Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I & II			
Course Code					
Course Name		**Engineering Physics**			
Desired Requisites:		Students are expected to know the basic concept in Physics.			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To provide basic concepts to solve many engineering and technical issues.
2	To give deep insights into the understanding of engineering courses.
3	To encourage them to understand engineering and technical development.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	State Kepler's law, Planks quantum hypothesis, de-Broglie's law, Compton effect, Heisenberg's uncertainty principle, Describe optical phenomenon such as interference, diffraction polarization and in terms of wave model. Schrödinger's wave equations, Hall effect, Fermi-Dirac statistics. Seebeck effect	Remembering
CO2	Explain Planck's quantum hypothesis, Schrödinger's wave equations and their applications; Explain the methods of production and detection methods of ultrasonic waves and its applications, Show motion of particle under central force field, Discuss two body problem, energy equation and diagram,	Understanding
CO3	Classify transducers, and sensors and their applications. Classify solids on the basis of band theory; Explain fermi level and its behavior in metal, semiconductor and insulator. Solve the problems on electrical Conductivity and Hall effect.	Applying

Module	**Course Contents**	**Hours**
I	**Optics:** Introduction, types of optics, diffraction, types of diffraction, Fresnel's diffraction: Fresnel's half period zones, zone plate, diffraction at straight edge. Fraunhofer's diffraction: diffraction due to single slit, double slits, plane diffraction grating. Polarization: optical activity, specific rotation of optical active substances, Laurent's half shade polarimeter.	7
II	**Quantum Physics:** Introduction, black body radiation, Planck's quantum theory, Wien's displacement law and Rayleigh – Jeans law, phase velocity, group velocity and particle velocity, de-Broglie's hypothesis, Compton effect: theory and experimental verification, Heisenberg's uncertainty principle and its applications, wave function and its physical significance, Schrödinger's wave equation: time independent and time dependent, applications of Schrödinger's wave equation.	7
III	**Ultrasonics:** Introduction, classification of sound, ultrasonic waves, generation of ultrasonic waves (Magnetostriction and Piezoelectric method), detection of ultrasonic waves by Kundt's tube, thermal detection and sensitive flame method, velocity of ultrasonic waves in liquid, applications of ultrasonic waves in scientific and engineering field.	7
IV	**Solid State Physics:** Introduction, formation of energy bands in solid, classification of solid on the basis of band theory, number levels in band, density	6

	of states, Fermi-Dirac statistics, Fermi level, variation of Fermi level with change in temperature for semiconductor, electrical conductivity of metal and semiconductor, Hall effect, basic concept of p-n junction.	
V	**Gravitation and Central Force Motion:** Law of gravitation, Gravitational potential energy, Inertial and gravitational mass, Potential and field due to spherical shell and solid sphere, Motion of a particle under a central force field, Two body problem and its reduction to one-body problem and its solution, The energy equation and energy diagram, Kepler's Laws, Satellite in circular orbit and applications, Geosynchronous orbits.	8
VI	**Computer Instrumentation:** Introduction, instrumentations, measurement system, control system, Transducer and Sensor: transducers, sensors, classification of transducers, characteristics of transducers, selection criterion for transducers, temperature transducers, strain gauge, pressure transducers, force transducers, optical transducers, actuators.	6

Text Books	
1	M. N. Avadhanulu and P. G. Kshirsagar, "*A Text book of Engineering Physics* ", S.Chand Pub.
2	R. K. Gaur and S. L. Gupta *"Engineering Physics",* Dhanpat Rai Publications, 2011
References	
1	Halliday, Resnic and Walker, *"Fundamentals of Physics"*, John Wiley, 9th edition 2011.
2	A. Beiser, *"Concepts of Modern Physics",* McGraw Hill International, 5th edition, 2003.
3	Ajoy Ghatak, *"Optics",* Tata McGraw Hill 5th edition, 2012.
4	P. M. Mathews, K. Venkatesan, *"Text Book of Quantum Mechanics",* Tata McGraw Hill
5	M.K Harbola, *"Engineering Mechanics",* Cengage 2nd edition, 2013.
6	D. Kleppner & R. Kolenkow, *"An Introduction to Mechanics",* McGraw Hill Education,
Useful Links	
1	For optics https://nptel.ac.in/courses/122/107/122107035/
2	For Quantum Physics https://nptel.ac.in/courses/122/106/122106034/
3	For Ultrasonics https://freevideolectures.com/course/3531/engineering-physics-i/8
4	For Solid State Physics https://nptel.ac.in/courses/115/105/115105099/
5	For Gravitation http://digimat.in/nptel/courses/video/115107121/L11.html
6	Basics of Instrumentation https://www.youtube.com/watch?v=qbKnW42ZM5c

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember	8	8	24	40
2	Understand	8	8	24	40
3	Apply	4	4	12	20
4	Analyze	0	0	0	0
5	Evaluate	0	0	0	0
6	Create	0	0	0	0
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I			
Course Code					
Course Name		Engineering Mathematics- I			
Desired Requisites:		Students are expected to know the basic concept in Mathematics.			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	1 Hrs/week	20	20	60	100
Practical	-				
Interaction	-	**Credits: 4**			

Course Objectives	
1	To develop mathematical skills and enhance thinking power of students.
2	To introduce fundamental concepts of mathematics and their applications in engineering fields

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Illustrating mathematical concepts in engineering field.	Understanding
CO2	Use mathematical and computational methods to solve problems in science and engineering field	Applying

Module	**Course Contents**	**Hours**
I	**Matrices:** Rank of matrix, Homogeneous and non-homogeneous linear equations, symmetric and skew symmetric and orthogonal matrices, Eigen values, Eigen vectors, Cayley Hamilton theorem, Diagonalisation of matrices.	6
II	**Calculus:** Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's theorem with remainders, L'hospital rule and indeterminate forms	6
III	**Complex Number:** Polar form of complex number, Argand's diagram, De Moiver's theorem, roots of complex number, Hyperbolic function, exponential form of complex number, relation between circular and hyperbolic function.	7
IV	**Partial Differentiation and its application :** Partial derivative, chain rule for partial differentiation, Euler's theorem for homogeneous and non-homogeneous function, Jacobian, Error and approximation, maxima and minima of function of two variables.	8
V	**First order ODE and its application**: Exact, Linear, Bernoulli's equations, Euler's equations, Orthogonal trajectory, applications to simple electric circuit.	8
VI	**Curve tracing:** Tracing of curves for Cartesian and polar coordinate.	5

Text Books	
1	A Text Book of Applied Mathematics, Vol I and II", P. N. and J. N. Wartikar, Vidyarthi Griha Prakashan, Pune, 2006.
2	Higher Engineering Maths", B .S. Grewal, Khanna Publication, 2005, 39th Edition.

