WALCHAND COLLEGE OF ENGINEERING, SANGLI.

DEPARTMENT OF INFORMATION TECHNOLOGY

Curriculum Structure for UG Information Technology

(Applicable for batch entered into 2023-24)

SEM-V

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2025-26					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Third Year B. Tech., Sem V				
Course Code					
Course Name	**Open Elective - 1:** Python Programming				
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 fundamental concepts of Python programming
2	To explain object-oriented programming principles in Python including classes, inheritance, and encapsulation.
3	To familiarize students with essential Python modules and data visualization tools

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	Associate object-oriented programming concepts like classes, inheritance, and encapsulation with Python	II	Understanding
CO2	Adapt libraries for efficient array operations, indexing, and numerical computations in Python.	III	Applying
CO3	Aquire exception handling and debugging techniques to write robust and error-free Python programs.	III	Applying
CO4	Summarize complex datasets using various chart types to communicate data effectively.	IV	Analyzing

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.	7
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 Array Processing Library:** **NumPy:** Introduction, Numpy array, Numpy array indexing, Numpy operations.	6
VI	**Pandas Library for Handling Data Frames:** **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, 2018
2	Chun, J Wesley, "*Core Python Programming*", Pearson, 2nd Edition, 2007 Reprint 2010

References	
1	Barry, Paul, Head *First Python*, O Rielly,2nd Edition, 2016
2	Lutz, Mark, *Learning Python*, O Rielly, 4th Edition, 2009

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc25_cs69/preview
2	https://onlinecourses.swayam2.ac.in/cec22_cs20/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	2	1	1	1		1	1		2	2	3	3
CO2	1	1	1	1	2	1			1		2	2	1	1
CO3	1	2	1	1	2	1			1		2	2	1	1
CO4	2	2	2	2	1	2			1		2	2	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)

Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

Walchand College of Engineering, Sangli
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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	
Course Name	**Open Elective - 1:** Data Science for Engineers
Desired Requisites:	Basic programming skills, Matrix , 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 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	Understanding
CO2	Develop codes for data science solutions	III	Applying
CO3	Analyze datasets to identify inconsistencies, missing values, and redundancy, and select appropriate preprocessing techniques such as cleaning, transformation, encoding, and integration to improve data quality for analysis.	IV	Analyzing
CO4	Construct use cases to validate approach and identify modifications	VI	Creating

Module	**Module Contents**	**Hours**
I	**Data Preprocessing:** Introduction data, Data collection methods, Data Preprocessing, Data Cleaning Techniques,Data Transformation and Encoding, Data Integration and Reduction. Database models.	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	**Supervised Learning** Classification methods, classification using logistic regression, performance measurement, Logistic Regression.	6
VI	**Unsupervised Learning** Nearest Neighbors techniques, K-means clustering, KNN, KNN implementation in programming language, data science for Engineers - summary.	7

Textbooks

1	Jeeva Jose,“ Data Analysis using R” Khanna Publications, 1st Edition, 2018

References

1	Anuradha and Vincy,”Machine Learning”, Wiley Publications, 1st Edition, 2019

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								2	
CO2	3	3											1	2
CO3		1			2								1	
CO4	3	2			1									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).

Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	
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 and cloud services 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
CO4	Evaluate cloud computing solutions for scalability, resilience, and security based on organizational requirements	v	Evaluating

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:** 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, 2013
2	Thomas Erl, Zaigham Mahmood and Ricardo Puttini, *"Cloud Computing: Concepts, Technology & Architecture"*, Pearson, 1st Edition, 2013

References	
1	Srinivasan, J. Suresh, *"Cloud Computing: A practical approach for learning and implementation"*, Pearson, 2nd Edition, 2014
2	

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc25_cs11/preview
2	https://onlinecourses.nptel.ac.in/noc25_cs12/preview

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	3	2	3		2		2					2		3
CO3	2	3		2	1			2		1	1		1	2
CO4	2	3	1		3	1			1		1	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)

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7IT301
Course Name	Database Engineering
Desired Requisites:	Discrete Mathematics, Data structures

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

Course Objectives

1	To introduce basic concepts of database management systems and design
2	To impart interacting and manipulating databases using query languages and indexing.
3	To describe database transaction management and recovery 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 Descriptor
CO1	Explain basic concepts of Relational database management systems	II	Understanding
CO2	Perform normal forms conversion, draw ER model and design Database system	III	Applying
CO3	Write optimized SQL queries on relational database	III	Applying
CO4	Evaluate transactions, and perform concurrency control and database recovery.	IV	Evaluating

Module	Module Contents	Hours
I	**Introduction:** Database Systems, Data Models, Data Abstraction, Architecture of database systems **Entity-Relationship Model:** Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.	6
II	**Relational Model:** Structure of Relational Databases, database schema, keys, Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus Schema Diagrams **Relational Database Design:** Domain Constraints, Referential Integrity, Functional Dependencies, Different anomalies in designing a Database, Normalization using functional dependencies, Decomposition, Normal Forms	7

III	**Query languages:** Structured Query Language (SQL), Basics of SQL, DDL, DML, Set operations Aggregate functions , Joins, Views, Unstructured Query Language (MongoDB/MariaDB/ NoSQL) **Query processing:** Measures of Query Cost, query-evaluation plan, measures of query cost, Evaluation of expression	7
IV	**Indexing and Hashing:** Ordered and secondary Indices, B+ Tree Index Files, Static Hashing, Dynamic hashing, Comparison of Indexing Techniques, 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	7
VI	**Crash Recovery:** Failure Classification, storage Structure, Log-Based Recovery, checkpoints, Shadow Paging, recovery with concurrent transactions, buffer management, backup systems.	6

Textbooks	
1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 7th Edition, 2019.
2	Raghu Ramakrishnan, "Database Management Systems", McGraw-Hill Education, 3rd Edition, 2003.

References	
1	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson India, 7th Edition, 2017
2	C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.
3	Hector Garcia-Molina, Jeffrey D. Ullman, " Database Systems: The Complete Book", Pearson, 2nd Edition, 2014

Useful Links	
1	https://archive.nptel.ac.in/courses/106/105/106105175/
2	https://onlinecourses.swayam2.ac.in/nou25_lb11/preview
3	https://onlinecourses.nptel.ac.in/noc25_cs40/preview

CO-PO Mapping

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

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

Assessment

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 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7IT302
Course Name	Computer Algorithms
Desired Requisites:	Data Structures

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

Course Objectives

1	To introduce fundamental algorithmic techniques and their applications in problem-solving.
2	To develop skills in designing and analyzing efficiency of algorithms
3	To comprehend parallel programming using MPI for designing scalable algorithm.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Illustrate divide-and-conquer, greedy, and dynamic programming algorithms.	III	Applying
CO2	Apply graph algorithms to solve real-world problems	III	Applying
CO3	Analyze and compare the efficiency of algorithms using asymptotic notation	IV	Analysing
CO4	Develop parallel algorithms using MPI for scalable performance.	VI	Creating

