Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS401
Course Name	Cryptography and Network Security
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	Understand OSI security architecture and classical encryption techniques.
2	Acquire fundamental knowledge on the concepts of finite fields and number theory.
3	Understand various block cipher and stream cipher models.
4	Describe the principles of public key cryptosystems, hash functions and digital signature.

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 transport layer and network layer security.	II	Understanding
CO2	apply the number theory concepts to different encryption and decryption techniques to solve problems related to confidentiality and authentication.	III	Applying
CO3	analyze the effectiveness of authentication and integrity processes of data across various applications	IV	Analyzing
CO4	evaluate Email, Web and System Security.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**INTRODUCTION** Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory –product cryptosystem – cryptanalysis MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures – Modular arithmetic-Euclid"s algorithm- Congruence and matrices	7
II	**SYMMETRIC KEY CRYPTOGRAPHY** SYMMETRIC KEY CIPHERS: Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard, Random bit generation and RC4	6

III	**PUBLIC KEY CRYPTOGRAPHY** MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes –Primality Testing –Factorization – Euler's totient function, Fermat's and Euler's Theorem – Chinese Remainder Theorem – Exponentiation and logarithm – ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key Management – Diffie Hellman key exchange -ElGamal cryptosystem –Elliptic curve cryptography.	7
IV	**MESSAGE AUTHENTICATION AND INTEGRITY** Properties of hash functions, MD2, MD5 and SHA-1, keyed hash functions, attacks on hash functions, Identity and Access Management (IAM), Digital signature– Entity Authentication: Passwords, challenge-response algorithms, zero-knowledge Protocols, Authentication applications – Kerberos, X.509.	6
V	**Transport Layer Security and IP Security** Transport Layer Security, Secure Socket Layer(SSL), TLS, IP Security Overview, IP Security Architecture, Encapsulating security Payload.	7
VI	**Email, Web and System Security** Email Security: Pretty Good Privacy(PGP),S/MIME, Web Security, Secure Electronic Transaction, Intruders, Intrusion Detection, Firewalls, Honey Pots, Software Vulnerabilities, Malicious software	7

Text Books	
1	William Stallings, *"Cryptography and Network Security: Principles and Practice",* Prentice Hall of India.
2	Behrouz A. Forouzan "*Cryptography And Network Security*". Tata Mcgraw-Hill, New Delhi India.

References	
1	"Applied Cryptography, Protocols Algorithms and Source Code in C", Bruce Schneier, Wiley.
2	"Cryptography and Network Security", Atul Kahate, Tata Mc Graw Hill.
3	Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press.
4	Johannes A. Buchmann, *"Introduction to Cryptography",* Springer.

Useful Links	
1	

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3											2	2	
CO2	3	2											3	2	
CO3	3	3											3	3	
CO4	3	2											3	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 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS402
Course Name	High Performance Computing
Desired Requisites:	Data structures, Basic Programming knowledge

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

Course Objectives

1	To be introduced with current trends in parallel computer architectures and programming models (i.e. languages and libraries) for shared memory, many core/multicore architectures.
2	To understand parallel program design methodology. Also to calculate speedup and efficiency of parallel algorithm.
3	To learn various parallel algorithms for matrices, graphs.

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 different parallel paradigms, inter connection networks, and tools for parallel programming.	II	Understanding
CO2	illustrate the design methodology and relevant parallel programming techniques to be used for parallelization of a given problem.	III	Applying
CO3	analyze a given problem for possibilities of parallel computations.	IV	Analyzing
CO4	evaluate different parallel algorithms using performance metrics.	IV	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction** What is parallel computing? The scope of parallel computing? Issues in parallel computing. Taxonomy of parallel architecture, Memory bound vs Compute bound problems, Dynamic interconnection networks, static interconnection networks, Routing mechanism for static network. Communication cost in static interconnection network.	8
II	**Parallel programming models and paradigms** Introduction, parallel applications and development, code granularity and level of parallelism, parallel programming models and tools, methodical design of parallel algorithm, parallel program paradigm, programming skeleton and templates.	6
III	**Parallel programming libraries** OpenMP, MPI, Thread basics, Work Sharing constructs, Scheduling, Reduction, Mutual Exclusion Synchronization & Barriers, The MPI Programming Model, MPI Basics, Global Operations, Asynchronous Communication, Modularity, Other MPI Features, Performance Issues, Thread programming C++11 Threads /OpenMP, MPI - two-sided communication, one side communication-based programming model aka PGAS (Partitioned Global	6

	Address Space) eg: OpenSHMEM/NVSHMEM	
IV	**Performance and scalability of parallel systems** Performance Metrics for parallel systems. The effect of Granularity and Data Mapping on Performance. The Scalability of parallel systems, Isoefficiency metric of scalability, sources of parallel overhead, Minimum execution time and minimum cost-optimal execution time, parallel work efficiency, amdahl limiters, communication-computation overlap/pipelining.	8
V	**Parallel programming using accelerators** Introduction of CUDA/OpenCL, Chapel, etc. Basics of GPGPU, CUDA Programming model, CUDA memory type, CUDA and/or OpenCL for GPGPU hardware, case study.	6
VI	**Algorithms** Dense matrix algorithms, sorting, graph algorithms, prefix sum with decoupled lookback, parallel radix sort/batcher's sort	6