References	
1	Advanced Engineering Mathematics", Erwin Kreyszig, Wiley Eastern Limited Publication, 1978, 1st Edition
2	Advanced Engineering Mathematics", Wylie C.R., Tata McGraw Hill Publication, 1999, 8th Edition.
3	Advanced Engineering Mathematics", H. K. Dass, S. Chand & Company Ltd., 1988, 1st Edition

Useful Links

1	https://engineering-computer-science.wright.edu
2	https://www.classcentral.com/course/edx-introduction-to-engineering-mathematics
3	https://nptel.ac.in/courses/111/105/111105035/
4	https://nptel.ac.in/courses/122/104/122104017/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember	5	5	20	30
2	Understand	10	10	20	40
3	Apply	5	5	20	30
4	Analyze	0	0	0	0
5	Evaluate	0	0	0	0
6	Create	0	0	0	0
Total		**20**	**20**	**60**	**100**

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Engineering Mechanics			
Desired Requisites:		Knowledge of higher secondary level Physics			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To impart knowledge of mechanics concepts applicable to civil and mechanical engineering.
2	To illustrate behavior of static bodies using mechanics concepts.
3	To provide knowledge of motions, forces and work energy principles and its engineering applications.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Apply laws and basic concepts of mechanics of rigid bodies.	Understanding
CO2	Analyze system of forces in Statics and Dynamics.	Analyzing
CO3	Apply concept of mechanics to solve engineering problems.	Applying

Module	**Course Contents**	**Hours**
I	**Equilibrium of Forces**: Fundamental concepts and axioms, Types of Force Systems, Composition and resolution of forces, Moment of a force, Couple, Resultant of planar force systems. Equilibrium of forces- Free body diagrams, Equations of equilibrium, Equilibrium of planar systems, Equilibriums of beams- Types of loads and supports. Friction-Laws of friction, equilibrium of bodies on inclined plane, applications- problem involving wedges, ladders etc.	8
II	**Virtual work and Moment of inertia:**Principle of Virtual work-applications to statically determinate simple and compound beams. Centre of gravity and Centroid, Moment of inertia, Radius of gyration, Mass-Moment of inertia.	6
III	**Analysis of plane frames:** Pin-jointed statically determinate plane trusses-Assumptions, imperfect, perfect and redundant trusses, Analysis of statically determinate trusses, method of joints, method of sections and graphical method.	6
IV	**Kinematics of particles:** Rectilinear motion of a particle under uniform and variable acceleration, Equations of motion, Motion under gravity, Relative motion, Motion of a Projectile, Curvilinear motion of a particle, Relation between linear and angular motion.	7
V	**Kinetics of Particles:** Newton's laws of motion, D'Alemberts principle. Rectilinear motion- Motion on a rough inclined plane, motion of a lift, motion of connected bodies, Circular motion- Centripetal and centrifugal force, motion of a bicycle, Car along a curved track, super elevation of roads and railway curves, Kinetics of rotation-Torque, mass moment of inertia, problems on centroidal and non centroidal rotation.	7
VI	**Kinetics :** Work energy method- potential energy, kinetic energy, law of conservation of energy. Impulse momentum method. Collisions- impact, collision of bodies, coefficient of restitution, loss of kinetic energy due to impact.	6

Text Books	
1	Ramamrutham., S. "Textbook of Applied Mechanics", Dhanpat Rai Publishing Company Limited, 2008.
2	Bhavikatti., S. S. and Rajashekarappa., K. G. "Engineering Mechanics", New Age International Publishers, 2015, 5th Edition.
3	Khurmi. R. S., "Textbook of Applied Mechanics", Tata McGraw Hill Publishing Company, 2013, 20th Revised Edition.
References	
1	Beer, F. P. and Johnston, E. R. "Vector Mechanics for Engineers Vol. I and II", McGraw Hill Company Publication, 2011, 9th Edition.
2	Singer, F. L. "Engineering Mechanics Statics & Dynamics", B. S. Publications, 2011.
3	Timoshenko, S. and Young, D. H. "Engineering Mechanics", McGraw Hill Companies, 2008, 4th Edition.
Useful Links	
1	https://nptel.ac.in
2	https://www.coursera.org/learn/engineering-mechanics-statics
3	https://swayam.gov.in/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		T1	T2	ESE	Total
1	Remember	0	0	0	**0**
2	Understand	10	10	30	**50**
3	Apply	05	05	15	**25**
4	Analyze	05	05	15	**25**
5	Evaluate	0	0	0	**0**
6	Create	0	0	0	**0**
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Communication Skills			
Desired Requisites:		Higher Secondary Level			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	1 Hrs/week	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	Inculcate the importance of Technical English Communication Skills
2	Enhance their communicative competence
3	Enable the students to communicate with clarity and precision
4	Prepare the students to acquire structure and written expression required for their profession and enable them to acquire proper behavioral skills

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Communicate clearly, precisely and competently in different scenario	Applying
CO2	Demonstrate the information through oral , written and graphic messages	Understanding
CO3	Acquire basic proficiency in English including reading and listening comprehension ,writing and speaking skills	Remembering

Module	**Course Contents**	**Hours**
I	**Module 1: Sentence Structure and Vocabulary Building:** Subject Verb Agreement, Modal verbs, Question tags, Connectives, Synonyms, Antonyms and Standard abbreviations, Redundancies, Misplaced Modifiers Passives.	5
II	**Module 2 : Fundamentals of Communication:** Features and Functions, Importance of Communication, The Communication Process, Barriers and Breakdown of Communication, Communication in an Organization, Upward communication, Downward communication, Horizontal communication, Diagonal communication, Informal communication / Grapevine communication.	3
III	**Module 3 : Nature and Style of Writing :** Describing, Defining, Classifying, Providing examples or evidence, Writing Introduction and Conclusion	3
IV	**Module 4 : A. Non Verbal Communication :** Kinesics or Body Language, Proxemics : Space Distance, Haptic, Chronemics, Nonverbal Barriers. **Vocalic** : **Paralinguistic features: 1.**Pitch 2.Volume 3.Pauses 4. Rate of words/minute **B. Listening Skills:-** 1.Process of Listening 2.Types of Listening 3. Barriers to effective Listening	4
V	**Module 5 : A. Oral Communication:-** 1. Speeches for different Occasions (Welcome Speech , Introductory Speech, Vote of Thanks Speech), 2. Group Presentations 3. Group Discussions 4. Individual Presentations 5. Job Interviews **B. Basics of Phonetics :-** 1. Improper Pronunciation 2. Classification of Sounds in English 3. Word Stress 4. Sentence Stress or Intonation 5. Pronunciation and Articulation	5
VI	**Module 6 : Writing Communication** **A. Basic Writing Skills : 1.**Paragraph Writing 2. Comprehension 3.Essay Writing 4.Sentence Structures 5. Use of phrases & clauses in sentences	8

	6.Importance of proper punctuations 7. Creating coherence 8.Organising the principles of paragraphs in documents 9.Techniques for writing precisely **B. Business Correspondence** : 1. Job Applications 2. Complaint Letters and Adjustment Letters 3. Inquiry and Order **C**. **Official Correspondence : 1**. Memorandums 2. Circulars 3. Notices **D** .**Report Writing** : 1. Individual Report 2. Lab Report 3. Inspection Reports	

Text Books	
1	Sanjay Kumar, Pushplata , *Communication Skills*, Oxford University Press, First edition ,2012
2	Ashraf Rizvi ,Effective Technical Communication, Tata McGraw Hills publishing Company 2006
References	
1	K.R.Laxminarayanan, English for Technical Communication, Scitech, Sixth Edition, 2008
2	William Sanborn Pfeiffer ,T.V.S. Padmaja ,*Technical Communication: A Practical Approach,* Pearson, Sixth Edition 2012
3	A.K.Jain, Praveen Bhatia, A.M.Shaikh, *Professional Communication Skills,* S. Chand and Co: Fifth edition ,2009
4	F.T.Wood,Remedial English Grammar, Macmillan, 2007
5	Andrea J.Rutherford,Phd. *Basic Communication Skills for Technology*, Pearson Education Asia,2001
6	Exercises in Spoken English, Parts 1 and II CIEFL, Hyderabad , Oxford University Press
Useful Links	
1	www.oupinheonline.com
2	www.scitechpblications.com