Module	Module Contents	Hours
I	**Introduction to Algorithms:** Algorithm analysis, Asymptotic notation (Big-O, Big-Ω, Big-Θ), Time and space complexity. **Greedy Algorithms:** Activity selection, Fractional Knapsack, Huffman coding, Intersecting Line segments	6
II	**Divide and Conquer Algorithms:** QuickSort, Convex Hull, Closest pair of points **Dynamic Programming:** Matrix chain multiplication, Longest Common Subsequence , 0/1 Knapsack, string matching, KMP algorithm	8
III	**Introduction to Parallel Computing**: Basics of parallelism, MPI basics, Parallel MergeSort, BFS, DFS, Prims, Matrix Multiplication	7
IV	**Shortest Path Algorithms:** Types, Bellman-Ford algorithm, Dijkstra's algorithm, Floyd-Warshall algorithm, Johnson's algorithm.	8
V	**Algorithm Complexity classes:** Complexity theory, Introduction to P, NP, NP-Complete and NP Hard problems	7

VI	**Advanced Topics:** Approximation algorithms, Randomized algorithms	6

Textbooks	
1	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein"Introduction to Algorithms" MIT Press, 4th Edition 2022
2	Jon Kleinberg and Éva Tardos "Algorithm Design" Pearson Publication, 1st Edition, 2005
3	Michael J. Quinn "Parallel Programming in C with MPI and OpenMP" McGraw Hill Indian 1st Edition, 2005

References	
1	Donald E. Knuth."The Art of Computer Programming" Addison-Wesley Professional, Vol 1-4 , 2011
2	Robert Sedgewick and Kevin Wayne "Algorithms" 4th Edition, (Online Available), 2011

Useful Links	
1	GeeksforGeeks Algorithms (https://www.geeksforgeeks.org/fundamentals-of-algorithms/)
2	MPI Official Documentation (https://www.mpi-forum.org/docs/)
3	NPTEL Algorithms Course (https://nptel.ac.in/courses/106/106/106106131/)
4	https://algs4.cs.princeton.edu/31elementary/

CO-PO Mapping

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

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

Assessment

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).
Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

Walchand College of Engineering, Sangli

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7IT303
Course Name	Cryptography & Network Security
Desired Requisites:	Computer Networks

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

Course Objectives

1	To describe the fundamental concepts of network security using confidentiality, integrity and availability (CIA) of the information
2	To explain various encryption techniques
3	To apprise security mechanisms and services against threats

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Associate number coding theory to the mathematical functions of information security	II	Understanding
CO2	Practice symmetric and asymmetric crypt-complex encryption algorithms providing confidentiality	III	Applying
CO3	Compare access control for authentication and integrity checksum mechanisms resolving security issues over communication networks	IV	Analyzing
CO4	Select appropriate security services for figuring out probable security threats in domain specific applications	V	Evaluating

Module	Module Contents	Hours
I	**Security Overview:** Requirement of Information Security over Communication Networks, Services, Mechanism and Attacks, The OSI Security Architecture, Classical Encryption Techniques, Substitution and Transposition Techniques, Steganography	7
II	**Block Cipher:** Modes of Data Transfer, Block Cipher Design Principles, Symmetric Cipher Model, Data Encryption Standard, Security of 2DES, 3DES & AES	7
III	**Public Key Encryption:** Principles of Asymetric/Public-Key Cryptosystem, RSA Algorithm, Distribution of Public Keys, Diffie-Hellman Key Exchange	6

IV	**Authentication Functions and Services:** Hash Functions, Message Authentication Codes, Digital Signatures Kerberos, X.509 Certificates	6
V	**IP & Web Security:** IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction	6
VI	**Perimeter Security:** Intruder Detection, Password Management, Firewall Configurations, Trusted Systems, Honeypots, Information Security Case Studies	7

Textbooks

1	William Stallings, *"Cryptography and Network Security, Principles and Practices"*, Pearson Publication, 8th Edition 2023
2	Atul Kahate, *"Cryptography and Network Security"*, McGraw Hill Edu. India, 4th Edition, 2019

References

1	Menezes, A. J., P. C. Van Oarschot, and S. A. Vanstone, "*Handbook of Applied Cryptography*", CRC Press, 2nd Edition, 2018
2	Schneier, Bruce, "*Applied Cryptography: Protocols & Algorithms*", Wiley Publication, 2nd Edition, 2015

Useful Links

1	https://onlinecourses.nptel.ac.in/noc24_cs31/preview : Swayam NPTEL course on Information Secuty coordinated by IIT Madras
2	https://onlinecourses.nptel.ac.in/noc23_cs127/preview Swayam NPTEL course on Cyber Security and Privacy coordinated by IIT Madras

CO-PO Mapping

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

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).
Self-study content should be provided to students and assessed during the In-Semester Evaluation

(ISE).

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7IT353
Course Name	Unix Operating System Lab
Desired Requisites:	Operating System

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

Course Objectives

1	To introduce and use various system call of Unix/Linux OS for process and file subsystems
2	To use the various IPC's available in OS
3	To investigate the kennel design for futurestics use in dockers

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	Illustrate the difference between thread and process	III	Applying
CO2	Implement various IPC's available in OS for communications.	III	Applying
CO3	Identify different system calls for Linux/Unix programming for process and file.	IV	Analyzing
CO4	Create processes, to use pipe as a IPC channel	VI	Creating

Module	**Module Contents**	**Hours**
I	**Introduction** General Overview of the System – History of Linux/Unix, System Structure, User Perspective, Operating System Services, Operating System Functions.	1
II	**The KERNEL** Process, file, Threads, Architecture of UNIX OS, Introduction to system concepts, Kernel Data Structure, System Administration, Case study: 0.1 Kernel code.	3
III	**Internal Representation of Files** Inodes, structure of the regular file, directories, super block, other file types, application of file types.	2
IV	**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.	3
V	**Inter-Process Communication within OS** Shared memory, message queues, semaphore, signals, Named (Fifo) and Unnamed Pipe (Pipe).	3

VI	**Inter-Process Communication** Socket, openMP, MPI, Go/java and concurrency, IPC comparison.	2

List of Experiments / Lab Activities/Topics

List of Experiments: (synoptic list)

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/Go language
5. IPC: Semaphore: semaphore: 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. Script writing in Linux (Shell Programming)
11. Script writing in python

Textbooks

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/ (Assignments Reference)
2	https://archive.nptel.ac.in/courses/106/102/106102132/ (Process and System calls)
3	https://github.com/mit-pdos/xv6-public (Kernel code)
4	https://nptel.ac.in/courses/106108101 (Shell Scripts)
5	https://github.com/beejjorgensen/bgipc (IPC book)

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			1	
CO2					3	1			1		1			2
CO3		1		2				1				2	2	
CO4		1												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. Modern tools are to be studied in self-mode for implementation laboratory assignment and will be evaluated in Laboratory Assessment (LA).				

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7IT351
Course Name	Database Engineering Lab
Desired Requisites:	Discrete Mathematics, Data structures

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

Course Objectives

1	To discuss fundamentals DDL, DML, DQL, DCL Commands
2	To describe interacting with databases using query languages
3	To instruct for writing database driven applications in programming language to connect with databases.