Textbooks	
1	"Introduction to Parallel Computing", (2nd ed.), by Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar.
2	"High Performance Cluster Computing: Programming and Applications", Volume 2 By Buyya Rajkumar.
3	"CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", by Shane cook "Introduction to PARALLEL PROGRAMMING", by Peter Pacheco.
References	
1	"Parallel Programming in C with MPI and OpenMP", Michael J. Quinn, McGraw-Hill, 2004.
Useful Links	
1	Single-pass Parallel Prefix Scan with Decoupled Look-back https://research.nvidia.com/publication/single-pass-parallel-prefix-scan-decoupled-look-back
2	parallel radix sort/batcher's sort. https://developer.download.nvidia.com/video/gputechconf/gtc/2020/presentations/s21572-a- faster-radix-sort-implementation.pdf
3	High Performance Computing, Charles Severance, 1998. http://cnx.org/content/col11136/latest/
4	MPI: The Complete Reference, Marc Snir, Steve Otto, Steven Huss-Lederman, David Walker, and Jack Dongarra, 1996. http://www.netlib.org/utk/papers/mpi-book/mpi-book.html

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

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

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

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AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS403
Course Name	Data Management, Protection and Governance
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	Get acquainted with the high-level phases of data life cycle management.
2	Acquire knowledge about the various aspects of data storage, data availability, data protection.
3	Gain exposure to various solutions/reference architectures for various use-cases.
4	Understand the technical capabilities and business benefits of data protection.

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	illustrate data management world and various types of data threats and approaches to ensure data center security.	II	Understanding
CO2	apply different standards for compliance and governance of data.	III	Applying
CO3	analyze various types of data threats and approaches to ensure data centre security.	IV	Analyzing
CO4	discriminate various concepts and technologies for enabling data storage and high availability	V	Evaluating
CO5	design data intensive enterprise applications and industry standard solutions in data management.	VI	Creating

Module	**Module Contents**	**Hours**
I	**Introduction to data life cycle management (DLM)** Goals of data life cycle management, Challenges involved- Volume of data source, Ubiquity of data locations, User demand for access, Stages of data life cycle – creation, storage, usage, archival, destruction, Risks involved without DLM, benefits, best practices.	4
II	**Data storage and data availability** **Storage technology**: Hard Disk Device (HDD), Solid State Devices (SSD), memory devices, Data access - block, files, object, Data center End to End View – overview of complete stack including storage, network, host, cluster, applications, virtual machines, cloud storage, Storage virtualization technologies - RAID level, storage pooling, storage provisioning, Advance topics in storage virtualization – storage provisioning, thin provisioning, Cloud storage – S3, glacier, storage tiering, High Availability-Introduction to high availability, clustering, failover, parallel access, Disaster Recovery -Need of disaster recovery, Building blocks - global cluster, wide-area-connector (WAC), heartbeat, Split-brain – problem and solutions , Preparing for DR – firedrill.	8

III	**Data Threats and Data center security** Type of Threats-Denial of Service (DoS), man in the middle attacks, Unintentional data loss, Repudiation, Malicious attacks to steal data, Understanding, Identification and Threat modelling tools, Introduction to Ransomware, Security- Authorization and authentication - access control, Transport Layer Security (TLS), key management, security in cloud, Design and architecture considerations for security.	7
IV	**Introduction to data protection** Introduction-Need for data protection, basic of back-up/restore, Snapshots for data protection, copy-data management (cloning, DevOps), De- duplication, Replication, Long Term Retention – LTR, Archival, Design considerations-System recovery, Solution architecture, Backup v/s Archival, media considerations and management (tapes, disks, cloud), challenges with new edge technology (cloud, containers).	8
V	**Data regulation, compliance and governance** Regulations requirements and Privacy Regulations-General Data Protection Regulation (GDPR), The Health Insurance Portability and Privacy Act of 1996 (HIPPA), PII (Personal Identity Information), Information Governance-Auditing, Legal Hold, Data classification and tagging (Natural Language Processing).	5
VI	**Applications uninterrupted** Understand data management aspects of traditional and new edge applications, Reference architecture/best practices (pick 2-3 case studies from below topics)- Transactional Databases (Oracle, MySQL, DB2), NoSQL Databases (MongoDB, Cassandra), Distributed applications (micro service architectures), Cloud applications – Platform as Service (PaaS), Software as Service (SaaS), Kubernetes, Multi-Tiered applications, ETL workloads, Data analytics (AI/ML).	7

Textbooks	
1	Robert Spalding, "*Storage Networks: The complete Reference*" Tata McGraw-Hill
2	Vic (J.R.) Winkler, "Securing The Cloud: Cloud Computing Security Techniques and Tactics" (Syngress/Elsevier) - 978-1-59749-592-9.
3	TBD – online reference for each topic.