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember	10	10	24	44
2	Understand	10	10	36	56
3	Apply	0	0	0	0
4	Analyze	0	0	0	0
5	Evaluate	0	0	0	0
6	Create	0	0	0	0
Total		**20**	**20**	**60**	**100**

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Programming For Problem Solving.			
Desired Requisites:		Basic course of software and hardware programming.			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives	
1	To imbibe an understanding of programming.
2	To develop problem-solving skills to translate text described problems into programs written using the Programming language with the help of language constructs.
3	To impart knowledge on general principles of computer languages such as: conditional branching, loops, block structures, functions, and input/output.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Paraphrase the basics of programming	Understanding
CO2	Convert the algorithms to programs	Understanding
CO3	Apply programming language principles and constructs to solve problems	Applying

Module	**Course Contents**	**Hours**
I	**Introduction to Programming** Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programming Language: source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.	04
II	**Arithmetic expressions, Precedence constraints, Conditional Branching & Loops** **Arithmetic expressions & Precedence :** Arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation Conditional **Branching & Loops:** Statements and blocks, if and switch statements, Loops ,while, do-while and for statements, break, continue, goto and labels.	04
III	**Arrays** Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional arrays, Character arrays, Strings, and applications of arrays.	05
IV	**Functions and Recursion** Designing structured programs, Functions basics, parameter passing, call by value, idea of call by reference, storage classes like extern, auto, register, static, scope rules, block structure, user defined functions, Recursion with examples.	04
V	**Pointers, Structures and Union** Pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointer to pointer. Derived types: structures- declaration, definition and initialization	05

	of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, and unions.	
VI	**Introduction to File handling** Input and output - concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations, error handling.	04

Text Books	
1	Byron Gottfried, Schaum's, "Outline of Programming with C", McGraw-Hill, Third edition, 2017.
2	Yashavant Kanetkar, "Let Us C", BPB Publication, Fifteenth edition, 2016.
3	E. Balagurusamy, "Programming in ANSI C", Tata McGraw-Hill Education, Seventh edition, 2016.
References	
1	Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India, Second Edition, 2015.
Useful Links	
1	http://www.learnvern.com/course/c-tutorials/
2	https://www.udemy.com/c-programming-for-beginners/
3	https://www.geeksforgeeks.org/c-programming-language/
4	https://codeforwin.org/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember		10	5	15
2	Understand	10	10	10	30
3	Apply	10		10	20
4	Analyze			15	15
5	Evaluate			10	10
6	Create			10	10
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information

Programme	B.Tech.
Class, Semester	First Year B.Tech., Sem I &II
Course Code	
Course Name	Engineering Mechanics Laboratory.
Desired Requisites:	Engineering Mechanics

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

Course Objectives

1	To conduct the experiments to verify the principles of mechanics.
2	To execute the graphical methods to verify the analytical solutions.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Demonstrate verification of laws and basic principles of mechanics through experiments.	Applying
CO2	Execute the experiments to verify the laws of mechanics analytically and graphically.	Applying

List of Experiments / Lab Activities

List of Experiments/ Lab Activities- Any Eight Experiments

1.	To verify of law of triangle of forces.
2.	To verify of law of polygon of forces.
3.	Determine the support reactions for Simply Supported Beam.
4.	To verify the principle of moments with the help of Bell crank lever apparatus.
5.	Determine the coefficient of friction for motion on horizontal plane.
6.	Determine the coefficient of friction for motion on inclined plane.
7.	Determine efficiency of simple screw jack apparatus.
8.	Determine efficiency of worm and worm wheel apparatus.
9.	Graphical solution of statically determinate Beams.
10.	Graphical solution of pin jointed perfect plane frames.

Text Books

1	Bhavikatti., S. S. and Rajashekarappa., K. G. "Engineering Mechanics", New Age International Publishers, 2015, 5th Edition.
2	Khurmi. R. S., "Textbook of Applied Mechanics", Tata McGraw Hill Publishing Company, 2013, 20th Revised Edition.
3	Ramamrutham., S. "Textbook of Applied Mechanics", Dhanpat Rai Publishing Company Limited, 2008.

References

1	Beer, F. P. and Johnston, E. R. "Vector Mechanics for Engineers Vol. I and II", McGraw Hill Company Publication, 2011, 9th Edition.
2	Singer, F. L. "Engineering Mechanics Statics & Dynamics", B. S. Publications, 2011.
3	Timoshenko, S. and Young, D. H. "Engineering Mechanics", McGraw Hill Companies, 2008, 4th Edition.

Useful Links

1	https://nptel.ac.in
2	https://www.coursera.org/learn/engineering-mechanics-statics
3	https://swayam.gov.in/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Lab. Course)

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

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand	5	5	10	**20**
Apply	10	10	15	**35**
Analyze	15	15	15	**45**
Evaluate				
Create				
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	B.Tech.
Class, Semester	First Year B.Tech., Sem I &II
Course Code	
Course Name	Workshop Practices LAB
Desired Requisites:	NA

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

Course Objectives

1	To train the students to use different tools and equipments involved in the manufacturing processes
2	To develop the skills to handle the basic machine tools and equipments required for various manufacturing processes
3	To prepare the students to carry out the various operations to make a finished product
4	Train the students for making PCB for electronic applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Describe the methods, operations and processes of manufacturing	Apply
CO2	Summarize the simple mechanical systems, machines, equipment's, the basic working of cutting tools for manufacturing.	Analyze
CO3	Use of chemical etching technique for making the PCB for electronic applications.	Evaluate

List of Experiments / Lab Activities

List of Experiments/ Lab Activities- Any Eight Experiments

List of Experiments:

1. Composite job based on carpentry, fitting, tin-smithy, welding etc. (16 Hrs.)
2. Composite job of PCB making based on negative film making, UV exposure, development and etching etc. (6 Hrs.)

   In case of mini-projects, drawing, presentations etc, write the relevant details of the same.

Text Books

1	Raghuwanshi B. S.,"A Course in Workshop Technology I",Dhanpat Rai Publications,10th Ed.2009
2	S. K. Hajra Choudhury and A. K. HajraChoudhary,"Workshop Technology" – Vol I [Manufacturing Processes]", , Media Promoters and Publishers Pvt. Ltd., 10th edition, reprint 2001

References

1	W.A.J. Chapman, "Workshop Technology Volume I", CBS Publishing & Distributors, Delhi. [ISBN-13:9788123904016] 2001
2	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House,2017
3	Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008

Useful Links

1	https://www.vlab.co.in/broad-area-mechanical-engineering
2	http://vlabs.iitb.ac.in/vlab/labsme.html
3	https://drive.google.com/file/d/1tp5yV2ghp_Slub58S7iKnvvJyoEwQVYq/view

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Lab. Course)

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

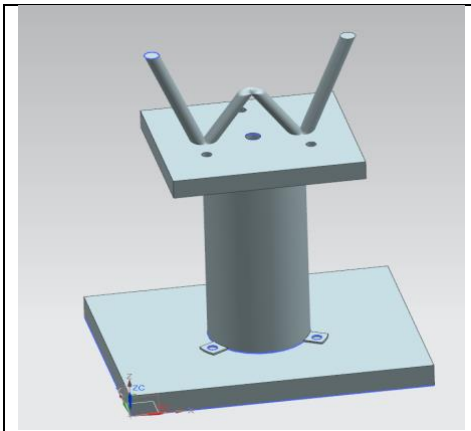
Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