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 ER Model and Convert entity relationship diagrams into RDBMS	II	Understanding
CO2	Demonstrate proficiency of SQL syntax and use it to interact with database	III	Applying
CO3	Differentiate query processing, indexing and hashing techniques	IV	Analyzing
CO4	Create database driven applications in programming language to connect with databases.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Assignments (Perform 2/3 experiments on each category):

1. Identify entity, its attributes to draw ER diagram for database schema design.
2. Create database tables and write SQL queries to retrieve information from the database using DDL and DML commands. Give Primary key and foreign key constraints.
3. Perform Data Control Language (DCL) and Transaction Control Language (TCL) command in SQL

4. Study of various types of integrity constraints (NOT NULL Constraint, DEFAULT Constraint, UNIQUE Constraint, PRIMARY Key, FOREIGN Key, CHECK Constraint).
5. Implementation of DML commands of SQL with suitable examples. Perform Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on specific conditions.
6. Perform Aggregation and group by, having clause queries to retrieve summary information from the database.
7. Implementation of different types of Joins- Inner Join, Outer Join, Natural Join etc.
8. Perform Nested Subqueries.
9. Create database views. Creation of views using views, Drop view. Operations using Views.
10. Perform Indexing Queries in SQL.
11. Create a row level trigger for the customers table that would fire for INSERT or
12. UPDATE or DELETE operations performed on the CUSTOMERS table.
13. Implement MYSQL database connectivity with python/Java. Implement Database queries (insert, delete, update) using ODBC/JDBC.
14. Study of Open Source NOSQL Database: MongoDB (Installation, Basic CRUD operations, Execution)

Textbooks

1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 7th Edition, 2019.
2	Raghu Ramakrishnan, "Database Management Systems", McGraw-Hill Education, 3rd Edition, 2003.

References

1	P. DuBois, MySQL, Addison Wesley,4th Edition, 2009
2	Vinicius M. Grippa, Sergey Kuzmichev, "Learning MySQL: Get a Handle on Your Data", O'reilly, 2nd edition 2021
3	Hector Garcia-Molina, Jeffrey D. Ullman, " Database Systems: The Complete Book", Pearson, 2nd Edition, 2014

Useful Links

1	https://archive.nptel.ac.in/courses/106/105/106105175/
2	https://onlinecourses.swayam2.ac.in/nou25_lb11/preview
3	https://onlinecourses.nptel.ac.in/noc25_cs40/preview

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1		2		1		1			1		1	2	
CO2	2	2		2	3	2			1			1	2	
CO3		2		2					1					
CO4	3	1	3	1	3	3	1	1					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. Modern tools are to be studied in self-mode for implementation laboratory assignment and will be evaluated in Laboratory Assessment (LA).

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

AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7IT352
Course Name	IT Practices lab 1
Desired Requisites:	Data Structures, Computer Networks

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

Course Objectives

1	To design and implement algorithms using both sequential and parallel computing paradigms
2	To enhance proficiency in applying algorithmic strategies to solve real-world problems
3	To introduce professional tools and techniques for cryptography, encryption, hashing, and data hiding
4	To explore network security monitoring and analysis of firewall, ethical hacking, and malware attack using standard tools

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 sequential and parallel algorithmic techniques to implement computation problem	III	Applying
CO2	Demonstrate problem-solving skills by implementing algorithms and analyzing performance	IV	Analyzing

CO3	Identify algorithmic complexity and information authentication mechanisms	IV	Analysing
CO4	Select appropriate programming approaches and skills in domain specific applications	V	Evaluating

List of Experiments / Lab Activities/Topics

List of Lab Assignments: (Minimum 10)

Part A:Computer Algorithm

1. Implement QuickSort algorithms and use tools such as debugger, profiler.
2. Implement any problem based on Matrix Chain MultiplicationGreedy Algorithms:
3. Implement sequential and parallel (MPI) MergeSort algorithms and compare
4. Any algorithm based on Computational geometry
5. Problem based on Floyd Warshall Shortest Path Algorithms
6. Parallel (MPI) Matrix Multiplication and Shortest Path algorithm

- **Part B: Cryptography and n/w Security**

1. Implementation of classical encryption techniques: Hill cipher or similar
2. Design and analysis of affine Caesar cipher
3. Generation of hash code: RSA_hash or similar
4. Demonstration of Stego Tools: Case Stools or similar
5. Network Security Monitoring and Analysis: Case Wireshark or similar
6. Verification Engine: Case Comodo Verisign or similar
7. Configuration of firewalls: Case Cisco or similar
8. Ethical hacking and attack analysis: Case malware

Textbooks

1	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein"Introduction to Algorithms" MIT Press, 4th Edition 2022
2	William Stallings, *"Cryptography and Network Security, Principles and Practices"*, Pearson Publication, 8th Edition 2023

References

1	Victor Eijkhout, "Parallel Programming in MPI and OpenMP" Google book Lulu.com 2017
2	Menezes, A. J., P. C. Van Oarschot, and S. A. Vanstone, "*Handbook of Applied Cryptography*", CRC Press, 2nd Edition, 2018

Useful Links

1	https://www.open-mpi.org/
2	https://archive.nptel.ac.in/courses/106/106/106106129/ : Nptel course coordinated by IIT Madras

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3			2								2	
CO2		2	3		3									2
CO3	3				2								3	
CO4	3	2			3								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. Modern tools are to be studied in self-mode for implementation laboratory assignment and will be evaluated in Laboratory Assessment (LA).

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7VSIT345
Course Name	Mini Project - 2
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 identify industry-based, interdisciplinary, or socially relevant problems
2	To introduce software project management tools, technologies, and frameworks
3	To emphasize the use of version control systems, documentation through report writing.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Interpret and analyze the requirements of problem to translate into software specifications	III	Applying
CO2	Analyze the system architecture and project components to develop effective solutions	IV	Analyzing
CO3	Compare the performance of the developed system with existing solutions for optimization.	IV	Analyzing
CO4	Propose the findings and outcomes of the project through a technical seminar and report.	VI	Creating

List of Experiments / Lab Activities

Guidelines for Mini-Project 2:

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 preferable object oriented technology
2. Industry based problem / Sponsored application / 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 Software Development Life Cycle (SDLC) with Continuous Integration and Continuous Development (CI/CD)
5. Apply project management tools such as Jira to manage timelines, track progress, and collaborate effectively on development of project
6. The project report should be prepared and submitted in both soft and hard copies, along with the source code and any necessary dependency documents
7. Use best practices for code versioning using Git branches, pull requests, and code reviews to enhance teamwork and collaboration
8. Modern tools are to be studied in self-mode for effective project implementation, result analysis, and deployment.
9. Project will be evaluated continuously by the guide/panel as per assessment plan
10. 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 link of online repository of project. Students should maintain a project log book containing weekly progress of the project.

Text Books	
1	Hofmann, Angelika H. , "*Scientific Writing and Communication: Papers, Proposals, and Presentations*", Oxford Press, 3rd Edition, 2016

References	
1	Marilyn Deegan, "*Academic Book of the Future Project Report*", A Report to the AHRC & the British Library, 2017

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc25_hs14/preview
2	https://www.youtube.com/watch?v=0oSDa2kf5I8 (report writing)
3	https://nptel.ac.in/courses/109105115
4	https://cerlalc.org/wp-content/uploads/2017/09/OLB-Doc_int_academic-book-of-the-future_2017.pdf

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		3							2	1	2
CO2		3		2	3	2				2	1	2	3	
CO3	1		3	3	1		3		3		2	1		2
CO4		2	1		2	1	2	2	3	3	2	2	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.

SEM-VI

Walchand College of Engineering, Sangli
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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	
Course Name	**Open Elective - 2:** Fundamentals of Machine Learning and 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 introduce fundamental concepts of machine learning and regression techniques for predictive analysis.
2	To develop understanding of classification algorithms including logistic regression and their optimization strategies.
3	To impart knowledge of unsupervised learning methods such as clustering, dimensionality reduction, and anomaly detection.

