familiarized standard algorithms for parallelism

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 appropriate logic for solving the problem	III	Applying
CO2	Analyse the algorithmic solution and apply parallelism	IV	Analysing
CO3	Design the appropriate algorithm for real-life problem	VI	Creating

Module	**Module Contents**	**Hours**
I	**Introduction:** Design and Analysis of Algorithm Greedy Algorithms: Knapsack problem, Huffman codes, Dynamic Programming: Matrix-chain multiplication, Longest common sub-sequence.	7
II	**Principles of parallel algorithm design:** Preliminaries, Decomposition techniques, characteristics of task and interaction, Mapping techniques, overhead, parallel algorithm model **Programming using MPI:** MPI basics, send, receive, overlapping computation and communication, collective communication	6
III	**Single-Source Shortest Path (SSSP)** Shortest paths and relaxation, Bellman-Ford algorithm, Single-source shortest paths in directed Acyclic graphs, Topological sort, Dijkstra's algorithm	6
IV	**All-Pairs Shortest Paths (APSP) and Maxflow** Shortest paths and matrix multiplication, The Floyd-Warshall algorithm, Flow Networks, Ford Fulkerson method, Maximum Bipartite matching	6
V	**String Matching:** The Rabin-Karp algorithm, Knuth-Morris-Pratt algorithm. Computational Geometry: Determining whether any pair of segments intersects, Finding the convex hull, Finding the closest pair of points.	7

VI	**Complexity class and Approximation Algorithm** NP-Completeness: NP completeness and reducibility, NP-complete problem. Approximation Algorithms: The vertex-cover problem, The travelling-salesman problem, The set-covering problem	7

	Text Books
1	Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, *"Introduction to Algorithms"*, Third Edition the MIT Press Cambridge, London, England, 2009
2	Anath Grama, Ansul Gupta, George Karypis, Vipin Kumar, *"Introduction to parallel computing"*, Second Edition, Pearson Education, 2003 (For mdule IV)

	References
1	Horrowitz, Sahni Rajasekaran, *"Computer Algorithms"*, Computer Science, W. H. Freeman and company Press, New york, 1997
2	

	Useful Links
1	https://nptel.ac.in/courses/106/104/106104019/
2	https://nptel.ac.in/courses/106/101/106101060/

CO-PO Mapping

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

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

Assessment

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

21/9/23

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT341
Course Name	Mini Project - 2
Desired Requisites:	Java programming

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

Course Objectives

1	To plan for various activities of the project and distribute the work amongst team members.
2	To develop student's abilities to transmit technical information through seminar
3	To introduce importance of document design by compiling Technical Report

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Understand, plan and execute a Mini Project with team	III	Applying
CO2	Prepare a technical report based on the Mini project	I	Remembering
CO3	Deliver technical seminar based on the Mini Project work carried out	IV	Analysing

List of Experiments / Lab Activities

List of Experiments:

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

1. Design and develop application using any one or more programming languages: Java with concepts swing, AWS, threading, APIs, etc.
2. Industry based problem / Sponsored application /Game/ Interdisciplinary application /socially useful application / Problem solving of previously learned complex concepts.
3. Project group should achieve all the proposed objectives of the problem statement.
4. The work should be completed in all aspects of design, implementation and testing and follow software engineering practices.
5. Project reports should be prepared and submitted in soft and hard form along with the code and other dependency documents. Preferable use online code repositories (github/bitbucket)
6. Project will be evaluated continuously by the guide/panel as per assessment plan.
7. Presentation and report should use standard templates provided by department.

Project report (pre-defined template) should be prepared using Latex/Word and submitted along with soft copy on CD/DVD (with code, PPT, PDF, Text report document & reference material) or on an online repository.
Students should maintain a project log book containing weekly progress of the project.

	Text Books
1	Rajendra Kumbhar , "*How to Write Project Reports, Ph. D. Thesis and Research Articles*", Universal Prakashan, 2015
2	Marilyn Deegan, " *Academic Book of the Future Project Report*", A Report to the AHRC & the British Library, 2017

	References
1	https://www.youtube.com/watch?v=0oSDa2kf5I8 (report writing)

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

CO-PO Mapping

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

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

Assessment

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

Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**

LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

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

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT351
Course Name	Database Engineering Lab
Desired Requisites:	Programming Lab

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

Course Objectives

1	To demonstrate basic concepts of conceptual database design
2	To introduce database schemas in DBMS
3	To illustrate between various transaction management protocols

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	Summarize real world problems into relational databases	III	Applying
CO2	Execute Query languages on databases	III	Applying
CO3	Analyse transaction processing techniques	IV	Analysing

List of Experiments / Lab Activities

List of Experiments:

1. Implement SELECT and PROJECT operation Assignment, Implement INSERT, DELETE and UPDATE operation database
2. Perform String operations and Aggregate functions on database
3. Perform Inner and Outer Join operations on database Assignment, Domain constraints & Referential Integrity Assignment
4. Program for sparse index and dense index Assignment
5. Program for static hashing Assignment, Program for Dynamic hashing Assignment
6. Program for log based protocol for transaction Assignment
7. Implementation of JDBC/ODBC driver for database connectivity
8. Program for Time Stamp protocol for transaction Assignment
9. Program for Deadlock Detection Assignment
10. perform CRUD (Create, Read, Update, Delete) operations on MongoDB databases
11. filtering for data efficiently on MongoDB databases
12. Working with command prompts and create database and tables on MariaDB.
13. Perform CRUD (Create, Read, Update, Delete) operations on MariaDB.

Text Books

1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "*Database System Concepts*", McGraw-Hill Education, 6th Edition, 2010.
2	Raghu Ramakrishnan, "*Database Management Systems*", McGraw-Hill Education, 3rd Edition, 2003.

References

1	J.D. Ullman, "*Principles of Database Systems*", Galgotia Publications, 2nd Edition, 1999
2	Wiederhold, "*Database Design*", McGraw Hill Inc, 2nd Edition, 1983
3	C.J.Date, A.Kannan, S.Swamynathan, "*An Introduction to Database Systems*", Pearson Education, 8th Edition, 2006.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105175/
2	http://www.nptelvideos.in/2012/11/database-management-system.html

CO-PO Mapping

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

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

Assessment

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

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

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

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2023-24					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Third Year B. Tech., Sem VI				
Course Code	6IT352				
Course Name	Web Technology lab				
Desired Requisites:	Basic Programming Concepts				

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

Course Objectives	
1	To introduce web techniques for solving client/server problems
2	To demonstrate design of web pages
3	To discuss about client-side or server-side applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Identify the principles of coherent coding and interactive web page	III	Applying
CO2	Demonstrate the incorporation of CSS and Java script in an HTML	IV	Analysing
CO3	Create web pages using Django and connect using MySQL	VI	Creating

Module	Module Contents	Hours
I	**HTML and CSS** HTML introduction, HTML editors, elements, attributes, headings, paragraphs, styles, formatting, lists, tables, layout, forms CSS Introduction, syntax, selectors, colors, backgrounds, borders, margins, padding, outline, text family, font family, navigation bar, dropdowns, forms, website layout and components	2
II	**Java script** Introduction to Java script, syntax, variables, operators, data types, functions, objects, events, date formats, math, control flow statements, forms, objects and its properties, object classes, components, Introduction to server-side and client-side scripting language	2
III	**PHP** Basics of PHP, installation of PHP, comments, variables, echo/print, data types, strings, numbers, math, constants, operators, control flow statements, arrays, Form handling, form validation, form required, from URL, form complete, date and time, file handling, open, read, write, upload, cookies, session,	3

IV	**Object oriented PHP** What is OOP?, classes and objects, constructor, destructor, access modifiers, inheritance, interfaces, abstract classes, static keyword	2
V	**Database Handling –** MySQL database connectivity, MySQL connect, creating database, inserting data, prepared statements, various queries used in PHP	2
VI	**Bootstrap and responsive web design** Introduction to Bootstrap, installation of bootstrap, grid system, buttons, tables, vertical forms, horizontal forms, dropdowns, responsive tabs, progress bar, alerts, pagination, badges, labels, page headers, tooltips, responsive web design: nodejs, angular js, angular, react, etc.	2

List of Experiments / Lab Activities

List of Experiments:

1. Program on HTML basic tags for text formatting.
2. Program on HTML tag to handle multimedia elements on web page.
3. Program on HTML tag to create forms and UI elements.
4. Program on CSS properties for HTML web page.
5. Program on applying event handling on HTML web page using JavaScript.
6. Program on applying layout to HTML webpage.
7. Program on PHP controls statements.
8. Program on PHP string operations.
9. Program on PHP form creation and data handling.
10. Program on session management using PHP.
11. Program on Cookies management using PHP.
12. Program on PHP to connect MySQL database for CURD operations.
13. Program on Bootstrap/ responsive web design using different components.