References	
1	"Designing Data-Intensive Applications " (O'Reilly, Martin Kleppmann).
2	TBD: provide more online material details and books (This can include some publicly available white-paper, solution guides etc.)

Useful Links	
1	https://www.enterprisestorageforum.com/storage-hardware/storage-virtualization.html
2	https://www.hitechnectar.com/blogs/three-goals-data-lifecycle-management/
3	https://www.bmc.com/blogs/data-lifecycle-management/
4	https://www.dataworks.ie/5-stages-in-the-data-management-lifecycle-process/

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		3											2	
CO2	3												2	
CO3	3	2						2						2
CO4		3												1
CO5		3	3						2	2				

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

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

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS451
Course Name	Cryptography and Network Security Lab
Desired Requisites:	Computer Networking

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

Course Objectives

1	To learn different cipher techniques
2	To implement the algorithms DES, AES, RSA,MD5,SHA-1
3	To use network security tools and vulnerability assessment 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	develop code for classical Encryption Techniques to solve the real life problems	III	Apply
CO2	analyze the network security system using open source tools	IV	Analyze
CO3	evaluate the securities of different security protocols	V	Evaluate
CO4	design and implement symmetric and asymmetric key encryption algorithms	VI	Create

List of Experiments:

1. Perform encryption, decryption using the following substitution techniques
    a. Ceaser cipher,
    b. playfair cipher
    c. Hill Cipher
    d. Vigenere cipher
2. Perform encryption and decryption using following transposition techniques
    a. Rail fence
    b. row and Column Transformation
3. Implementation of Euclidean and Extended Euclidean Algorithm
4. Implementation of Chinese Remainder Theorem (CRT)
5. Apply DES algorithm for practical applications
6. Apply AES algorithm for practical applications
7. Implementation of RSA Algorithm
8. Implement the Diffie-Hellman Key Exchange algorithm for a given problem
9. Calculate the message digest of a text using the SHA-1 algorithm
10. Implement the SIGNATURE SCHEME – Digital Signature Standard
11. Demonstration of SSL using Wireshark
12. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w
13. Exploring a Vulnerability Assessment Tool

Text Books	
1	William Stallings, *"Cryptography and Network Security: Principles and Practice",* Prentice Hall of India.
2	Behrouz A. Forouzan "*Cryptography And Network Security*". Tata Mcgraw-Hill, New Delhi India.
References	
1	"Applied Cryptography, Protocols Algorithms and Source Code in C", Bruce Schneier, Wiley.
2	"Cryptography and Network Security", Atul Kahate, Tata Mc Graw Hill.
3	
4	
Useful Links	
1	

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3												3	2	
CO2	3	3			3								3	1	
CO3	3	3		2									3	2	
CO4	3	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				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B.Tech. (Computer Science and engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS452
Course Name	High Performance Computing Lab
Desired Requisites:	Data structures, Basic Programming knowledge

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 provide basics of parallel architectures
2	To provide basics of parallel algorithm design and analysis
3	To provide basics of parallel programming platforms

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	illustrate use of different parallel programming techniques	III	Applying
CO2	measure performance of parallel program using different metrics	III	Applying
CO3	apply and analyze different parallel strategies to a parallel program to improve its performance	VI	Analyzing
CO4	analyze the performance of a parallel program on different underling architectures	VI	Analyzing

List of Experiments / Lab Activities/Topics
List of Lab Activities: A. Implementation of following tasks using OpenMP. 1. Implementation of sum of two lower triangular matrices. 2. Implementation of Matrix-Matrix Multiplication. 3. Implementation of dot product 4. Implementation of Prefix sum B. Implementation of following tasks using MPI. 5. Implementation of Matrix-Vector Multiplication. 6. Implementation of Matrix-Matrix Multiplication. 7. Implementation of 2D Convolution 8. Implementation of dot product 9. Implementation of Prefix sum C. Implementation of following tasks using CUDA. 10. Implementation of Matrix-matrix Multiplication using global memory. 11. Implementation of Matrix-Matrix Multiplication using shared memory. 12. Implementation of Histogram 13. Implementation of Odd even sort 14. Implementation of Prefix sum 15. Implement 2D Convolution using shared memory D. Performance evaluation of following computations using open-source libraries or OpenACC compare to sequential and explicit parallel implementation 16. Implementation of Matrix-Matrix multiplication using OpenACC MKL, and cuBLAS. Compare their performance with OpenMP based implementation from assignment no.2, 10 and 11.

Textbooks	
1	Zbigniew J. Czech, Introduction to Parallel Computing, Cambridge University Press, 2016.
2	Kumar, V., Grama, A., Gupta, A., & Karypis, G. (1994). Introduction to parallel computing (Vol. 110). Redwood City, CA: Benjamin/Cummings.
3	Chandra, R., Dagum, L., Kohr, D., Menon, R., Maydan, D., & McDonald, J. (2001). Parallel programming in OpenMP. Morgan kaufmann.
4	Cheng, J., Grossman, M., & McKercher, T. (2014). Professional CUDA c programming. John Wiley & Sons.