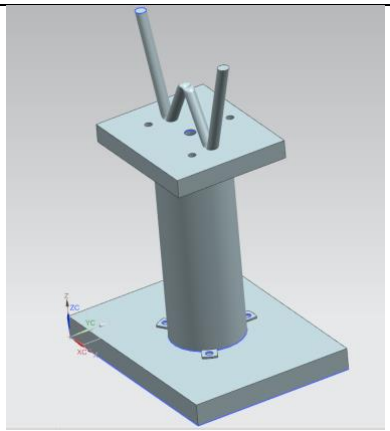
Assessment Plan based on Bloom's Taxonomy Level

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand				
Apply	15	15	20	**50**
Analyze	10	10	10	**30**
Evaluate	5	5	10	**20**
Create				
Total	**30**	**30**	**40**	**100**

Job Drawings [The detailed drawing of each section will be finalized after finalizing the proper dimensions of individual jobs and availability of respective job raw material]

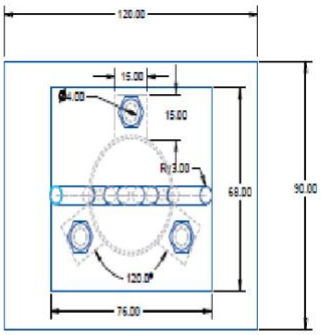


View1



View2

All dimensions are in mm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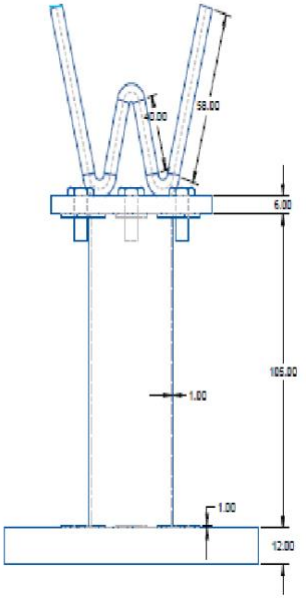
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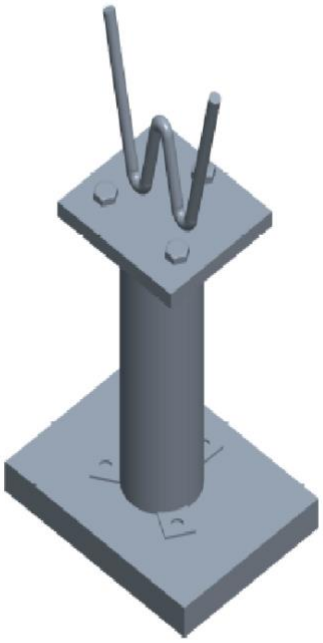

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Programming for Problem Solving Lab			
Desired Requisites:		Basic course of software and hardware programming			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives	
1	To impart problem-solving and programming skills to translate text described problems into programs, written using the Programming language with the help of language constructs.
2	To demonstrate use of computer language constructs and principles such as: conditional branching loops, block structures, functions, and input/output for implementing programs to solve problems.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Illustrate the use of different Language constructs and principles of programming language using a programming environment/tool	Apply
CO2	Implement programs using programming language in a programming environment/using programming tool to solve problems	Apply
CO3	Examine a given program to identify its output	Apply

List of Experiments / Lab Activities	
List of Experiments/ Lab Activities- Any Eight Experiments	
1.	Familiarization with programming environment IDE (Integrated development environment).
2	Writing algorithms to solve problems
3	Variable types and type conversions
4	Programs to demonstrate different operators and their order precedence
5	Programs to solve simple computational problems using arithmetic expressions e.g. simple and compound interest
6	Programs to demonstrate problems on conditional branching e.g. roots of quadratic equation, finding a maximum/minimum value
7	Programs to show statement block, conditional statement
8	Programs to show different types of iteration / loop.
9	Implementation of iterative problems e.g., sum of series
10	Programs to demonstrate matrix problems, string operations, sorting problems.
11	Programsto implement numerical methods problems(Root finding, numerical differentiation, and numerical integration): using array, function and recursion.
12	Programs to illustrate use of pointer with simple data type (create pointer variable, assign value, access value and show address using (* and &).
13	Programs to solve the problems using pointers and structures e.g. swap two numbers.
14	File handling: Study and implementation file operations
15	Programs to demonstrate simple read and write operation on the external text file.
16	Case study to demonstrate basic programming constructs

Text Books	
1	Byron Gottfried, Schaum's, "Outline of Programming with C", McGraw-Hill, Third edition,
2	Yashavant Kanetkar, "Let Us C", BPB Publication, Fifteenth edition, 2016.
3	E. Balagurusamy, "Programming in ANSI C", Tata McGraw-Hill Education, Seventh edition,

References	
1	Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Prentice Hall of India, Second Edition, 2015

Useful Links	
1	http://www.learnvern.com/course/c-tutorials/
2	https://www.udemy.com/c-programming-for-beginners/
3	https://www.geeksforgeeks.org/c-programming-language/
4	https://codeforwin.org/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Lab. Course)

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

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom’s Taxonomy Level

Bloom’s Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember			5	**5**
Understand			5	**5**
Apply	20		10	**30**
Analyze		10	5	**15**
Evaluate	10		5	**15**
Create		20	10	**30**
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Engineering Physics Lab.			
Desired Requisites:		Students are expected to know the basic practical knowledge upto HSC			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives		
1	To gain practical knowledge by applying the experimental methods to correlate with the physics theory.	
2	To learn the usage of electrical and optical systems for various measurements.	
3	To Apply the analytical techniques and graphical analysis to the experimental data.	
Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Calculate the diameter of the thin wire, wavelength of light, Planck's constant, values of e/m of an electron, Specific rotation of optical active substances. Demonstrate Hartley and Colpitt's oscillator with their simulations, Newton's ring, and I-V characteristics of semiconductor diode. Kundt's tube.	Applying

List of Experiments / Lab Activities.	
List of Experiments/ Lab Activities- Any Eight Experiments	
1	Find the diameter of the thin wire by diffraction of the light
2	Determination of wavelength of light by plane diffraction grating.
3	Determine the Specific rotation of sugar solution
4	Find the wavelength of He-Ne Laser using Plane diffraction grating.
5	Find the e/m for the cathode rays
6	Verify the expression for the resolving power of a telescope.
7	Measure the wavelength of ultrasonic waves by Kundt's tube method.
8	Design and simulate Colpitt's & Hartley Oscillator.
9	Determine the Planck's constant.
10	Find the wavelength and velocity of ultrasonic waves in liquid.
11	Study the I-V characteristic of semiconductor diode.
12	Newton's ring: Determination of wavelength of light and refractive index of liquid.
Text Books	
1	C. L. Arora *"Practical Physics"* S. Chand & Co Edition 2009.
2	P.R. Sasi Kumar *"Practical Physics"*, PHI Learning Pvt.Ltd 1st edition 2011.
References	
1	Halliday, Resnic and Walker, *"Fundamentals of Physics"*, John Wiley, 9th edition 2011.
2	A. Beiser, *"Concepts of Modern Physics",* McGraw Hill International, 5th edition, 2003.
3	Ajoy Ghatak, *"Optics",* Tata McGraw Hill 5th edition, 2012.
Useful Links	
1	https://nptel.ac.in/courses/115/105/115105121/
2	https://www.iitg.ac.in/cet/nptel.html
3	http://nptel.ac.in/video.php?subjectId=117106091