Text Books

1	P.J. Deitel & H.M. Deitel Pearson, "Internet and World Wide Web How to program", Pearson Education India, 4th Edition, 2009
2	Jon Duckett,"HTML and CSS: Design and Build Websites", John Wiley & Sons, Inc, 1st Edition, 2011

References

1	Steven M. Schafer, "HTML, XHTML and CSS", Wiley India Edition, 5th Edition, 2010
2	Ivan Bayross ,"Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP", BPB Publications, 4th Edition , 2006

Useful Links

1	https://www.coursera.org/learn/web-app#syllabus
2	https://www.coursera.org/specializations/web-applications
3	https://www.udemy.com/course/foundations-of-front-end-development/

CO-PO Mapping

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

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT353
Course Name	Computer Algorithm Lab
Desired Requisites:	Programming Language

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

Course Objectives

1	To recognize the logic of algorithm and its complexity
2	To impart standard algorithms and their parallel counterparts
3	To categorize the algorithms based on complexity

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Implement appropriate algorithms for solving the problem	III	Applying
CO2	Analyse the problem statement for algorithmic approach	IV	Analysing
CO3	Design the appropriate algorithm for problem statement	VI	Creating

List of Experiments / Lab Activities

List of Experiments:

1. Design of Algorithm and Analysis with gprof profiler
2. Problem of paragraph alignment and justification
3. Implementation of Optimal Binary Search Tree
4. MPI communication Assignment.
5. MPI performance analysis
6. Implementation of gift box packaging using SSSP algorithm
7. Application of APSP algorithm
8. Graph algorithms implementations
9. Implementation of approximate algorithm

Text Books

1	Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, *"Introduction to Algorithms"*, Third Edition the MIT Press Cambridge, London, England, 2009
2	Anath Grama, Ansul Gupta, George Karypis, Vipin Kumar, *"Introduction to parallel computing"*, Second Edition, Pearson Education, 2003 (For mdule IV)

References

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

Useful Links	
1	https://nptel.ac.in/courses/106/104/106104019/
2	https://nptel.ac.in/courses/106/101/106101060/

CO-PO Mapping

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

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

Assessment

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

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

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

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	B.Tech. Information Technology
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT311
Course Name	Professional Elective 1: Graph Theory
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 discuss basics of graph theory
2	To explain various properties of graphs to its applications
3	To illustrate relevant algorithms in graph theory to solve complex problems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Summarize graph types and their properties	II	Understanding
CO2	Demonstrate real life problems by appropriate representations and operations on the graphs	III	Applying
CO3	Compare the performances of various graphs theory algorithms	IV	Analysing

Module	Module Contents	Hours
I	**Introduction to Graphs, Paths and Trees:** Introduction to graphs, Basic properties of graphs, Complete and bi-partite graphs, Isomorphism of graphs, Paths and circuits	6
II	**Cut Set and Planar Graph:** Cut sets, connectivity and separability, network flows, isomorphism, Planner graphs, Kuratowski's two graphs, representation of planner graphs, detection of Planarity, Vertex Colouring of graphs, Edge Colouring of graphs,The four-colour and five-colour theorems	7
III	**Weighted Graph and Matrix representation:** Eulerian Graphs, Hamiltonian cycles, Matrix representation of graphs, Chordal graphs, Weighted graphs, Matching's in graphs, Hall's 'marriage' theorem and its application	6
IV	**Graph Algorithm:** Travelling salesman's problem & Chinese postman problem, Distances in graphs, Shortest path and Dijkstra's algorithm, Floyd – Warshall Algorithm, Bellman-Ford Algorithm	7
V	**Spanning Tree:** Trees, Spanning tree in graphs, Minimum spanning tree algorithms, Kruskal's algorithm, Independence sets and covering in graphs	7
VI	**Applications of Graph Thory:** Perfect Graphs, Applications of graphs in switching theory, Directed Graphs (or Digraphs)	6

Text Books

1	Deo Narsing , *"Graph Theory With Applications To Engineering And Computer Science"*, 2nd Edition, PHI Publication, 2011
2	Wilson Robin J, *"Introduction to Graph Theory"*, 5th Edition, Longman Publication", 2012
	References
1	Parthasarathy K. R., *" Basic Graph Theory"*, McGraw-Hill Professional Publishing,3rd Edition, 1994
	Useful Links
1	https://onlinecourses.swayam2.ac.in/cec20_ma03/preview
2	https://archive.nptel.ac.in/courses/111/106/111106050/

CO-PO Mapping

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

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Walchand College of Engineering, Sangli

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT312
Course Name	Professional Elective -1: Blockchain Technology and Applications
Desired Requisites:	Data Communication

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

Course Objectives

1	To introduce blockchain technology over decentralized network
2	To explain use of various blockchain tools
3	To discuss applications of blockchains to the required security

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain the concepts and framework of blockchains	II	Understanding
CO2	Apply blockchain consensus algorithms using various tools	III	Applying
CO3	Identify suitable blockchain mechanisms with security permissions to the domain applications	IV	Analysing