References	
1	Michael Quinn, Parallel Computing: Theory and Practice, McGrawHill Publishers, July 2017.
2	Arch Robison, James Reinders, and Michael Macoul, Structured Parallel Programming: Patterns for Efficient Computation, Morgan Kaufman, Elsevier, 2012.

Useful Links	

CO-PO Mapping

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

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS491
Course Name	Project-I
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	6 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 3			

Course Objectives

1	To understand Software Development Life Cycle and prepare project proposal based on real life use case
2	To utilize state of the art CASE tools especially for design, development and testing phases.
3	To experience project management techniques.
4	To acquaint the ability to map technical skills to real life applications from customers perspective.

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 existing solutions and define scope of the project accordingly.	II	Understanding
CO2	apply project design and development methodology and appropriate team skills for project implementation.	III	Applying
CO3	identify use of modern engineering tools, software, and techniques utilized during project implementation.	IV	Analyzing
CO4	verify developed solution for different test cases and measure the performance of the system for various parameters.	V	Evaluating
CO5	build the project working model with real life use cases mainly to potential stakeholders.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Project work is to be carried out in two semesters with group size of maximum three to four students
2. In first semester project group will select a project topic with consent from guide and approval from department and submit the brief document discussing the outline of the project with clear objectives.
3. Students should maintain a project log book containing weekly progress of the project.
4. At the end of the semester project group should complete the system design, Algorithm design and present with suitable model. (CFD, DFD & Data structure layout, SRS & UML diagram using project management tool)
5. Project report should be prepared using Latex and submitted in soft and hard form.

Textbooks

1	NIL

References

1	NIL

Useful Links

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	3		3	2		1		2	2	2			2	2
CO3					3								2	
CO4	2	2			2								2	
CO5			2			1		2	2	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, and preferably to only one PO.														

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

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AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., SemVII
Course Code	6CS453
Course Name	Techno-Socio Activity
Desired Requisites:	This is the audit course. No pre-requisite.

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

Course Objectives

1	To nurture technical knowledge mainly through various participations and competitions during their engineering study
2	To develop empathy by participating in social empowerment acts.
3	To propose a structured and rational solution to address the relevant skills.
4	To motivate students towards the desirous need of industry, economy and society.

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	engage the programme for welfare of society and environment	III	Applying
CO2	appraise pragmatic skills for national and international competitions	IV	Analysing
CO3	develop professional and soft skills to participations.	IV	Analysing
CO4	analyse real world problem, create and showcase the best solution of techno-socio domains.	VI	Creating

List of Experiments / Lab Activities/Topic

List of Lab Activities:

Open to students. Student can undertake any techno-socio activity as listed below but not limited to it :

1. Each student or group of students may participate in any social activity like "Swach Bharat Abhiyan",
2. "Blood Donation Camp", or any social activity announced by Govt. / Corporation / Panchayat.

Each student or group of students participating in technical events / competition.

3. Awards / recognition received in techno-socio activity
4. Completing the on line courses (on topics beyond syllabus) / certification of any companies / technologies (e.g. IBM / Oracle / CISCO etc.)
5. Developing any innovative gadget / solution / system and transfer in the interest of Nation / Society / Institute (WCE)
6. Published a papers in national / international conferences / journals
7. Coordinating the students clubs / services
8. Organizing techno-socio activity for the students / community in rural areas, backward areas.

Textbooks

1	Nil

References

1	The students may refer/undergo on line courses required to undertake any techno-socio activity.

Useful Links

1	Nil

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									2		3			
CO3											1			
CO4											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	15
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	15
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	20
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS404
Course Name	Research Methodology
Desired Requisites:	Nil

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

Course Objectives

1	To develop a research orientation among the students and to acquaint them with fundamentals of research methods.
2	To develop understanding of the basic framework of research process and techniques
3	To identify various sources of information for literature review and data collection.
4	To develop an understanding of the ethical dimensions of conducting applied research.
5	To develop understanding about patent process.

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	understanding the limitations of specific research methods	II	Understanding
CO2	demonstrating the ability to choose appropriate research methods.	III	Applying
CO3	identify skills in qualitative and quantitative data analysis and presentation.	IV	Analyzing
CO4	classify critical thinking skills and improved writing skills.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Research Fundamentals** What is research, types of research, the process of research, Literature survey and review, Formulation of a research problem.	4
II	**Research Methods** Research design- Meaning, Need and Types, Research Design Process, Measurement and scaling techniques, Data Collection – concept, types and methods, Processing and analysis of data, Design of Experiment	5
III	**Analysis Techniques** Quantitative Techniques, sampling fundamentals, Testing of hypothesis using various tests like Multivariate analysis, Use of standard statistical software, Data processing, Preliminary data analysis and interpretation, Uni-variate and bi-variate analysis of data, testing of hypotheses.	5
IV	**Research Communication** Writing a conference paper, Journal Paper, Technical report, dissertation/thesis writing. Presentation techniques, software used for report writing such as WORD, Latex etc. Types of journal/conference papers	4