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 concepts of machine learning and regression analysis techniques	II	Understanding
CO2	Apply logistic regression for classification problems	III	Applying
CO3	Study perceptron learning, back propagation, and support vector machines for complex classification problems.	IV	Analyzing
CO4	Analyze unsupervised learning techniques and principal component analysis to discover patterns in data.	IV	Analyzing

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	Tom M. Mitchell, "Machine Learning", McGraw Hill Education, 1st Edition, 2017
2	J. Gabriel, "Artificial Intelligence: Artificial Intelligence for Humans", Wiley, 1st Edition , 2016

References

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

Useful Links

1	https://onlinecourses.swayam2.ac.in/imb24_mg126/preview
2	https://onlinecourses.nptel.ac.in/noc25_cs50/preview

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									3		2
CO3	3	2											3	
CO4	2	3										1	1	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).

Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

Walchand College of Engineering, Sangli
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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	
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 introduce satellite-based remote sensing technologies, image interpretation and enhancement methods, and the integration of Remote Sensing with GIS and GPS.

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 remote sensing process to collect data.	II	Understanding
CO2	Apply image enhancement and interpretation techniques on image data.	III	Applying
CO3	Collect, examine and process GIS data set for application	IV	Analyzing
CO4	Explain the principles of remote sensing, image interpretation, and image enhancement techniques.	IV	Analyzing

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, 2011.
2	Schowengerdt, R. A., *"Remote Sensing: Models and Methods for Image Processing"*, Academic Press, 3rd Edition, 2007.
3	Ian HeyWood, Sarah Cornelius and Steve Carver, *"An Introduction to Geographical Information Systems"*, Pearson Education, 4th Edition, 2011

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

Useful Links

1	https://nptel.ac.in/courses/121/107/121107009/
2	https://nptel.ac.in/courses/105/107/105107155/

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	2					2		2		2	
CO3		3	3		3		2		2				3	3
CO4			3		4			3		2	3	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).

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	
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	Analyzing
CO4	Study the content management systems (CMS) to develop web services	IV	Analyzing

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
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, 2nd Edition, 2003
3	Robin Nixon, "*Learning PHP, MySQL, JavaScript, and CSS: A Step-by-Step Guide to Creating Dynamic Websites*", O'Reilly Publications, 3rd Edition, 2021

References	
1	Erik T. Ray "*Learning XML*" O'Reilly Publications, 1st Edition, 2003
2	Chris Bates, "*Web Programing Building Internet Applications*", WILEY, 3nd Edition, 2006

Useful Links	
1	https://www.w3schools.com/
3	https://www.javatpoint.com/php-tutorial
4	https://www.javatpoint.com/xml-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		1								2	
CO2	2	2	2		2							2		2
CO3	3	1	2		3							1	3	
CO4	3	2			1							1	1	2

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

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

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

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

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

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

Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	**B.Tech. (Information Technology)**
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7IT331
Course Name	**Professional Elective 1:** Internet of Things and AI Applications
Desired Requisites:	Computer network

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

Course Objectives

1	To comprehend IoT and AI technologies to develop a IoT applications
2	To describe the design methodology and diverse IoT platforms
3	To explore the concepts adjoining IoT Data Analytics and AI
4	To recall unique features and challenges in IoT case studies using AI 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 Descriptor**

CO1	Understand the Fundamentals of IoT and AI in IoT Systems.	II	Understanding
CO2	Distinguish AI-Enabled IoT Applications by applying Hardware/Software Integration and various protocols in Real-World Scenarios.	III,IV	Applying, Analyzing
CO3	Analyze IoT Data Using Data Analytics concepts.	IV	Analyzing
CO4	Design AI based IoT systems by incorporating current technological standards.	VI	Creating

Module	Module Contents	Hours
I	**Introduction to IoT:** Introduction to IoT, IoT World Forum standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, IoT Data Management and Compute Stack ,Fog, Edge and Cloud role in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects. IoT Challenges, IoT Network Architecture and Design	7
II	**IoT Communication:** IoT Access Technologies, Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Optimizing IP for IoT Transport Layer: IoT Application Transport Methods, Application Layer Protocols: CoAP and MQTT. Communication technologies Bluetooth, Wi-Fi, Li-Fi, RFID, Cellular, Z-Wave	7
III	**Basic Design Of AI Enabled IoT Applications:** IoT Interfacing: Component selection, Hardware Components- Computing by NodeMCU, Raspberry Pi, Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's -Python/Node.js/Arduino.	5
IV	**Development Of AI - IoT Applications:** Interfacing of various types of sensors, camera. Communication: Bluetooth, WiFi, GSM. Introduction to cloud storage models & cloud IoT platforms -Amazon Web Services (AWS), Microsoft Azure, Google Cloud , IBM Watson, Google IoT, ThingSpeak, Thing Works IoT.	7
V	**Data Analytics Used In Applications:** Data Analytics for IoT, Structured Versus Unstructured Data, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics. Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M.	7
VI	**Case Studies:** Device integration, Data acquisition, Organization and integration for IoT application. Case studies: Smart Cities, Smart Homes, Automobiles, Industrial IoT Activity Monitoring in Agriculture, Weather, Healthcare, and Environment applications.	6

Textbooks

1	Raj Kamal *"Internet of Things: Architecture and Design Principles"* , 2nd Edition, McGraw Hill Education, 2022.
2	Dr Sudha M *"Internet of Things Analytics and Its Applications IoT Applications" , Orange book publication* ,1st edition, 2024.
3	Arshdeep Bahga, Vijay Madisetti *"Internet of Things – A hands-on approach"*, Universities Press, 1st edition , 2015.

4	Joel J. P. C. Rodrigues A. Gawanmeh, K. Saleem S. Parvin *"Smart Devices, Applications, and Protocols for the IoT "* ,1st edition, IGI Global ,March 2019
5	Vinay Solanki, *"Confluence of AI and IoT -Marriage Made in Heaven"* ,Paperback , Notion Press, 1 st edition, Dec 2023.
References	
1	D. Hanes, G. Salgueiro, P. Grossetete, R. Barton, J. Henry, *"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things"* ,1st Edition, Pearson Education ,2018.
2	Pethuru Raj and Anupama C. Raman *"The Internet of Things: Enabling Technologies, Platforms, and Use Cases"* , CRC Press, 1st edition, 2017.
3	Shriram K V., A. S Nagarajan, RMD Sundaram *"Internet of Things, 2ed Paperback "* , Wiley , Sep 2020.
4	https://www.worldscientific.com/page/ai-iot books
Useful Links	
1	https://onlinecourses.swayam2.ac.in/ntr24ed01/preview
2	https://www.coursera.org/learn/introduction-iot-boards?action=enroll
3	https://www.coursera.org/learn/iot-software-architecture
4	https://onlinecourses.nptel.ac.in/noc25_cs75/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										1		
CO2	2	3	2	2					2	1	1			
CO3		2	2	2	2	1		1	2	1	1	2	2	2
CO4	2	2		2	2		1		2	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.