Module	**Module Contents**	**Hours**
I	Elements of a Blockchain, Digital Money to Distributed Ledgers, Overall Blockchain Architecture, permissions, Types of blockchain	6
II	Security Primitives, Hashing, Digital Signatures in Blockchain, Blockchain Consensus Mechanism and its types, Permissions	7
III	Blockchain Interoperability, Proof of Work (PoW)-Scalability aspects Blockchain Consensus I – Permissionless Models Blockchain Consensus II – Permissioned Models	7
IV	Smart Contract, Decomposing the consensus process Ethereum Smart Contracts (Permissionless Model) Hyperledger Fabric (Permissioned Model)	6
V	Block chain in Financial Software and Systems (FSS), Settlements- KYC-Capital Markets-Insurance Popular Blockchain tools- Study and Comparison	7
VI	Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems	6

Textbooks

24/8/2023

1	Mark Gates, "*Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money*", Wise Fox Publishing and Mark Gates 2017
2	Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "*Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer*", 2018
3	Bahga, Vijay Madisetti, "*Block chain Applications: A Hands-On Approach*", Arshdeep Bahga, Vijay Madisetti publishers 2017

References	
1	Andreas Antonopoulos, "*Mastering Bitcoin: Unlocking Digital Crypto currencies*", O'Reilly Media, Inc. 2014
2	Melanie Swa, "*Block chain* ",O'Reilly Media 2014

Useful Links	
1	blockgeeks.comguide/what-is-block-chain-technology https://nptel.ac.in/courses/106105184/
2	https://www.coursera.org/specializations/blockchain
3	https://www.blockchain-council.org/blockchain/?utm_source=GoogleAds&utm_medium

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B.Tech., Sem VIII
Course Code	6IT313
Course Name	Professional Elective 1 :Wireless Networks
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 Objective

1	To introduce wireless network standards, technologies, and operations
2	To elaborate the concepts of wireless network
3	To compare physical layer protocols in wireless network

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Understand basics of wireless network systems	Understand
CO2	Compare the transmission of voice and data through various networks	Analyze
CO3	Distinguish multipath propagation and advanced wireless networks	Analyze

Module	**Module Contents**	**Hours**
I	**WLAN Introduction and Basics** 802.11 protocol stack basics, RF spectrum of operations, unlicensed band usage, Types of networks and their usage, Role of Wi-Fi alliance. Exercises: Survey of WLAN products in consumer appliances.	7
II	**Data Link Layer services** Overview of Circuit and Packet switches, ARP, Data link control: HDLC & PPP, Multiple access protocols, Wireless LAN, Comparison wired and wireless LAN.	6
III	**MAC Layer** CSMA/CA principles used for WLAN MAC, Details of MAC protocol, Medium reservation and hidden nodes, MAC Frame Aggregation and QoS in WLAN, Roaming, Throughput calculation.	7
IV	**Network Layer** Network Entry Process in WLAN, Security Evolution, Power save concepts, Throughput and performance of WLAN, Network tracking operations.	7
V	**WLAN data transmission** Sniffing WLAN Frames and analysis using open source tools, Inferring capabilities of APs and clients, Analysing network entry steps and debugging connection problems, Analysing Data transmission and debugging performance issues, Analysis of Roaming performance.	6
VI	**4G Technologies** Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.	6

Text Books	
1	Eldad Perahia and Robert Stacey,"*Next Generation wireless LANS 802.11n and 802.11ac*", 2nd edition, Cambridge University Press, 2013
2	Mathew Gast, 802.11 '*Wireless Networks: The Definitive Guide*', 2nd Edition, OReily, 2009
References	
1	Mathew Gast, *"802.11n: A Survival Guide: Wi-Fi Above 100 Mbps*", OReilly, 2012
2	Mathew Gast, *"802.11ac: A Survival Guide: Wi-Fi at Gigabit and Beyond"*, OReilly, 2012
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc19_ee48/preview
2	https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview

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

Bharat
Mrs. B.S. Shetty

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2023-24					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Third Year B. Tech., Sem V				
Course Code	6IT314				
Course Name	Professional Elective -1:Natural Language Processing				
Desired Requisites:	Artificial Intelligence				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
	-	**Credits: 3**			

Course Objectives	
1	To introduce the field of Language Computing and its applications
2	To provide NLP abstractions and concept of syntactic parsing
3	To deliver knowledge of different algorithms of NLP

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	Distinguish between NL language and Computer Language	II	Understanding
CO2	Illustrate the concept of POS tagging	III	Applying
CO3	Analyse the NLP algorithms using small datasets.	IV	Analysing