V	**Intellectual Property Rights** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	5
VI	**Patents and Patenting Procedures** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs	4

Textbooks	
1	C. R. Kothari, Research Methodology, New Age international
2	Deepak Chopra and Neena Sondhi, Research Methodology : Concepts and cases, Vikas Publishing House, New Delhi
References	
1	E. Philip and Derek Pugh, How to get a Ph. D. – a handbook for students and their supervisors, open university press
2	Stuart Melville and Wayne Goddard, Research Methodology: An Introduction for Science & Engineering Students
Useful Links	
1	NPTEL Lectures

CO-PO Mapping

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

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

Assessment

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

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	15
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	15
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	20

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

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*						
AY 2024-25						
Course Information						
Programme		B.Tech. (Computer Science and Engineering)				
Class, Semester		Final Year B. Tech., Sem VII				
Course Code		6CS411				
Course Name		PE4: Human Computer Interaction (HCI)				
Desired Requisites:		No				
Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**	
Tutorial		30	20	50	100	
		Credits: 03				

Course Objectives	
1	Introduction to concept related to Human Computer Interaction.
2	Understand the theoretical dimensions of human factors involved in the acceptance of computer interfaces.
3	Identify the impact of usable interfaces / interaction styles in the acceptance and performance utilization of information systems.
4	Resolve the various design issues using the state of the art technologies.

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 fundamentals of Human-Computer Interaction and Interaction design.	II	Understanding
CO2	apply human Capabilities and Core Cognitive aspects of interaction design.	III	Applying
CO3	analyse quantitative analysis, evaluation, and redesign through HCI concepts.	IV	Analysing
CO4	evaluate sample interfaces using different models of HCI.	V	Evaluating

Module	Module Contents	Hours
I	**Introduction :** The human , The computer ,The interaction , Paradigms , Usability of Interactive Systems , Guidelines, Principles, and Theories.	6
II	**Design Process :** Interaction design basics, HCI in the software process, Design rules, Implementation support , Evaluation techniques , Universal design , User support	7
III	**Models and Theories :** Cognitive models , Socio-organizational issues and stakeholder requirements , Communication and collaboration models , Task analysis , Dialog notations and design , Models of the system , Modelling rich interaction	6
IV	**Interaction Styles :** Direct Manipulation and Immersive Environments , Fluid Navigation , Expressive Human and Command Languages , Devices , Communication and Collaboration.	7
V	**Design Issues :** Advancing the User Experience ,The Timely User Experience , Documentation and User Support/Online help , Information Search , Data Visualization	7

VI	**Outside the Box:** Groupware, Ubiquitous computing and augmented realities, Hypertext, multimedia and the world wide web. Case Studies.	6

Textbooks	
1	"Human Computer Interaction" by Alan Dix, Janet Finlay, Third Edition, Pearson Education
2	"Designing the User Interface - Strategies for Effective Human Computer Interaction", by Ben Shneiderman Sixth Edition, Pearson Education.
References	
1	Usability Engineering: Scenario-Based Development of Human-Computer Interaction, by Rosson, M. and Carroll, J. (2002)
2	The Essentials of Interaction Design, by Cooper, et al., Wiley Publishing (2007)
3	Usability Engineering, by Nielsen, J. Morgan Kaufmann, San Francisco, 1993. ISBN 0-12-518406-9
4	The Resonant Interface: HCI Foundations for Interaction Design, by Heim, S., Addison-Wesley. (2007)
5	Usability engineering: scenario-based development of human-computer interaction, By Rosson, M.B & Carroll, J.M. , Morgan Kaufman.(2002)
Useful Links	
1	https://www.hcii.cmu.edu/research-areas/artificial-intelligence-ai
2	https://www.linkedin.com/advice/1/how-does-ai-impact-human-computer-interaction
3	https://www.interaction-design.org/literature/topics/human-computer-interaction

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									2			1	2
CO3	1	2							2					
CO4			1											

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

Assessment

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

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6CS412
Course Name	Elective IV : Data Mining
Desired Requisites:	Database Engineering

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

Course Objectives

1	To gain the knowledge of theoretical background to several of the commonly used data mining techniques.
2	To analyze data, choose relevant models and algorithms for respective applications.
3	To evaluate the different data mining algorithms and tools
4	To develop research interest towards advances in data mining

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	**apply** the data pre-processing and data mining algorithms to **solve** real world problems	II	Understanding
CO2	**analyze** a complex data mining problem and different data mining algorithms to **identify** solutions.	III	Applying
CO3	**measure** the performance of different data mining algorithms/tools, **evaluate** and **recommend** the optimal solution.	IV	Analyzing
CO4	**design** and **build** a data mining tool/solution to meet the given set of computing requirements in the context of the complex data mining problem.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction** Data mining and its need, Different kinds of data that can be mined, Various patterns that can be mined, Technologies to be Used, Target applications, Major Issues in Data Mining.	5
II	**About Data and its pre-processing** Data objects and attribute types, basic statistical description of data, Data visualization, Data pre-processing : Overview, data cleaning, data integration, data transformation and data discretization.	7
III	**Classification** Basic concepts, decision tree induction and rule based classification, Bayes Classification, Artificial Neural Network (ANN) based classification, Metrics for Evaluating Classifier Performance	8
IV	**Clustering** Basic concepts, measuring data similarity and dissimilarity, partitioning methods, Hierarchical Methods, Density-Based methods, Evaluation of Clustering	6
V	**Association Rule Mining** Basic concepts, Frequent itemset mining methods, interesting patterns and its evaluation methods, Pattern Exploration and Application.	6