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, Implementation of prototype etc. and is expected to map at least one higher order PO. ISE assignments should focus on teamwork.
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).
Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)					
AY 2025-26					
Course Information					
Programme		B.Tech. (Information Technology)			
Class, Semester		Third Year B. Tech., Sem VI			
Course Code		7IT332			
Course Name		**Professional Elective 1:** Data Analytics			
Desired Requisites:		Basic mathematics			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	ISE	MSE	ESE	Total
Tutorial		20	30	50	100
		Credits: 3			

Course Objectives	
1	Gain data analysis and decision-making concepts
2	Understand ETL processes and design effective dashboards for data presentation
3	Understand ethical considerations in data analytics

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Apply statistical methods to visualize data insights using charts and dashboards	III	Applying
CO2	Analyze complex data sets using charts, tables and tools	IV	Analyzing
CO3	Create and apply data transformation and mappings for different data types	VI	Creating
CO4	Evaluate data using various techniques to optimize processes speed and efficiency	V	Evaluating

Module	Module Contents	Hours
I	**Introduction to data analytics:** Data science and data analytics; statistical data analysis, descriptive statistics, aggregate functions, conditional formatting and essential functions, analysis with pivot tables and charts	6
II	**Data Acquisition and Manipulation**: Data types, Data base; data warehouse; data filtering and selection, structured and unstructured data, ETL fundamentals, data cleansing, validation, normalization, and aggregation, data transformation, optimize ETL processes.	6
III	**Data Visualization**: Visualization techniques, various charts, interactive dashboards, correlation and regression analysis, decision trees, probability distributions	7
IV	**Predictive Modeling**: Correlation to Supervised Segmentation, Identifying informative attributes, Segmenting data by progressive attribute selection, Attribute/variable selection, Induction and Prediction Models, Supervised-unsupervised Segmentation, Visualizing Segmentations.	7
V	**Data Model Development**: Datasets generation, Model Development, Model Planning, Fitting model to data, Fitting and overfitting, Linear regression; Logistic regression; Support-vector machines. Classification via Mathematical Functions; Assessing Results.	7
VI	**Data Ethics**: Introduction to Data Ethics, Legal and Regulatory Frameworks, Data Privacy and Consent, Data Handling and Security, Transparency and Accountability, Data Visualization and Communication, Bias and Fairness in Data Analysis, Ethical Decision-Making, Social and Ethical Impacts.	6

Textbooks

1	Foster Provost, Tom Fawcett, "Data Science for Business: What you need to know about data mining and data analytic thinking", O'Reilly Media, Inc.; ISBN- 9781449361327; 2020.
2	Bharti Motwani, "Data Analytics using Python", Wiley, 2nd Edition, 2020

References

1	Dr. Gaurav Aroraa, Chitra Lele, Dr. Munish Jindal; Data Analytics: Principles, Tools, and Practices; BPB Publishers; ISBN- 9789388511957; Jan 2022.

Useful Links

1	https://onlinecourses.swayam2.ac.in/ntr25_ed08/preview
2	https://onlinecourses.nptel.ac.in/noc25_cs17/preview

CO-PO Mapping

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

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).

Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

Walchand College of Engineering, Sangli

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7IT333
Course Name	**Professional Elective 1:** Distributed Systems
Desired Requisites:	Operating Systems, Computer Networks, Computer algorithm

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

Course Objectives

1	To explain core concepts and challenges in distributed systems.
2	To introduce algorithms for synchronization, consistency, and replication
3	To evaluate the performance, scalability, and fault tolerance of distributed systems
4	To address security considerations in distributed environments

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Understand and articulate fundamental principles, goals, and challenges of distributed systems.	II	Understanding
CO2	Apply appropriate communication protocols in distributed system scenarios.	III	Applying
CO3	Analyze the algorithms for synchronization, mutual exclusion, and consensus in distributed environments.	IV	Analyzing
CO4	Evaluate consistency models and strategies to ensure data reliability and availability.	V	Evaluating

Module	Module Contents	Hours
I	**Introduction to Distributed Systems:** Definition, Goals, and Characteristics, Transparency and Openness, Challenges and design issues **Communication in Distributed Systems:** Remote Procedure Call (RPC) Message-Oriented Middleware, Stream-Oriented Communication, Multicast Communication	6
II	**Distributed System Architectures:** Client-Server Model, Peer-to-Peer (P2P) Systems, Service-Oriented Architecture (SOA), Cloud Computing and Microservices. **Synchronization in Distributed Systems:** Clock synchronization (logical, physical clocks), Mutual exclusion algorithms, Election algorithms (e.g., Bully algorithm, Ring algorithm)	7

III	**Consistency and Replication:** Data-centric consistency models, Client-centric consistency, Replica management, CAP theorem.	6
IV	**Fault Tolerance and Reliability:** Fault models, Redundancy and recovery, Consensus and agreement (Paxos, Raft algorithms), Byzantine fault tolerance.	7
V	**Distributed File Systems:** Architecture (e.g., NFS, AFS, HDFS), Distributed file-sharing systems, Fault-tolerant distributed storage (Google File System)	7
VI	**Case Studies and Advanced Topics:** Hadoop Distributed File System (HDFS), MapReduce and Spark, Blockchain as a distributed system	6

Textbooks

1	Coulouris, George," Distributed Systems: Concepts and Design" Addison-Wesley, 5th Edition, 2011.
2	Tanenbaum, Andrew S., and Maarten Van Steen. Distributed Systems: Principles and Paradigms, Pearson Education, 3rd edition, 2017.

References

1	Kleppmann, Martin, "*Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems*", O'Reilly Media, 1st Edition, 2017.

Useful Links

1	https://archive.nptel.ac.in/courses/106/106/106106168/

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	3	1	2	2	1	1		1	3	3	3
CO2	3	3	2	3	1	2	1	1	2	1	1	2	2	2
CO3	2	2	2	2	2	1	1	1	1		1	1	2	2
CO4	2	3	3	3	1	2	2	1	1		2	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.

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).
Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

Walchand College of Engineering, Sangli

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech.,
Course Code	7IT334
Course Name	**Professional Elective 1:** Augmented Reality and Virtual Reality
Desired Requisites:	Object Oriented Programming, Image processing

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

Course Objectives

1	To provide an understanding of the fundamentals and applications of Augmented Reality (AR) and Virtual Reality (VR).
2	To explore the hardware and software components involved in AR and VR systems.
3	To explain the fundamental concepts of Unity 3D and its role in game development.
4	To Set up a basic Unity project and navigate the workspace.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Explain AR and VR principles, hardware, and software components	2	Understanding
CO2	Design basic AR/VR applications using appropriate tools and platforms	3	Applying
CO3	Configure a new Unity project and manage basic scene navigation.	3	Applying
CO4	Analyze and evaluate AR/VR systems for different domains	4	Analyzing

Module	Module Contents	Hours
I	**Introduction to AR and VR** Definition and History of AR and VR, Key Differences between AR and VR, Applications of AR and VR in different domains, Challenges and Opportunities	6
II	**Module 2: Hardware and Software for AR/VR** AR/VR Display Devices: HMDs, Smart Glasses, Mobile Devices, Sensors and Tracking Systems, Input Devices: Controllers, Haptics , Software Frameworks and SDKs.	7
III	**3D Modelling and User Interaction** 3D Graphics Basics and Modeling Tools, User Interface Design for AR/VR, Natural User Interfaces (NUI): Gesture, Voice, and Eye Tracking, Real-time Rendering and Animation	7

IV	**Introduction to Unity 3D and Game Development** Overview of Game Development, Introduction to Unity 3D and its Features, Understanding the Unity Interface (Hierarchy, Scene, Game, Inspector, Project), Creating and Managing a Unity Project, Navigating the Scene and Game Views	6
V	**Understanding Game Objects and Components** Creating and Manipulating Game Objects, Using Transform, Rigid body, and Colliders, Applying Materials, Textures, and Lights, Introduction to Prefabs and Their Uses.	7
VI	**Scripting with C# in Unity** Introduction to C# in Unity, Writing and Attaching Scripts to Game Objects, Handling User Input (Keyboard, Mouse, Touch), Implementing Object Movements and Interactions, Debugging and Testing Scripts	6

Textbooks

1	Alan B. Craig, "Understanding Augmented Reality: Concepts and Applications, Morgan Kaufmann, 1st Edition, 2013
2	Grigore C. Burdea and Philippe Coiffet, "Virtual Reality Technology," Wiley, 2nd Edition, 2006

References

1	Dieter Schmalstieg and Tobias Hollerer,"Augmented Reality: Principles and Practice", Pearson Education India, 1st Edition, 2016
2	Jason Jerald, "The VR Book: Human-Cantered Design for Virtual Reality", Morgan & Claypool Publishers, 1st Edition, 2015

Useful Links

1	https://onlinecourses.swayam2.ac.in/nou24_ge76/preview
2	Unity Learn: https://learn.unity.com/

CO-PO Mapping

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

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).
Self-study content should be provided to students and assessed during the In-Semester Evaluation

(ISE).