Module	Module Contents	Hours
I	Introduction to NLP, brief history, NLP applications: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers etc., challenges/Open Problems, NLP abstraction levels, Natural Language (NL) Characteristics and NL computing approaches/techniques and steps, NL tasks: Segmentation, Chunking, tagging, NER, Parsing, Word Sense Disambiguation, NL Generation.	6
II	Text Processing Challenges, Overview of Language Scripts and their representation on Machines using Character Sets, Language, Corpus and Application Dependence issues, Segmentation: word level(Tokenization), Sentence level.	7
III	Regular Expression and Automata Morphology, Types, Survey of English and Indian Languages Morphology, Morphological parsing FSA and FST, Porter stemmer, Rule based and Paradigm based Morphology, Human Morphological Processing, Machine Learning approaches.	6
IV	Word Classes ad Part-of-Speech tagging(POS), survey of POS tagsets, Rule based approaches (ENGTOWL), Stochastic approaches(Probabilistic, N-gram and HMM), TBL morphology, unknown word handling, evaluation metrics: Precision/Recall/F-measure,error analysis.	6
V	NL parsing basics, approaches: TopDown, BottomUp, Overview of Grammar Formalisms: constituency and dependency school, Grammar notations CFG, LFG, PCFG, LTAG, Feature- Unification, overview of English CFG, Indian Language Parsing in Paninian Karaka Theory, CFG parsing using Earley's and CYK algorithms.	7

VI	Concepts and issues in NL, Theories and approaches for Semantic Analysis, Meaning Representation, word similarity, Lexical Semantics, word senses and relationships, WordNet (English and IndoWordnet), Word Sense Disambiguation: Lesk Algorithm Walker's algorithm, Coreferences Resolution:Anaphora,Cataphora.	6

	Text Books
1	Indurkhya, N., & Damerau, F. J. "*Handbook of Natural Language Processing*" CRC Press Taylor and Francis Group,2nd edition,2010.
2	Steven Bird, Edward Loper "*Natural Language Processing With Python*" O'Reilly Media, 2nd edition,2016.
	References
1	Martin, J. H., & Jurafsky, D. "*Speech and Language Processing*" Pearson Education India, 2013.
2	Manning, Christopher and Heinrich, Schutze," *Foundations of Statistical Natural Language Processing*", MIT Press,1st Edition,1997.
	Useful Links
1	http://www.nptelvideos.in/2012/11/natural-language-processing.html
2	https://www.javatpoint.com/nlp
3	https://www.geeksforgeeks.org/natural-language-processing-overview/

CO-PO Mapping

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

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

Assessment

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

Bharati
Mrs. B.S. Shetty

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year, B. Tech. , Sem-V
Course Code	6IT315
Course Name	Professional Elective -1: Geographical Information System
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 introduce Geographical Information System(GIS).
2	To familiarize GIS data structures, data capture, storage and analysis
3	To impart typical uses of GIS in business, government, and resource management

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	Distinguish spatial and non-spatial characteristics of GIS data	II	Understanding
CO2	Examine the data quality issues and performance for GIS data	III	Applying
CO3	Design a GIS application for real time system	VI	Creating

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to GIS** Introduction to GIS, components of GIS, Real World to Digital World through GIS, GIS data and structures, representing the Real World.	7
II	**Module 2: Georeferencing and Map Projections** Georeferencing, Relative and Discrete Referencing, levation models, Coordinate Systems, Maps and Numbering, Map Projections.	6
III	**Module 3: Data Quality and Measures** Positional Accuracy and Source of Errors, Classification Accuracy and Pixel Errors, Spatial Data Editing and Transformations, data model and comparisons.	6
IV	**Module 4: Remote Sensing and GPS and Database systems:** Introduction to Remote Sensing, RS-working, satellites, and GPS, GPS: Working and Signals , GPS errors Introduction to database, Database Management System - Introduction, DBMS models, Normalization forms, Creating and Maintaining a database, Spatial Database systems.	7
V	**Module 5: Spatial Query and analysis** Spatial Query - Introduction, Spatial analysis, Raster and vector data analysis, Overlay operations, Basic spatial analysis, advanced spatial analysis.	6
VI	**Module 6: GIS Data Standard and Infrastructure** Open Source GIS Softwares- Introduction, PROS & CONS of open source, GIS Data Standards, Open Geospatial Consortium (OGC), National Spatial Data Infrastructure (NSDI), Introduction to Web GIS and Geoserver.	7

Text Books

1	Ian HeyWood, Sarah Cornelius and Steve Carver, "*An Introduction to Geographical Information Systems*", Pearson Education, 2nd Edition, 2006