VI	**Web Mining** Introduction, web content mining, web structure mining, web usage mining	7

Textbooks	
1	Jiawei Han , Micheline Kamber and Jian Pei , *"Data Mining - Concepts and Techniques"* , Third Edition, Morgan Kaufmann, 2012, ISBN 978-0-12-381479-1
2	Dunham, Margaret H , *"Data Mining: Introductory and Advanced Topics"*, 1st Edition , PHI/Pearson, 2006 , ISBN 978-81-7758-785-2

References	
1	Sumathi, S., Sivanandam, S.N. , *"Introduction to Data Mining and its Applications"*, Springer , 2006 , ISBN 978-3-540-34351-6
2	P. Tan, M. Steinbach and V. Kumar, *"Introduction to Data Mining"*, 2nd Edition, Addison Wesley, 2019,
3	Related papers from various IEEE Transactions , Int. Journals / Conferences.

Useful Links	
1	Data sets : https://archive.ics.uci.edu/ml/index.php
2	IEEE Transactions on Knowledge and Data Engineering : https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=69
3	Tools - Tableau : https://www.tableau.com/developer/tools , SPSS : https://www.ibm.com/in-en/analytics/spss-statistics-software , Weka : https://www.cs.waikato.ac.nz/ml/weka/
4	Data Mining Resources : https://www.cs.purdue.edu/homes/ayg/CS590D/resources.html

CO-PO Mapping

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

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

Assessment

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

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem
Course Code	6CS413
Course Name	Elective IV: Software Defined Network
Desired Requisites:	Computer Network and Data Communication

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

Course Objectives	
1	To understand SDN/NFV motivation and benefits.
2	To describe how SDN/Openflow work.
3	To understand mininet and some programming languages.

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 SDN and NFV, OpenFlow, challenges in SDN, and the recent development in SDN	II	Understanding
CO2	apply implementation of SDN through SDN Devices	III	Applying
CO3	analyse implementation of SDN through Open Flow Switches, SDN-Controllers and mininet.	IV	Analysing
CO4	evaluate the pros and cons of applying SDN, API approaches, Hypervisor overlays, and SDN Data Centre	V	Evaluating

Module	**Module Contents**	**Hours**
I	**History and Evolution of Software Defined Networking (SDN)** Introduction, Traditional Vs. SDN network, Separation of Control Plane and Data Plane, IETF Forces, Active Networking. Control and Data Plane Separation: Concepts, Advantages and Disadvantages.	8
II	**OpenFlow Protocol and Network Virtualization** Introduction to OpenFlow Protocol, OpenFlow Versions, OpenFlow with multiple flow tables, Virtualization: Concepts, Applications of virtual networking, Existing Network Virtualization Framework (VMWare and others), Open Virtual Switch (OVS), OpenFlow flow entries on OVS, Monitoring tools: Mininet, OpenDaylight, etc., Mininet introduction, Network virtualization with mininet and Mininet topologies.	7
III	**Control Plane** Overview, Existing SDN Controllers including Floodlight and Open Daylight projects. Customization of Control Plane: Switching and Firewall, Implementation using SDN Concepts	6
IV	**Data Plane** Software-based and Hardware-based; Programmable Network Hardware. Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs.	6
V	**Network Functions Virtualization (NFV) and Software Defined Networks** Network architecture, NFV Infrastructure, NFV Management and Orchestration (MANO), NFV and SD	5

VI	**SDN Applications and Use Cases Data Centre Networks** SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System 3. **SDN'S FUTURE AND PERSPECTIVES:** SDN Open Source - SDN Futures	7

Textbooks	
1	SDN: Software Defined Networks, an Authoritative Review of Network Programmability Technologies, By Thomas D. Nadeau, Ken Gray Publisher: O'Reilly Media, August 2013, ISBN: 978-1-4493-4230-2, ISBN 10:1-4493-4230-2.
2	Software Defined Networks: A Comprehensive Approach, by Paul Goransson and Chuck Black, Morgan Kaufmann, June 2014, Print Book ISBN: 9780124166752, eBook ISBN : 9780124166844
3	

References	
1	SDN and OpenFlow for Beginners by Vivek Tiwari, Sold by: Amazon Digital Services, Inc., ASIN: , 2013
2	Network Innovation through OpenFlow and SDN: Principles and Design, Edited by Fei Hu, CRC Press, ISBN-10: 1466572094, 2014
3	sdnhub.org

Useful Links	
1	SDxCentral (https://www.sdxcentral.com/)
2	https://www.youtube.com/watch?v=dkUDUb9GtH0&list=PLpherdrLyny8YN4M24iRJBMCXkLcGbmhY&ab_channel=NickFeamster
3	