CO-PO Mapping For All B.Tech. Programs															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1													
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment (for Lab. Course)

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

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember	10	10	15	**35**
Understand	10	10	10	**30**
Apply	10	10	15	**35**
Analyze	0	0	0	**0**
Evaluate	0	0	0	**0**
Create	0	0	0	**0**
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Engineering Chemistry			
Desired Requisites:		Chemistry course at secondary and higher secondary level			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To make student familiar with engineering properties associated with different materials to use them successfully in practice.
2	To provide knowledge and significance of characterization and chemical analysis for using materials in different engineering applications.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Explain chemical analysis, thermal analysis, water chemistry, phase rule. Types of polymers and its application and water's industrial applications. Draw schematic of water softeners, phase diagrams, Thermo grams, calorimeter and fuel cells setups.	Understanding
CO2	Classify types of chemical analysis, hard water, polymers, fuel, fuel cells and thermal analysis.	Understanding
CO3	Calculate concentration of solutions, % or GF of analyte gravimetrically, hardness of water, Calorific values	Applying

Module	**Course Contents**	**Hours**
I	**General principles of chemical Analysis -** Chemical analysis, Its types, Advantages and Disadvantages of instrumental and non-instrumental methods, Different ways to express concentration of solution. Numerical problems. Standards and its types. Titrimetric analysis, Definition of terms associated with titrimetry. Classification of titrimetry, Gravimetry and its requirements, applications.	8
II	**Water Chemistry** - Natural sources of water, Impurities in natural water. Water quality parameters Hardness- Definition, Causes, Types, Expressing hardness, units to measure hardness, Numerical problems on hardness calculation, ill effects of hard water in steam generation, Ion exchange method of water softening, Dissolved oxygen(DO), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) its significance.	5
III	**Phase Rule:** Gibbs phase rule, Explanation of the terms Phase, Component, Degree of freedom, Phase reactions, types of equilibrium, equilibrium conditions. One component system- Water system, Sulphur system, Two component system- Lead Silver system, Application of Eutectic system, Merit and Demerits of Phase rule.	6
IV	**Polymers-** Polymer, Polymerization reactions – Addition, Condensation and Co polymerization. Comparison of addition and condensation polymerization and polymers, Plastics and its types- Thermoplastic and thermosetting plastics, comparison Thermoplastic and thermosetting plastics, Properties and Uses of Poly Vinyl Chloride (PVC), Bakelite, Epoxy resin, Fiber Reinforced Plastic (FRP), Rubber and properties of Rubber, vulcanization of natural rubber.	7
V	**Thermal Analysis** – Thermal analysis and its types, Thermal events,	

	Thermal analysis methods Thermo gravimetric Analysis (TGA), Differential Thermal Analysis (DTA)and Differential Scanning Calorimetry (DSC) w.r.t. Principle, instrumentation, and applications, Interpretation of Thermogram	6
VI	**Energy Science:** Fuel and its classification, Characteristics of good fuel, Properties of solid, liquid and gaseous fuels. Calorific value, Gross and net calorific value, its units, and determination by bomb and Boys calorimeter, Numerical problems on calorific value. Fuel cell, its types and applications.	6

Text Books	
1	S.K. Singh, "Engineering Chemistry", New Age Publication, 3rd Edition , 2005.
2	Shasi Chawla, "Engineering Chemistry", Dhanpat Rai Publication, 3rd Edition , 2003.
3	Jain P.C. and Jain Monika, "Engineering Chemistry", Dhanpat Rai Publication, 16th Edition, 2013
References	
1	O G Palanna, "Engineering Chemistry" Tata McGraw Hill 2009.
2	Mendham, R.C. Denney, J.D. Barnes, M.J.K Thomas, "Quantitative Chemical analysis", Vogel's Pearson Education, 6th Edition , 2008.
3	S.S Dara, "Engineering Chemistry" S. Chand and Company 2008.
4	Askeland and Phule , "The Science and Engineering of Materials" Thomson Publication 4th Edition ,2003
Useful Links	
1	https://edu.rsc.org/resources A free resource for Chemistry teachers and students of all levels, including higher education, hosted by Royal Society of Chemistry.
2	https://www.digimat.in/nptel/courses/video/122106028/L01.html
3	https://onlinecourses.nptel.ac.in/noc21_cy49/preview
4	https://www.coursera.org/browse/physical-science-and-engineering/chemistry

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember	6	6	20	32
2	Understand	8	8	25	41
3	Apply	6	6	15	27
4	Analyze	0	0	0	0
5	Evaluate	0	0	0	0
6	Create	0	0	0	0
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem II			
Course Code					
Course Name		Engineering Mathematics- II			
Desired Requisites:		Students are expected to know the basic concept in Mathematics.			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	1Hrs/week	20	20	60	100
Practical	-				
Interaction	-	**Credits: 4**			

Course Objectives	
1	To develop mathematical skills and enhance thinking power of students.
2	To introduce fundamental concepts of mathematics and their applications in engineering fields

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Illustrating mathematical concepts in engineering field.	Understanding
CO2	Use mathematical and computational methods to solve problems in science and engineering field	Applying

Module	**Course Contents**	**Hours**
I	**Beta-Gamma Functions:** Definition of Beta, Gamma functions and properties of Beta Gamma functions.	5
II	**Multivariable Calculus:** Multiple Integrals: Double integrals, change of order of integration, change of variables (Cartesian to polar) Evaluation of triple integrals, Application of Multiple integrals such as Area enclosed by plane curves, Mass of lamina, Volume of solid.	10
III	**Numerical Solution of Ordinary Differential Equations of first order and first degree:** Numerical Solution by (i) Picard's Method (ii) Taylor's series method (iii) Euler's method (iv) Modified Euler's method (v) Runge-Kutta fourth order method.	6
IV	**Probability theory**: Introduction, Sample Space, Events, Axioms of probability, Conditional probability Baye's Theorem	6
V	**Statistics:** Correlation, Regression, Curve-fitting.	6
VI	**Probability Distribution:** Random Variable, Binomial distribution, Poisson distribution, Normal distribution.	7

Text Books	
1	A Text Book of Applied Mathematics, Vol I and II", P. N. and J. N. Wartikar,
2	Higher Engineering Maths", B .S. Grewal, Khanna Publication, 2005, 39th Edition.
3	Fundamentals of Mathematical Statistics and probability S.C. Gupta 2014 ,S. Chand &Sons

References	
1	Advanced Engineering Mathematics", Erwin Kreyszig, Wiley Eastern 1st edition 1978
2	Advanced Engineering Mathematics", Wylie C.R., Tata McGraw Hill 1999, 8th Edition.
3	Advanced Engineering Mathematics", H. K. Dass, S. Chand ,1988, 1st Edition
4	Engineering Mathematics (Vol.-I)", S. S. Sastry, Prentice Hall Publication, 2006, 3rd Edition.