R R Rathod

2	Kang-tsung Chang , "*Introduction to Geographic Information Systems*", Tata McGrawHill, 4th Edition, 2007

	References
1	Peter A. Burrough, Rachael A. McDonnell and Christopher D. Lloyd "*Principles of Geographical Information System*", Oxford University Press, 2016
2	Keith C. Clarke, Bradley O. Parks, and Michael P. Crane, "*Geographical Information Systems and Environmental Modeling*", Prentice-Hall India, 2001
3	Michael N. Demers , "*Fundamentals of Geographic Information Systems*", 4th Edition, Wiley Publication 2008,
4	Chor Pang Lo , "*Concepts and Techniques of Geographic Information Systems*", Pearson Prentice Hall, 2007

	Useful Links
1	https://nptel.ac.in/courses/107/105/107105088/
2	https://nptel.ac.in/courses/105/107/105107206/
3	https://nptel.ac.in/courses/105/107/105107155/
4	

CO-PO Mapping

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

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

Assessment

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

RR Rathod

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

AY 2023-24

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

Module	Module Contents	Hours
I	**Introduction to Cloud Computing** 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	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)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1		2										2		
CO2			3												
CO3	2				3									3	

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

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

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

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

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

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

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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

Text Books

1	R. Nageswara Rao, "*Core Python Programming*", Dreamtech Press, 2nd Edition, 2017

2	Chun, J Wesley, "*Core Python Programming*", Pearson, 2nd Edition, 2007 Reprint 2010

References	
1	Barry, Paul, Head *First Python*, O Rielly,2nd Edition, 2010
2	Lutz, Mark, *Learning Python*, O Rielly, 4th Edition, 2009

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs32/preview
2	https://docs.python.org/3/tutorial/
3	https://www.learnpython.org/

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2023-24					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Third Year B. Tech., Sem V				
Course Code	6OE387				
Course Name	Open Elective - 1: Data Science for Engineers				
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 Introduce R /Python a programming language
2	To Familiarize the mathematical foundations required for data science
3	To impart the first level data science algorithms

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Describe a flow process for data science problems	II	Ubderstanding
CO2	Develop R codes for data science solutions	III	applying
CO3	Construct use cases to validate approach and identify modifications	VI	Creating

Module	**Module Contents**	**Hours**
I	**Introduction to R:** Introduction to R, variables and data types in R, Data frames, Arithmetic and logical operations in R, Matrix operations in R, Functions in R, control structure, graphical visualization in R.	6
II	**Statistics in ML:** Statistics (descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence, interval for estimates).	6
III	**Optimization for data Science:** Unconstrained Multivariate optimization, Gradient Descent Learning Rules. Typology of data science problems and a solution framework, Multivariate optimization with Equality constraints, solving data analysis problems.	7
IV	**Predictive Modeling:** Simple linear regression and verifying assumptions used in linear regression r2. Multivariate linear regression, model assessment, assessing importance of different variables, subset selection	7
V	**Classification** classification using logistic regression, performance measurement, Logistic Regression in R	5

VI	**Clustering** Nearest Neighbors techniques, K-means clustering, KNN, KNN implementation in R, data science for Engineers - summary.	8

	Textbooks
1	Jeeva Jose," Data Analysis using R" Khanna Pub.
	References
1	Anuradha and Vincy,"Machine Learning", Wiley Pub
	Useful Links
1	https://archive.nptel.ac.in/courses/106/106/106106179/
2	https://archive.nptel.ac.in/courses/106/106/106106212/

CO-PO Mapping

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

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

Assessment

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

TY Sem II

HODIT

Bharat
DACIT
Mrs. B. S. Shetty

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

AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6IT321
Course Name	Unix Operating System
Desired Requisites:	Operating System

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptio n
CO1	Interpret design, principal and philosophy of the Unix/Linux OS	III	Applying
CO2	Analyze the architecture of Unix/Linux OS	IV	Analysing
CO3	Apply Linux/Unix system calls	III	Applying

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

Text Books

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

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

Useful Links	
1	https://nptel.ac.in/courses/106/102/106102132/ (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)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			3						2					
CO2		2			2							2	2	
CO3			2	1										1

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

Assessment

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

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

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

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

Course Objectives

1	To introduce the image fundamentals and geometric transforms necessary for image processing.
2	To demonstrate the image pre-processing techniques using various tools
3	To describe pattern recognition algorithms for domain applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Determine fundamental requirements of digital image handling, storages and representations	II	Understanding
CO2	Implement image processing steps for image enhancement and segmentation	III	Applying
CO3	Differentiate image patterns for recognition and classification	IV	Analyzing

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

24/8/2023

VI	**Pattern Recognition:** Pattern Classes, Pattern Recognition and Clasification, , Issues in Pattern Recognition, Design Concepts and Methodologies, Pattern Recognition Applications	7