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7IT335
Course Name	**Professional Elective 1:** 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
		Credits: 3			

Course Objectives

1	To introduce parallel and distributed databases architectures.
2	To deliver application oriented appropriate database system
3	To discuss complex database systems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Summarize Parallel and distributed database systems, Data warehousing architectures	II	Understanding
CO2	Use appropriate database system for an application	III	Applying
CO3	Construct data warehouse schema, cube and OLAP queries and use it for decision support and mining	III	Applying
CO4	Discuss complex database systems for Object, web, spatial and multimedia data	V	Evaluating

Module	Module Contents	Hours
I	**Parallel and Distributed Databases:** Architectures for parallel database, Parallel query Evaluation, Parallelization individual operation, Parallel Query Optimization, Distributed DBMS, Architecture, Storing data in distributed DBMS, Distributed Catalog Management, Distributed query processing, Updating distributed data, Distributed concurrency control, Distributed recovery	8
II	**Data Warehousing and Data Mining:** Introduction to decision support, Data warehousing,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	**Information Retrieval and 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 Queries	7
V	Spatial Database Types of Spatial Data, Spatial Queries, spatial Indexes, space filling Curves, Grid files, R trees, Spatial Database Applications, Geographic Information Systems	6
VI	**Deductive Database and Introduction to Advanced Topics** Recursive Queries, least model semantics, fixpoint operator, datalog programs, Recursive Queries with Negation, stratification, evaluation of Recursive Queries.	6

Textbooks

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

References

1	Carlos Coronel, Steven Morris, "Database Systems: Design, Implementation, And Management", Course Technology, 13th Edition, 2018
2	Singh S K, "Database Systems - Concepts, Design & Applications", Pearson India, 2nd Edition, 2011
3	Han Jiawei and Kamber Micheline, "Data Mining – Concepts and Techniques The Morgan Kaufmann Series in Data Management Systems", 3rd Edition, Elsevier, 2012.

Useful Links

1	https://nptel.ac.in/courses/106105175

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			1			1		2
CO2	1	1	1				1						1	
CO3	3	2	2		3	1		2				2	2	2
CO4		2	1	2	1		1	1		1			1	1

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

Assessment

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

(ISE).

Walchand College of Engineering, Sangli

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7IT321
Course Name	Artificial Intelligence
Desired Requisites:	Computer algorithm

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

Course Objectives

1	To introduce problem-solving techniques using state-space representation and search strategies.
2	To comprehend knowledge representation methods, including scripts, conceptual dependency, and semantic networks.
3	To explore logic programming with predicate and propositional logic, expert systems, and neural networks.
4	To summarize planning methods such as block world problem, goals stack planning, and develop AI solutions using Prolog.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Identify and apply informed and uninformed search strategies for AI problem-solving.	III	Applying
CO2	Apply AI logical programming techniques using Prolog for problem-solving.	III	Applying
CO3	Represent knowledge using formal representation schemes for reasoning in AI systems.	IV	Analyzing
CO4	Evaluate simple expert systems and compare AI-based planning solutions.	V	Evaluating

Module	Module Contents	Hours
I	**Introduction to AI & Problem-Solving by State Space** Definition and scope of AI, Problem formulation and state-space representation, Problem-solving strategies, Uninformed search strategies: BFS, DFS, Uniform cost search, Informed search strategies: Best-first search, A* algorithm, heuristic functions	7
II	**Logical Reasoning** Propositional logic and predicate logic, Syntax, semantics, inference rules, Resolution and unification in predicate logic, Conversion to clausal form, Applications of logical reasoning in AI	7

III	**AI Logical Programming using Prolog** Introduction to Prolog and its architecture, Facts, rules, and queries in Prolog, Recursive programming in Prolog, Applications of Prolog in AI problem-solving, Case studies of Prolog-based AI systems	6
IV	**Knowledge Representation** Importance and approaches of knowledge representation, Scripts, frames, conceptual dependency, Semantic networks and their application in AI, Representation issues	6
V	**Module 4: Expert Systems & Artificial Neural Networks** Structure and components of expert systems, Knowledge acquisition and inference mechanisms, Applications of expert systems, Introduction to artificial neural networks (ANN), Perceptron model, multi-layer perceptron, back propagation algorithm	6
VI	**Module 5: Natural Language Processing (NLP) & Planning** NLP basics: syntax, semantics, and pragmatics, Parsing techniques and language models, Planning: Introduction and types of planning, Block world problem and goal stack planning	7

Textbooks	
1	Janakiraman V S; Sarukesi K. "Foundations Of Artificial Intelligence And Expert Systems" Laxmi Publications, 1st Edition. 2016
2	Rich, E., Knight, K., & Nair, S,"*Artificial Intelligence"* McGraw-Hill, 3rd Edition, 2017

References	
1	Russell, S., & Norvig, P, "Artificial Intelligence: A Modern Approach" Pearson, 4th Edition, 2020
1	Bratko, I. "*Prolog Programming for Artificial Intelligence"* Addison-Wesley, 3rd Edition, 2000

Useful Links	
1	https://nptel.ac.in/courses/106102220
2	https://onlinecourses.nptel.ac.in/noc24_ge47/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											2	1
CO2	3				1							1	3	
CO3	1	3	2											2
CO4	3	2			2								2	

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

Assessment

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

Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

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AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7IT322
Course Name	Digital Image Processing
Desired Requisites:	Data Structures, Matrix Operations

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

Course Objectives

1	To explain digital images and its characteristics
2	To discuss image processing steps for domain specific applications
3	To describe images with transform domain representations

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Summarize characteristics of images as discrete signals useful for its representations and processing	II	Understanding
CO2	Implement image operations for visual enhancement and apply segmentation to show regions in the images	III	Applying
CO3	Study frequency domain representations of images for estimating additional details	IV	Analyzing
CO4	Select appropriate image processing steps required for domain specific applications	V	Evaluating

Module	Module Contents	Hours
I	**Introduction to Digital Image Processing:** Pixel Representation, Resolution, Image Formats and Storages, Intensity, Hue, Saturation, Brightness, Image Color Models, Image Digitization, Raster Scan Graphics, Image Quantization, Sampling and Reconstruction, , Image Aliasing and Anti-aliasing Applications of Digital Image Processing	7
II	**Geometric Transformations:** Image Matrix Representations, Mathematical and Logical Operations on Pixels Image Transformation- Scaling, Rotation, Reflection, Translation etc. Screen Aspect Ratio, Examples based on geometric transformations	7