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

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

Assessment

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

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	6OE471
Course Name	Open Elective III: Cyber Security
Desired Requisites:	

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

Course Objectives	
1	Understand foundational concepts of cybersecurity.
2	Identify common cybersecurity threats and vulnerabilities.
3	Analyze strategies for mitigating cybersecurity risks.
4	Apply basic cybersecurity principles to real-world scenarios.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Define key terms and concepts in cybersecurity.	I	Remembering
CO2	Recognize common cyber threats and vulnerabilities.	II	Understanding
CO3	Evaluate cybersecurity strategies for risk mitigation.	III	Analyzing
CO4	Demonstrate the application of cybersecurity principles.	IV	Applying

Module	**Module Contents**	**Hours**
I	Introduction to Cybersecurity: Overview of Cybersecurity, Definition and Scope, Evolution of Cybersecurity, Foundational Concepts, Principles of Information Security, CIA Triad: Confidentiality, Integrity, Availability, Cybersecurity Threat Landscape, Types of Cyber Threats, Common Attack Vectors, Legal and Ethical Considerations, Cybersecurity Laws and Regulations, Ethical Issues in Cybersecurity	4
II	Cyber Threats and Attack Vectors: Malware and Viruses, Types of Malware, Detection and Prevention Techniques, Social Engineering Attacks, Phishing, Pretexting, Baiting, Mitigation Strategies, Network Attacks, DDoS Attacks, Man-in-the-Middle Attacks, Network Defense Mechanisms, Web Security Threats, Common Web Vulnerabilities, Best Practices for Web Security, IoT and Mobile Security, Challenges in IoT and Mobile Devices, Strategies for Securing IoT and Mobile Ecosystems,	6
III	Security Measures and Controls: Access Control Mechanisms, Authentication, Authorization, Accounting, Access Control Models, Firewalls and Intrusion Detection Systems, Types of Firewalls, IDS/IPS, Secure Software Development Practices, Secure Coding Principles, Tools for Secure Software Development, Endpoint Security, Endpoint Security Challenges, Endpoint Protection Solutions	8
IV	Cryptography and Data Protection: Fundamentals of Cryptography, Encryption Algorithms, Cryptographic Protocols, Cryptographic Applications, Public Key Infrastructure (PKI), Digital Signatures, Data Protection Mechanisms, Data Encryption, Data Masking and Tokenization	6

V	Network Security: Network Security Fundamentals, Network Vulnerabilities, Secure Communication Protocols, Wireless Security, Wi-Fi Security Mechanisms, Bluetooth Security, Virtual Private Networks (VPNs), VPN Types and Protocols, VPN Implementation and Management	6
VI	Security Policies and Compliance Security Policies Overview, Purpose and Scope of Security Policies, Components of Security Policies, Regulatory Compliance, Compliance Standards (e.g., GDPR, HIPAA), Compliance Implementation Strategies, Ethical Considerations, Responsible Disclosure, Privacy and Ethical Hacking	4

Textbooks	
1	"Cybersecurity Essentials" by William Stallings and Lawrie Brown.
2	"Principles of Computer Security" by Conklin, White, Williams, Davis, and Cothren.

References	
1	"Network Security Essentials" by William Stallings.
2	"Cryptography and Network Security" by William Stallings.

Useful Links	
1	National Institute of Standards and Technology (NIST) Cybersecurity Framework : https://www.nist.gov/cyberframework
2	OWASP (Open Web Application Security Project) Website : https://owasp.org/

CO-PO Mapping

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

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Open Elective III: **Information Retrieval**
Desired Requisites:	Basics of data, Information and presentations.

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

Course Objectives	
1	To understand the basics of information retrieval.
2	To evaluate the performance of the IR system and understand user interfaces for searching.
3	To understand information sharing on the web.
4	To understand the various applications of information retrieval emphasizing recommendation systems, web Search.

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 fundamental concepts of Information retrieval.	II	Understanding
CO2	use of Tokenization, Tolerant Retrieval and concepts of Ranking algorithms in IR.	III	Applying
CO3	investigate the web information using appropriate techniques and trends in IR.	IV	Analysing
CO4	estimate the performance of information retrieval systems.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Information Retrieval** Exploring information retrieval systems, Short history, role of Information retrieval in Library, Important terms in IR, Types of IR models, Exact match and partial match retrieval, types of searches in IR, Challenges and opportunities in IR, IR terminologies, Indexing in IR, types of queries, example of Indexing, Inverted Index, Bitwise operations.	7
II	**Tokenization and Tolerant Retrieval** Basics of text processing, tokenizing, stemming, lemmatization, stop word removal, vector space model, concept of wild card queries in IR, introduction to NLTK	6
III	**Ranking Algorithms** Concept of ranking, Link Analysis, HITS algorithm, Google Panda Algorithm, BM25, Collaborative filtering, Knowledge graph, search engine results space (SERP), types of SERP, categories of web queries, surface web and deep web, Hidden web, dark web.	7