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

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Apply schemes of knowledge representation.	III	Applying
CO2	Demonstrate an expert system.	III	Applying
CO3	Evaluate performance of AI systems.	V	Evaluating

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

Textbooks

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

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

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

CO-PO Mapping

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

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

Assessment

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

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AY 2023-24

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand, plan and execute a Project with team	III	Applying
CO2	Deliver technical seminar based on the Project	IV	Analyzing
CO3	Prepare a technical report based on the project	IV	Analyzing

List of Experiments / Lab Activities

Guidelines for Project - 1:

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

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

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

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

Text Books

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

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

References	
1	https://www.youtube.com/watch?v=0oSDa2kf5I8 (report writing)

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

CO-PO Mapping

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

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

Assessment

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

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

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

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

AY 2023-24

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain the difference between thread and process	III	Applying
CO2	Implement effective programing on Unix/Linux	III	Applying
CO3	Distinguishing various IPC's available in OS	IV	Analysing

List of Experiments / Lab Activities

List of Experiments:

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

Text Books

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

References

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

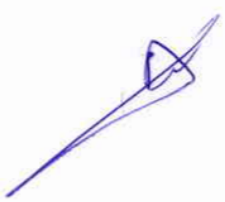
Useful Links

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

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

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				



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Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Identify various image processing techniques	2	Understanding
CO2	Apply various concepts of IT practices to design model	3	Applying
CO3	Demonstrate prototype using IT practices	4	Analyzing

List of Experiments / Lab Activities

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

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

Text Books

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

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

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

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

CO-PO Mapping

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

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

Assessment

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

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

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6IT373
Course Name	Parallel Computing Lab
Desired Requisites:	Computer Algorithms

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Analyze sequential code and apply parallelism	III	Applying
CO2	Implement parallel code to speed-up the execution	IV	Applying
CO3	Design the parallel algorithm for the engineering problem	VI	Creating

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

Laboratory assignment

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

Textbooks

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

References

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

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

CO-PO Mapping

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

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

Assessment

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

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

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6IT331
Course Name	Professional Elective - 1: Soft Computing
Desired Requisites:	Artificial Intelligence, Tool like Matlab/Scilab

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Classify hard and soft computing concepts	IV	Analysing
CO2	Compare the working of swarm intelligence methods	IV	Analysing
CO3	Justify the soft computing technique for real-time problem	V	Evaluating

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

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

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

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

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

CO-PO Mapping

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

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

Assessment

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

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Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Recognize the characteristics of machine learning for the real-world problems	II	Understanding
CO2	Apply the different supervised learning methods for real-world problems	III	Applying
CO3	Use different linear methods for regression and classification	IV	Analyzing

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

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

CO-PO Mapping

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

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

Assessment

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

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Course Information

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

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

Course Objectives

1	To analyze the need of Artificial Neural Network(ANN) for an application
2	To decide the use of type ANN in application.
3	To compare supervised and unsupervised learning applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Describe the fundamental concepts of ANN, managing and organizing the data for ANN	II	Understanding
CO2	Experiment the use of ANN for simple applications	III	Applying
CO3	Compare the simple perceptron and mutli-layer ANN	IV	Analysing

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

	Textbooks
1	Jacek M. Zurada, *"Introduction to artificial neural systems"*, West Publishing Company, NewYork, 1995
2	Krogh, and R. G. Palmer, *"Introduction to the theory of neural computation"*, Addison Wesley, 2018
3	S. N. Sivanandam & M. Paulraj, *"Introduction to Artificial Neural Networks"*, Wiley, 2016
	References
1	Charu C. Aggarwal, *"Neural Networks and Deep Learning"*, Springer, 2018
2	Simon Haykin, *"Neural Networks and Learning Machines"*, Pearson, 1999
	Useful Links
1	https://nptel.ac.in/courses/117105084
2	https://onlinecourses.nptel.ac.in/noc19_ee53/preview
3	https://www.shiksha.com/online-courses/introduction-to-machine-learning-by-nptel-course-nptel38?enModal=Y&regFlow=N

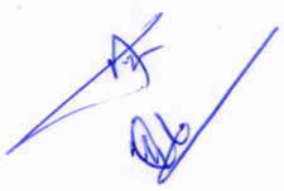
CO-PO Mapping

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

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

Assessment

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



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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6IT334
Course Name	Professional Elective - 2: Cloud Computing
Desired Requisites:	Computer Networks