III	**Image Enhancement and Restoration:** Image Quality and Evaluation, Image Histogram and Processing, Image Noise, Thresholding, Clipping, Bit slicing, Spatial Filtering and Smoothing, Image Restoration Techniques, Interpolation,	6
IV	**Image Transforms:** Introduction to Frequency Domain Image Transforms, Image Compression, Image Representations in Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform, Image Smoothing and Sharpening using Frequency Domain Filters	7
V	**Image Segmentation:** Connectivity, Regions, Distance Measures Point, Line and Edge Detection Methods, Edge based Segmentation, Region based Segmentation, Region Split and Merge Techniques, Region Growing by Pixel Aggregation	6
VI	**Mathematical Morphology:** Basic Morphological Concepts, Dilation, Erosion, Opening and Closing, Structural Element, Hit or Miss Transformation, Boundary Extraction, Thinning and Skeleton Algorithms, Case Studies	6

Textbooks	
1	Millan Sonka, Vaclav Hiavac, Roger Boyle, "Image Processing Analysis and Machine Vision", Cengage Learning, 4th Edition, 2015
2	Rafel C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education, 4th Edition, 2017

References	
1	Earl Gose, Richard Johnsonbaugh, "Pattern Recognition and Image Analysis", Prentice Hall of India Private limited, 1st Edition, 2009
2	S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing ", Tata McGraw Hill Publication, 2nd Edition, 2020

Useful Links	
1	https://archive.nptel.ac.in/courses/117/105/117105135/# NPTEL course by IIT Khrgapur
2	https://cse19-iiith.vlabs.ac.in/ Virtual Lab by IIIT Hyderabad

CO-PO Mapping

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

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).

Self-study content should be provided to students and assessed during the In-Semester Evaluation (ISE).

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., VI
Course Code	7IT371
Course Name	IT Practices Lab 2
Desired Requisites:	Python, Matrix operations

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

Course Objectives

1	To explain image processing operations and usage of graphical library of the desired programming language
2	To describe image pre and post processing for various applications
3	To provide hands-on experience in implementing fundamental AI techniques such as state-space search, informed search, semantic networks, logical reasoning, and predicate logic using Python and Prolog.
4	To develop problem-solving skills by applying AI algorithms to real-world scenarios, enabling students to understand AI-based decision-making and knowledge representation.

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	Associate theoretical concepts of programming with practical skills through various problem statements	II	Understanding
CO2	Apply search techniques and graphical operations	III	Applying
CO3	Integrate inference logic rules and graphical utility libraries for testing application requirements	IV	Analysing
CO4	Discuss scope of s/w program parameters in terms of programming approach, variable scope and lifetime, requirement of data structures, program complexity etc.	V	Evaluating

List of Experiments / Lab Activities/Topics

List of Lab Assignments: (Minimum 10)

Part A: DIP

1. Experiment 1: Input 24 bit Color Image and convert it in 24 bit CMY model; 8 bit gray image
   Objective: Understand Screen co-ordinates, color models and apply conversion
2. Experiment 2: Convert color 24 bit image into 24 bit negative, 8 bit negative
   Objective: Understand intensity range
3. Experiment 3: Apply geometric transformation on images
   Objective: Implement affine transformation e.g. scaling, rotation, reflection etc.
4. Experiment 4: Obtain image histogram and process on it
   Objective: Study images and its intensity distribution
5. Experiment 5: Convert image into transform domain
   Objective: Learn DFT, DCT and DWT representations and their support for compression
6. Experiment 6: Apply spatial and frequency domain filters
   Objective: Apply image de-noising, smoothing, sharpening etc.
7. Experiment 7: Apply edge detection operations
   Objective: Implement edge detector operators like sobel, Prewitt, Canny etc.
8. Experiment 7: Apply Morphological Operations
   Objective: Calculate image matrices with mathematical and logical operations

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Part B: Artificial Intelligence

1. Experiment 1: Problem-Solving with State Space Search
   Objective: Implement BFS and DFS algorithms in Python to solve a simple maze problem.
   Tools: Python/ Prolog
2. Experiment 2: Informed Search Techniques
   Objective: Implement the A* algorithm using a custom heuristic function for a path finding problem.
   Tools: Python/ prolog
3. Experiment 3: Knowledge Representation Using Semantic Nets
   Objective: Create a simple semantic network for an AI-based recommendation system.
   Tools: Python
4. Experiment 4: Logical Reasoning with Propositional Logic
   Objective: Write Prolog programs to verify logical statements using inference rules.
   Tools: Prolog
5. Experiment 5: Predicate Logic Applications
   Objective: Solve a family relationship problem using predicate logic in Prolog.
   Tools: Prolog

Textbooks	
1	Elaine Rich, Kevin Knight, & Shivashankar B. Nair, "Artificial Intelligence",3rd Edition, McGraw Hill, July 2017.
2	Rafel C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education, 4th Edition, 2017

References	
1	Ivan Bratko ,"Prolog Programming for Artificial Intelligence" , Addison-Wesley; 4th edition ,August 2011.

2	S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing ", Tata McGraw Hill Publication, 2nd Edition, 2020

Useful Links

1	https://cse19-iiith.vlabs.ac.in/ Virtual Lab by IIIT Hyderabad
2	https://archive.nptel.ac.in/courses/117/105/117105135/# NPTEL course by IIT Khrgapur

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	2											1	
CO3	2		3		1									
CO4		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. Modern tools are to be studied in self-mode for implementation laboratory assignment and will be evaluated in Laboratory Assessment (LA).

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Course Information

Programme	B.Tech. (Information technology)
Class, Semester	ThirdYear B. Tech., Sem VI
Course Code	7IT373
Course Name	Parallel Computing Lab
Desired Requisites:	

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

Course Objectives

1	To introduce parallel computing concepts with a focus on Manycore GPGPU programming.
2	To equip students with CUDA programming and GPU acceleration skills for solving high-performance computational problems
3	To provide hands-on experience with parallel programming tools and libraries.

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	Develop hands-on skills in using GPU acceleration techniques to efficiently solve computational problems	III	Applying
CO2	Analyze and evaluate the performance and scalability of parallel algorithms implemented on GPUs	IV	Analyzing
CO3	Apply advanced optimization strategies to enhance the efficiency of GPU programs.	V	Evaluating
CO4	Implement GPU-accelerated solutions across various application domains	VI	Creating

Module	**Module Contents**	Hours
I	**Introduction to GPGPU Computing:** GPU architecture vs CPU, Parallel computing paradigms,Applications in HPC/AI	2
II	**CUDA Programming:** CUDA execution model, Memory hierarchy, Kernel programming	3
III	**SYCL/OpenCL:** Intel oneAPI ecosystem, Cross-platform abstraction, Unified shared memory	2
IV	**ROCm & HIP:** AMD GPU architecture ,HIP portability layer , ROCm libraries	2
V	**Directive-Based (OpenACC):** Pragmas for acceleration , Data management , Multi-GPU programming	2
VI	**Performance Optimization:** arp scheduling , Occupancy tuning, Benchmarking tools	2

List of Experiments / Lab Activities/Topics

List of Lab Assignments: (Minimum 10)