Useful Links	
1	https://engineering-computer-science.wright.edu
2	https://www.classcentral.com/course/edx-introduction-to-engineering-mathematics
3	https://nptel.ac.in/courses/111/105/111105035/
4	https://nptel.ac.in/courses/122/104/122104017/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember	5	5	20	30
2	Understand	10	10	20	40
3	Apply	5	5	20	30
4	Analyze	0	0	0	0
5	Evaluate	0	0	0	0
6	Create	0	0	0	0
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Engineering Graphics and AutoCAD			
Desired Requisites:		Basic Knowledge of Different Types of Curves			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives	
1	Introduce students to the conventions, concepts and basic principles of Engineering Drawing.
2	Draw projections of geometrical objects and real life components.
3	Demonstrate graphics skill for communication of concepts, ideas and design of engineering products

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Understanding Principles of Engineering and Computer Graphics	Understanding
CO2	Outline projection of engineering objects	Understandinge
CO3	Demonstrating Principles of Engineering, Computer Graphics through drafting software	Demonstrating

Module	**Course Contents**	**Hours**
I	**Introduction to Engineering Drawing** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales; Problems from the above units should also be practiced on computer aided drafting software	4
II	**Orthographic Projections** Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Problems from the above units should also be practiced on computer aided drafting software	5
III	**Projections of Regular Solids Sections and Sectional Views of Right Angular Solids** Inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only) Problems from the above units should also be practiced on computer aided drafting software	4
IV	**Isometric Projections** Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;	4

	Problems from the above units should also be practiced on computer aided drafting software	
V	**Introduction to Computer Aided Sketching** Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. of HP, VP, RPP & LPP. of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering.	5
VI	**Annotations, layering & other functions** Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;	4

Text Books	
1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014.
2	Shah, M.B. and Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008.
3	Agrawal B. and Agrawal C. M., Engineering Graphics, TMH Publication, 2012.
References	
1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2010
3	Fredderock E. Giesecke, Alva Mitchell others, Principles of Engineering Graphics, Maxwell McMillan Publishing, 2010
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019/
2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	5	5	20	30
3	Apply	10	10	30	50
4	Analyze	5	5	10	20
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Basic Electrical Engineering			
Desired Requisites:					
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To summarize and solve electrical and magnetic circuits.
2	To imparts skill to identifying principles, construction and working of electrical machines.
3	To develops skill to describe the wiring system, lamps and low voltage installation components.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	**Explain** principles, construction and working of electrical machines. .	Understand
CO2	**Solve** electrical and magnetic circuits. .	Apply

Module	**Course Contents**	**Hours**
I	**DC Circuits:-** Review of R-L-C- Electrical circuit elements, KCL and KVL. Star- delta conversion, voltage and current sources. Thevenin, Norton and Superposition, Maximum power transfer Theorems.	6
II	**AC Circuits:-**Representation of sinusoidal waveforms, peak, RMS values, phasor representation real, reactive and apparent power. Analysis of single-phase, ac circuits consisting of R, L, C, RL, RC, RLC (series and parallel) circuits and three-phase balanced circuits. Voltage and current relations in star and delta..	5
III	**DC Machines:-**Construction, working principle and types of DC generator and Motor. Voltage and speed control methods, Speed-Torque characteristics. Principle, construction, working and application of stepper, servo and universal motors.	6
IV	**Transformers:-**Magnetic circuits, Construction, working principle and types of single-phase transformer, open circuit and short circuit tests: Losses, efficiency, all-day efficiency and regulation. Autotransformer.	7
V	**AC Machines:-**Construction and working principle of single and three-phase induction motor. Types, torque- speed characteristics and applications of induction motor, Types of starters, AC generator.	6
VI	**Wiring, Electrical Installations and Components of LT Switchgear** Switch fuse unit, MCB, ELCB, MCCB. Types of wire and cables. Staircase, Go-down and Domestic wiring, CFL, LED, Fluorescent tube. Lighting schemes, Earthing, types of batteries, characteristics of batteries.	6

Text Books	
1	D.C. Kulshreshtha, "*Basic Electrical Engineering*", 1st revised edition McGraw Hill, 2012.
2	D. P. Kothari and I. J. Nagrath, "*Basic Electrical Engineering*", Tata McGraw Hill, 2010.
3	B.L Theraja,"*A Textbook of Electrical Technology*", S Chand Publication, 2013.

References	
1	V. D. Toro, *"Electrical Engineering Fundamentals*", Prentice Hall India, 1989.
2	E. Hughes, *"Electrical and Electronics Technology"*, Pearson, 2010.
3	V. N. Mittle and Arvind Mittal, "*Basic Electrical Engineering*", 2nd edition TMH, 2006.

Useful Links	
1	https://nptel.ac.in/courses/108/105/108105053/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand		10	40	50
3	Apply	20	10	20	50
4	Analyze				
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Arduino Based Systems			
Desired Requisites:		No pre-requisite course.			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives	
1	To explain and illustrate the fundamentals of digital systems and op-amps which are necessary for Arduino based simple systems.
2	To explain, demonstrate the Arduino programming language and IDE
3	To illustrate and demonstrate programing for basic Arduino systems.
4	To illustrate how to build the prototype circuits and connect them to the Arduino for building useful systems.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Explain fundamentals of digital systems and operational amplifiers	Understand
CO2	Illustrate the fundamentals of Arduino, installation of Arduino IDE, Running the arduino executable file, Using IDE to prepare Arduino sketch	Understand
CO3	Writing programs for interfacing various sensors and output devices with Arduino	Apply
CO4	Illustrate use of Arduino for an application or a system	Analyze

Module	**Course Contents**	**Hours**
I	**Overview of Digital Systems:-**Combinational Circuits- Adder, Subtractor, Multiplexer, Demultiplexer / Decoder, Sequential CircuitsFlip flops: S-R, D, Clocked flipflop, J-K Flip flop, Counters: Synchronous and Asynchronous, MOD –N Counters, Shift Registers, Memory Block	5
II	**Operational amplifiers:-**Block Diagram, Basic Operations, Op-Amps as comparator, Op amp in feedback mode, Inverting/ Noninverting Amplifier, Adder/ Subtractor	5
III	**Introduction to Arduino:-**Arduino device, Types of arduino, Features of Arduino, Components of Arduino board, Description of Microcontrollers, Installation of Arduino, Run the arduino executable file, Using IDE to prepare Arduino sketch, Uploading and running the sketch, Program notation: variables, functions, control flow, Arduino conventions. The concept of a program variable. Numerical values and basic numerical operators. If/then/else iteration using for loops. Real world timing and the delay() function	5
IV	**Input/Output Programming:-**Sensor Inputs: - Definition, Types. Interfacing arduino to different sensors- light sensor, temperature sensor, sound sensor, distance ranging sensor, water/detector sensor, smoke, gas, alcohol sensor, ultrasonic sensor Displays: Basics of LED's and LCD's. Interfacing arduino to LED's- blinking single LED, blinking multiple LED's, 7 segment display, LED dot matrix. Interfacing to LCD's- 16x2 LCD display	4
V	**Input/Output Programming:-**Motor control: DC motors- Speed control, spin direction control. Servo motor control, Steppers and Robots, Communication over Ethernet: Ethernet shield, internet weather, display, e-mail alert system, Arduino Libraries Using ESP 8266 – Logging data on online server using ThingSpeak	4
VI	**Arduino Applications:-**Case studies : Arduino based robot car, Arduino based PLC industrial application	3

Text Books	
1	"Arduino Cookbook", Michael Margolis, O'Reilly Publications, 2020
References	
1	"Beginning Arduino", Michal Mc Roberts, Second Edition, Apress Publishing, 2013
2	"Getting started with Arduino", Massimo Banzi, 2nd Edition, O'Reilly, 2011
Useful Links	
1	
2	
3	