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

Module	**Module Contents**	**Hours**
I	**Introduction to Cloud Computing** Virtualization and Cloud Computing, Cloud Reference Model: IAAS, PAAS, SAAS, Cloud Deployment Model: Public Cloud, Private Cloud and Hybrid Cloud, Cloud Platforms in Industry	7
II	**Virtualization** Hosted and Bare-Meta, Server Virtualization, Desktop Virtualization, Application Virtualization, Storage Virtualization	6
III	**Network Functions** Public Cloud Networking: Route53, Content Delivery Networks, Resilience Infrastructure, Virtual Network Functions: Cloud Firewall, DNS, Load Balancers, Intrusion Detection Systems	6
IV	**Virtual Private Clouds (VPC)** VPC fundamentals, Public and Private Subnets, Security Groups, Network Access Control List, Network Address Translation.	7
V	**Cloud Management** Service Management in Cloud Computing, Data Management in Cloud Computing, Resource Management in Cloud	7
VI	**Cloud Computing and Micro-Services:** Docker, Kubernetes, Application Deployment on Docker and Kubernetes, Open Source Cloud	6

Text Books

1	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, *"Mastering cloud computing"*, Mc Graw Hill Education, 3rd Edition, 2011

2	Thomas Erl, Zaigham Mahmood and Ricardo Puttini, *"Cloud Computing: Concepts, Technology & Architecture"*, Pearson, 1st Edition, 2010

References

1	Richardo Puttini, Thomas Erl, and Zaigham Mahmood, *"Cloud Computing: Concepts, Technology & Architecture"*, Pearson Prentice Hall, 2nd edition, 2013
2	Srinivasan, J. Suresh, *"Cloud Computing: A practical approach for learning and implementation"*, Pearson, 2nd Edition, 2012

Useful Links

1	Module: I, II, IV, V, VI https://nptel.ac.in/content/syllabus_pdf/106105167.pdf
2	https://aws.amazon.com/

CO-PO Mapping

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

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

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
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Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

Programme	B.Tech. (Information Techology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6IT335
Course Name	Professional Elective - 2: Advance Database Engineering
Desired Requisites:	Database Engineering

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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

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

	Text Books
1	Raghu Ramakrishnan, Johannes Gehrke, *"Database Management Systems"*, 3rd Edition, McGraw-Hill Higher Education, 2014
	References
1	Carlos Coronel, Steven Morris, *"Database Systems: Design, Implementation, & Management"*, 13th Edition, Cengage Learning, 2018.
2	Shio Kumar Singh, *"Database Systems: Concepts, Design and Applications"*, 2nd Edition, Pearson Education India, 2011
	Useful Links
1	https://nptel.ac.in/courses/106/104/106104021/
2	https://nptel.ac.in/courses/106/106/106106093/

CO-PO Mapping

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

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

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
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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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AY 2023-24

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6IT336
Course Name	Professional Elective - 2: Spatial Data Analysis
Desired Requisites:	

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

Course Objectives

1	To interpret and communicate effectively the results of spatial data analysis.
2	To demonstrate competency in the use of spatial data analysis tools.
3	To explain design and implement a spatial data analysis

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Understand the concepts and nature of spatial data analysis.	III	Applying
CO2	Apply different approaches to spatial data exploration	III	Applying
CO3	Analyze spatial statistics, spatial patterns and processes	IV	Analysing

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

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	Text Books
1	Ian HeyWood, Sarah Cornelius and Steve Carver, *"An Introduction to Geographical Information Systems"*, Pearson Education, 2nd Edition, 2006.
2	Kang-tsung Chang, *"Introduction to Geographic Information Systems"*, Tata McGrawHill, 4th Edition, 2007.

	References
1	Peter A. Burrough, Rachael A. McDonnell and Christopher D. Lloyd, *"Principles of Geographical Information System"*, Oxford University Press, 2016
2	Keith C. Clarke, Bradley O. Parks, and Michael P. Crane, *"Geographical Information Systems and Environmental Modeling"*, Prentice-Hall India, 2001.

	Useful Links
1	https://archive.nptel.ac.in/courses/130/106/130106115/
2	https://onlinecourses.nptel.ac.in/noc19_cs76/preview

CO-PO Mapping

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

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

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
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R K Kalkod

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
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Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Third Year B. Tech., Sem VI				
Course Code	6OE392				
Course Name	Open Elective 2: Web Development and Applications				
Desired Requisites:	Computer Programming				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
	-	**Credits: 3**			

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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

Mr. B.S. Shetty

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

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

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

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

CO-PO Mapping

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

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

Assessment

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

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AY 2023-24

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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

Text Books

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

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

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

CO-PO Mapping

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

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

Assessment

The assessment is based on MSE, ISE and ESE.
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Walchand College of Engineering, Sangli
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AY 2023-24

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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

Text Books

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

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

References

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

Useful Links

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

CO-PO Mapping

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

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