IV	**Evaluation and Visualization of Information Retrieval System** **Performance evaluation**: Precision and recall, MRR, F-Score, NDCG, user-oriented measures. **Visualization in Information System:** Starting points, Query Specification, document context, User relevance judgment, Interface support for search process.	6
V	**Web Searching:** Introduction to Web Search Engines, Exploring types of search engines, Crawler-based search engines, web mining, web search optimization, Comparison between web search engine and desktop search engines, SPAM **Introduction to Web Scraping**: Python for web Scraping, Request, HTML parsing, Beautiful Soup.	6
VI	**Trends in Information Retrieval** **XML Retrieval:** Basic XML concepts, Why to use XML, content and structure XML query language, Tag-based languages, XML parsing in python, Goals and challenges in XML retrieval, Text-Centric vs. Data-Centric XML retrieval. **Recommendation system (case study):** Collaborative Filtering and Content Based Recommendation of Documents and Products. Introduction to Semantic Web.	7

Textbooks	
1	Dr. Madhavi Vaidya, Yashovardhan Sowale, "Information Retrival"Wiley India Pvt. Ltd.
2	Ricardo Baeza-Yates, Berthier Riberio–Neto, Modern Information Retrieval, Pearson Education, ISBN: 81-297-0274-6.
3	Ryan Mitchell, Web Scraping with Python, O'reilly, second Edition, ISBN: 9781491985571.
3	Yates & Neto, "Modern Information Retrieval", Pearson Education, ISBN:81-297-0274-6
4	C.J. Rijsbergen, "Information Retrieval", (www.dcs.gla.ac.uk).,2ndISBN:978- 408709293.

References	
1	V. S. Subrahamanian, Satish K. Tripathi, Multimedia information System, Kulwer Academic Publisher. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze, An Introduction to Information Retrieval, Cambridge University Press, 2008.
2	Grigoris Antoniou and Frank van Harmelen, "A semantic Web Primer", Massachusetts.
3	Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutzen, "Introduction to Information Retrieval", Cambridge University Press, Online book, ISBN:978-0-521- 86571-
4	Ricci F, Rokach L, Shapira B, Kantor P, Recommender Systems Handbook, Springer, ISBN:978-0-387-85819-7.
5	Norbert Fuhr, MouniaLalmas, Saadia Malik, Gabriella Kazai, Advances in XML Information Retrieval andEvaluation, Springer New York Publisher.

Useful Links	
1	https://web.stanford.edu/class/cs276/handouts/EvaluationNew-handout-1-per.pdf
2	https://www.coursera.org/learn/text-retrieval.

CO-PO Mapping

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (All Branches)
Class, Semester	Fourth Year B. Tech., Sem VII
Course Code	6HS401
Course Name	Management Accounting/ Accounting and Finance for Engineers
Desired Requisites:	Mathematics course at Higher Secondary Junior College

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	Hrs/week	30	20	50	100
		Credits: 02			

Course Objectives

1	Introduce the basic concepts required to understand, classify, summarize, and interpret financial accounting
2	Acquire the knowledge of cost accounting tools used in a manufacturing organization.
3	Understand and analyse the tools and techniques of management accounting
4	Evaluate projects based on commercial viability

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Understand the concept of management accounting	Understanding
CO2	Solve the problems of financial statement and cost sheet	Applying
CO3	Apply the decision-making function using selected management accounting tools.	Applying
CO4	Evaluate the projects using BEP and CVP analysis	Evaluating

Module	**Module Contents**	**Hours**
I	**Financial Accounting:** Meaning, Concepts and conventions, accounting cycle	**5**
II	**Financial Accounting:** Preparation of financial statements- Trading, Profit and Loss Account, and Balance- Sheet (Trading firm - sole Proprietor)	**5**
III	**Cost Accounting:** Meaning and Significance of cost accounting, Elements of Cost- Material, Labour and Overheads,	**4**
IV	**Cost Accounting:** Classification of Cost, Preparation of Cost-Sheet	**4**
V	**Management Accounting** Significance of Management Accounting in decision-making. Tools and techniques of management accounting	**4**
VI	**Management Accounting** BEP and CVP analysis- Contribution, PV ratio, BEP, Margin of Safety, Angle of Incidence, decision-making based on CVP analysis	**4**

References

1	Dr. Jawahar Lal , "Accounting for Management", Himalaya Publishing House, 5th Edition, 2017.
2	I M Pandey "*Management Accounting",* Vikas Publishing House Pvt. Ltd., 3rd Edition 2018.
3	Gupta K Shashi , R.K. Gupta, Management Accounting -Principles and Practices*", Kalyani Publishers*., 14th Edition, 2017.
4	Peter Atrill and Eddie McLaney, "Management Accounting for decision makers", Pearson Education, 6th edition, 2009

Useful Links	
1	https://nptel.ac.in/courses/111105121
2	https://unacademy.com/content/cbse-class-11/study-material/accountancy/management-accounting/
3	https://www.shiksha.com/online-courses/articles/management-accounting-definition/
4	

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