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand	10	10	20	**40**
3	Apply	10	10	20	40
4	Analyze			20	20
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Life Science (Elective)			
Desired Requisites:		-Nil-			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives	
1	Introduce students to modern aspect of life science.
2	Develop an understanding of scientific methods with a broad background in the life sciences at all levels of biological organization (from molecular, cellular, and organismal biology, to populations, communities and ecosystems)
3	Provide a foundation of basic biological principles and education in life science technologies.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Outline and describe cytological, biochemical, physiological and genetic aspects of the cell,	Understanding
CO2	Explain the structure and function of organ systems in the human body and describe the concept, practice and significance of immunity.	Understanding
CO3	Relate knowledge of Bio chemistry, Biotechnology and Bioinformatics with application areas in Engineering.	Understanding

Module	**Course Contents**	**Hours**
I	**Cell Biology :** **Introduction to Cell structure and functions** Structure and function of prokaryotic cell (Typical Bacterial Cell) and eukaryotic cell (Plant cell and animal cell) and intracellular organelles, Mechanism of cell division including (mitosis and meiosis) and cell differentiation; Cell-cell interaction.	3
II	**Bio Chemistry :** **Introduction to Structure of atoms, molecules and chemical bonds,** Principles of physical chemistry, Thermodynamics, kinetics, dissociation and association constants, Nucleic acid structure, genetic code, replication, transcription and translation in prokaryotic and eukaryotic cell, Structure, function and metabolism of carbohydrates, lipids and proteins, Enzymes and coenzyme.	4
III	**Human Physiology:** **a**. **Digestive system** - Digestion, absorption, energy balance **b**. **Respiratory system**: Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration. **c**. **Neural system**: Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture. **d**. **Excretory system**: Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance. **e**. **Cardiovascular System**: Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance,	9

	cardiac cycle, heart as a pump, blood pressure, **f. Endocrinology and reproduction** - Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, gametogenesis, ovulation, neuroendocrine regulation.	
IV	**Immunity:** **Introduction, definition and types of Immunities and Antigens**, **Immunoglobulins**: Structure and functions of different classes of immunoglobulins, Primary and secondary immune response, Lymphocytes and accessory cells, Humoral and cell mediated immunity, Mechanism of immune response and generation of immunological diversity, Application of immunological techniques.	4
V	**Biotechnology and Its Applications:** **Principles and process of Biotechnology**: Genetic engineering (Recombinant DNA technology). **Application of Biotechnology in health and agriculture**: Production of secondary metabolites/products: **Insulin, Growth hormones**: Indoleacetic acid, interferons. Methods of gene transfer in plants, crop improvement. **Introduction to transgenics**: Gene therapy, Genetically modified organisms Biosafety issues– Bio piracy.	4
VI	**Bioinformatics and its Applications:** Introduction and Definition of Bioinformatics, **Molecular Bioinformatics**: Genomics, Proteomics and Drug Design. **Organic and Community Bioinformatics**: Bioinformatics of species diversity. **Applications of Bioinformatics**: Human health, Microbial genome application, Biotechnology, Agriculture, Comparative studies**.**	4

Text Books	
1	T. S. Ranganathan, Text book of Human Anatomy, S. Chand and Company Ltd, 2002.
2	P. S. Verma and V. K. Agarwal, Concept of Cell Biology, S. Chand and Company Ltd, 2002.
3	R. D. Vidyarthi and P. N. Pandey, A Text book of Zoology, S. Chand and Company Ltd, 2004.
References	
1	Bruce Alberts and Alexander Johnson, Molecular Biology of the Cell Garland Science, Taylor & Francis Group, 6th Edition, 2015.
2	Peter H. Raven, George B. Johnson, Biology, McGraw hill, 11th edition, 2017.
3	Laurence A. Cole, Biology of Life - Biochemistry, Physiology and Philosophy, Elsevier, 2016.
Useful Links	
1	https://www.youtube.com/watch?v=yaQhH9iKY0M
2	https://www.youtube.com/watch?v=V6s0xOTNmT4
3	https://www.youtube.com/watch?v=5Q9LgvQs5Nw
4	https://www.youtube.com/watch?v=nzJXq4YMPYE
5	https://www.youtube.com/watch?v=ssIBNVLSG58
1	https://www.youtube.com/watch?v=yaQhH9iKY0M

CO-PO Mapping For All B.Tech. Programs

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

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

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Engineering Graphics and AutoCAD Lab			
Desired Requisites:		Basic Knowledge of Computer			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives	
1	To impart the techniques of engineering graphics using the CAD software
2	To prepare the students for applying knowledge of engineering graphics in real life drawings using CAD software
3	To develop the skills of students for evaluating CAD software for its applications

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Understand the basic principle of Engineering graphics and working of CAD software.	Understanding
CO2	Draw different views of components using the CAD software.	Applying
CO3	Apply the knowledge of engineering graphics in real life applications.	Applying

List of Experiments / Lab Activities.	
1	Plane Curves and Conic Sections (Min. 5 Problems)
2	Projections of Points and Lines (Min. 5 Problems)
3	Projections of Planes and Solids (Min. 6 Problems)
4	Development of Lateral Surfaces (Min. 3 Problems)
5	Orthographic Projections (Min. 2 Problems)
6	Isometric Projections (Min. 2 Problems)

Text Books	
1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014
2	Shah, M.B. and Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008.
3	Agrawal B. and Agrawal C. M., Engineering Graphics, TMH Publication, 2012.

References	
1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2010
3	Fredderock E. Giesecke, Alva Mitchell others, Principles of Engineering Graphics, Maxwell McMillan Publishing, 2010

Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019/
2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For All B.Tech. Programs															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3				2					1		1	2		
CO2			2												
CO3					3					1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment (for Lab. Course)

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

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand	10	10	10	**30**
Apply	15	15	20	**50**
Analyze	5	5	10	**20**
Evaluate				
Create				
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information

Programme	B.Tech.
Class, Semester	First Year B.Tech., Sem I &II
Course Code	
Course Name	Basic Electrical Engineering Lab
Desired Requisites:	

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

Course Objectives

1	To demonstrate basic knowledge of Electrical engineering.
2	To develop skills to recognize working principle, construction and types of electrical machines.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	**Describe** basic concepts of electrical circuits and various theorems.	**Remember**
CO2	**Demonstrate** the use of transformers and AC/DC machines.	**Apply**

List of Experiments / Lab Activities.

1	To study AC and DC machines parts and their functions.
2	To study series-parallel RL, RC and RLC circuits
3	To verify KVL and KCL theorems.
4	Study of AC/DC motor starters
5	To study speed control techniques of ac and dc machines
6	To perform load test on transformer.
7	To study servo motor/ steeper motor with application
8	Study of installation techniques using fuse, MCB and MCCB.

Text Books

1	D.C. Kulshreshtha, *"Basic Electrical Engineering",* 1st revised edition McGraw Hill, 2012.
2	D.P Kothari and I.J Nagrath, *"Basic Electrical Engineering"* ,Tata McGraw Hill, 2010.