1. CUDA Hello World: Write first CUDA program with device queries
2. Vector Addition: Compare CPU/GPU performance with CUDA
3. Matrix Multiplication: Optimize with shared memory (CUDA)
4. Image Filter: Implement Sobel edge detection (CUDA)
5. SYCL Vector Ops: Cross-platform vector addition (Intel DevCloud)
6. HIP Porting: Convert CUDA code to HIP for AMD GPUs
7. OpenACC Stencil: Heat diffusion simulation with pragmas
8. ROCm Reduction: Parallel sum with ROCm libraries
9. Unified Memory: Implement with SYCL/CUDA
10. Occupancy Calculator: Analyze kernel performance
11. Multi-GPU: Domain decomposition with MPI+CUDA
12. Final Project: Optimize real-world algorithm (e.g., CNN layer)

Textbooks

1	David Kirk, "Programming Massively Parallel Processors: A Hands-on Approach" Morgan Kaufmann, 1st Edition, 2012
2	Jason Sanders, Edward Kandrot,"CUDA by Example: An Introduction to General-Purpose GPU Programming" Addison-Wesley, 1st Edition, 2010

References

1	Wen-mei W. Hwu "GPU Computing Gems", Morgan Kaufmann, 1st Edition ,2011

Useful Links

1	NVIDIA Developer Resources – http://www.developer.nvidia.com
2	Website URL http://www.leetgpu.com

CO-PO Mapping

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

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, 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 the 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. Modern tools are to be studied in self-mode for implementation laboratory assignment and will be evaluated in Laboratory Assessment (LA).				

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V/VI
Course Code	7IT372
Course Name	IT Practice Lab 3 - Web Technology
Desired Requisites:	Basic knowledge of Computer and Designing

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

Course Objectives

1	To develop an ability to design and implement static and dynamic website
2	To Demonstrate JavaScript for dynamic effects and prepare PHP scripts.
3	To implement XML documents and XML Schema

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 static and dynamic web pages.	III	Applying
CO2	Demonstrate the incorporation of CSS and JAVASCRIPT in HTML	IV	Analyzing
CO3	Construct XML Document by using XML schemas.	IV	Analyzing
CO4	Create a simple web application with database connectivity	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Assignments: (Minimum 10)

1. Implement a program to design the following static web page required for an online bookstore website.
   1. Home Page
   2. Login Page
   3. Catalogue Page : The catalogue page should contain the details of all the books available in the website in a table.
   4. Registration Page.
2. Create a HTML form for a student for course registration which should have following fields:
   1. Student Name (textbox)
   2. Age (textbox with numbers only)
   3. Date of Birth (Calendar)
   4. Select Course (Drop Down)

5. Submit and Cancel (Button)

3. Program On CSS properties in HTML page:

a) Develop and demonstrate the usage of inline, internal and external style sheets using CSS.

b) Design and develop web pages by applying CSS text formatting properties, such as Text Alignment, Text Decoration, Text Transformation, Text Spacing, Text Shadow, Font family, Font style Font Size, etc. Also apply CSS colors and backgrounds properties, such as color, RGB, HEX, HSL values, background image, background color, etc.

c) Design and develop web pages by using CSS Selectors.

4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

a) Input: Click on Display Date button using onclick( ) function
Output: Display date in the textbox

b) Input: A number n obtained using prompt
Output: Factorial of n number using alert

c) Input: A number n obtained using prompt
Output: A multiplication table of numbers from 1 to 10 of n using alert

d) Input: A number n obtained using prompt and add another number using confirm
Output: Sum of the entire n numbers using alert.

5 a) Implement a script using JavaScript that shows use of JavaScript conditionals and loops for web pages.

5 b) Implement a script using JavaScript that shows use of JavaScript Functions, Arrays, and Objects for web pages.

6. Write a program to design a XML page for students and validate the structure using DTD and show the output in HTML format using XSLT.

7. Write a program to design a simple calculator using JavaScript or PHP.

8. Develop and demonstrate PHP Script for the following problems:

a) Write a PHP Script to find out the Sum of the Individual Digits.

b) Write a PHP Script to check whether the given number is Palindrome or not.

9. Program on cookies mgmt. using PHP.

10.Implement sessions using server-side scripting language

11. Implement CRUD operations on databases using server-side scripting language.

12. Program on Boot Strap /responsive web design using different components

13 a) Choosing a hosting server and selecting a plan for web hosting.

13 b) Choosing and configuring a DNS address.

13 c) Uploading, configuring and running the website over the internet.

Textbooks	
1	Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education,1st Edition, 2007.
2	Kogent Learning Solution Inc.,"Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET ,XML and Ajax, Black Book", Dreamtech Press , 1st Edition,2009.
3	Jhon Duckeet ,"HTML and CSS:Design and Building Websites ",Jhon Willey and Sons,Inc".1st Edition, 2011.
References	
1	Steven M Schafer, "HTML, XHTML and CSS" Wiley India Education,5th Edition, 2010
2	Thomas A. Powell,,"The Complete Reference :HTML & CSS", McGraw Hill Education, 5th Edition,2017.

3	Ivan Bayross,"Web Enabled Commercial Application Development Using .. HTML, JavaScript, DHTML and PHP",BPB Publication,4th revised Edition 2005.

Useful Links	
1	https://onlinecourses.swayam2.ac.in/nou25_cs09/preview
2	https://html-iitd.vlabs.ac.in/Introduction.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	2		1		1		1			1	1	2
CO2	2	1	3	1	2	1		2	1		1			2
CO3	1	2	2		3					1			2	
CO4	3		3		2		1		2	1		1	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. Modern tools are to be studied in self-mode for implementation laboratory assignment and will be evaluated in Laboratory Assessment (LA).

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7VSIT346
Course Name	Mini Project - 3
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 identify industry-based, interdisciplinary, or socially relevant problems
2	To introduce software project management tools, technologies, and frameworks
3	To emphasize the use of version control systems, documentation through report writing.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Interpret and analyze the requirements of problem to translate into software specifications	III	Applying
CO2	Implement effective solutions using web interface and database management systems	III	Applying
CO3	Analyze the performance of the web interface and database tuning	IV	Analysing
CO4	Propose the findings and outcomes of the project through a technical seminar and report	VI	Creating

List of Experiments / Lab Activities

Guidelines for Mini-Project 3:

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 front end technologies (Web) and database engineering
2. Industry based problem / Sponsored application / 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 Software Development Life Cycle (SDLC) with Continuous Integration and Continuous Development (CI/CD)
5. Apply project management tools such as Jira to manage timelines, track progress, and collaborate effectively on development of project
6. The project report should be prepared and submitted in both soft and hard copies, along with the source code and any necessary dependency documents
7. It is recommended to use online code repositories (such as GitHub or Bitbucket) for version control and collaboration
8. Modern tools are to be studied in self-mode for effective project implementation, result analysis, and deployment.
9. Project will be evaluated continuously by the guide/panel as per assessment plan
10. 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 link of online repository of project.

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

Text Books	
1	Hofmann, Angelika H. , "*Scientific Writing and Communication: Papers, Proposals, and Presentations*", Oxford Press, 3rd Edition, 2016
References	
1	Marilyn Deegan, "*Academic Book of the Future Project Report*", A Report to the AHRC & the British Library, 2017
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc25_hs14/preview
2	https://www.youtube.com/watch?v=0oSDa2kf5I8 (report writing)
3	https://nptel.ac.in/courses/109105115

CO-PO Mapping

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

CO4	2	2	1		3	1	2	2	3	3	2	2	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. Modern tools are to be studied in self-mode for implementation laboratory assignment and will be evaluated in Laboratory Assessment (LA).