References

1	V. N. Mittle and Arvind Mittal, "*Basic Electrical Engineering*", 2nd edition, Tata McGraw Hill.

Useful Links

1	https://nptel.ac.in/courses/108/105/108105053/

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Lab. Course)				
There are three components of lab assessment, LA1, LA2 and Lab ESE. **IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.**				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember	25	15	10	**50**
Understand				
Apply	5	15	30	**50**
Analyze				
Evaluate				
Create				
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme		B.Tech.			
Class, Semester		First Year B.Tech., Sem I &II			
Course Code					
Course Name		Engineering Chemistry Lab.			
Desired Requisites:		Chemistry course at secondary and higher secondary level			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives		
1	To make the student familiar with analytical techniques.	
2	To provide hands on practice of titrimetric analysis.	
Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	**Apply** principles of Volumetry to quantitative analysis of water quality parameter, metal and alloys. **Demonstrate** use of instrument for quantitative analysis. **Experiment** physical/Chemical characteristics of material.	Applying
List of Experiments / Lab Activities.		
1	Estimation of hardness of water by EDTA method (Complexometric Titration).	
2	Estimation of alkalinity of water (Neutralization Titration).	
3	Estimation of Dissolved Oxygen in water (Iodometric Titration).	
4	Estimation of Chloride content in water (Argentometry).	
5	Demonstration of pH meter & pH metric titration.	
6	Determination of strength of acid/base conductometrically.	
7	Colorimetric estimation of Copper.	
8	Estimation of copper from Bronze. (Iodometric Titration).	
9	Estimation of Zn from Brass (Displacement Titration).	
10	Determination of purity of Iron (Redox Titration).	
11	Determination of viscosity of given liquid. By Ostwald viscometer.	
12	Determination of corrosion rate by weight loss method	
13	Gravimetric estimation of Ba from BaSO4 as BaO.	
Text Books		
1	College Practical Chemistry, V K Ahaluwaliya.Sunita Dhingra,Adarsha Gulati, Universities Press.	
2	Laboratory Manual on Engineering Chemistry by Sudha Rani And S.K. Bashin, Dhanpat Rai & Co.	
References		
1	Engineering Chemistry Laboratory Manual, Department of Chemistry WCE, Sangli.	
2	J Mendham, R.C. Denney, J.D. Barnes, M.J.K Thomas, "Quantitative Chemical analysis", Vogels, Pearson Education, 2008, 6th Edition.	
Useful Links		
1	https://www.lccc.edu/academics/science-and-engineering/science-in-motion/labs-equipment/chemistry-lab-experiments	
2	https://edu.rsc.org/resources/collections/classic-chemistry-experiments	

CO-PO Mapping For All B.Tech. Programs															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1													
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment (for Lab. Course)

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

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember	10	10	15	**35**
Understand	10	10	10	**30**
Apply	10	10	15	**35**
Analyze	0	0	0	**0**
Evaluate	0	0	0	**0**
Create	0	0	0	**0**
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme	B.Tech.				
Class, Semester	First Year B.Tech., Sem I &II				
Course Code					
Course Name	Arduino Based Systems Lab				
Desired Requisites:	-				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives	
1	To demonstrate and facilitate students to learn the fundamentals of digital systems and op-amps which are necessary for Arduino based simple systems.
2	To explain, demonstrate the Arduino programming language and IDE
3	To illustrate and demonstrate programing for basic Arduino systems
4	To illustrate and facilitate to build the prototype circuits and connect them to the Arduino for building useful systems.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Install Arduino IDE, Run the arduino executable file, Using IDE to prepare Arduino sketch.	Apply
CO2	Interface various sensors with Arduino	Analyze
CO3	Use Arduino to build specific application/system.	Evaluate

List of Experiments / Lab Activities.	
1	Writing a program to blink the onboard LED
2	Arduino interfacing with Tricolor LED and Push button
3	Sensing analog voltage using onboard ADC and printing it on serial monitor
4	Using Arduino to generate Pulse width modulation output
5	Arduino-based servo motor control
6	Interfacing of ultrasonic distance sensor(HC-SR04) with Ardiuno
7	Ethernet and WiFi Connectivity with Arduino
8	Arduino interfacing with Tricolor LCD

Text Books	
1	"Arduino Cookbook", Michael Margolis, O'Reilly Publications, 2020

References	
1	"Beginning Arduino", Michal Mc Roberts, Second Edition, Apress Publishing, 2013
2	"Getting started with Arduino", Massimo Banzi, 2nd Edition, O'Reilly, 2011

Useful Links

CO-PO Mapping For All B.Tech. Programs

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

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

Assessment (for Lab. Course)				
There are three components of lab assessment, LA1, LA2 and Lab ESE. **IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.**				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	20	15	20	**55**
Analyze	10	10	10	**30**
Evaluate		5	10	**15**
Create				
Total	**30**	**30**	**40**	**100**

GROUP A SEM-I

Course Name	Theory Hrs.	Tutorial HRs	LAB. Hrs.	Credits	Category
Engineering Physics	3	--	--	3	BS
Engineering Mathematics- I	3	1	--	4	BS
Engineering Mechanics	3	--	--	3	ES
Communication Skills	2	1	--	3	HS
Programming For Problem Solving	2	--	--	2	BS
Engineering Mechanics Lab.	--	--	2	1	ES
Workshop Practice	--	--	2	1	ES
Programming For Problem Solving Lab.	--	--	2	1	ES
Physics Lab.	--	--	2	1	BS
TOTAL	**13**	**2**	**8**	**19**	

GROUP A SEM-II

Course Name	Theory Hrs.	Tutorial HRs	LAB. Hrs.	Credits	Category
Engineering Chemistry	3	--	--	3	BS
Engineering Mathematics- II	3	1	--	4	BS
Engineering Graphics and AutoCAD	2	--	--	2	ES
Basic Electrical Engineering	3	--	--	3	ES
Arduino Based System	2	--	--	2	ES
Life Science	2	--	--	2	HS
Engineering Graphics and AutoCAD Lab.	--	--	2	1	ES
Basic Electrical Engineering Lab.	--	--	2	1	ES
Chemistry Lab.	--	--	2	1	BS
Arduino Based System Lab.	--	--	2	1	ES
TOTAL	**15**	**1**	**8**	**20**	

GROUP B SEM-I

Course Name	Theory Hrs.	Tutorial HRs	LAB. Hrs.	Credits	Category
Engineering Chemistry	3	--	--	3	BS
Engineering Mathematics- I	3	1	--	4	BS
Engineering Graphics and AutoCAD	2	--	--	2	ES
Basic Electrical Engineering	3	--	--	3	ES
Arduino Based System	2	--	--	2	ES
Life Science	2	--	--	2	HS
Engineering Graphics and AutoCAD Lab.	--	--	2	1	ES
Basic Electrical Engineering Lab.	--	--	2	1	ES
Chemistry Lab.	--	--	2	1	BS
Arduino Based System Lab.	--	--	2	1	ES
TOTAL	**15**	**1**	**8**	**20**	

GROUP B SEM-II

Course Name	Theory Hrs.	Tutorial HRs	LAB. Hrs.	Credits	Category
Engineering Physics	3	--	--	3	BS
Engineering Mathematics- II	3	1	--	4	BS
Engineering Mechanics	3	--	--	3	ES
Communication Skills	2	1	--	3	HS
Programming For Problem Solving	2	--	--	2	BS
Engineering Mechanics Lab.	--	--	2	1	ES
Workshop Practice	--	--	2	1	ES
Programming For Problem Solving Lab.	--	--	2	1	ES
Physics Lab.	--	--	2	1	BS
TOTAL	**13**	**2**	**8**	**19**	

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Credit System for

S.Y. B.Tech. (Computer Science and Engineering)

Sem-III and IV

2022-23

Walchand College of Engineering

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Credit System for S.Y. B.Tech. (Computer Science and Engineering) Sem-III AY 2022-23

Sr.No.	Category	Course Code	Course Name	L	T	P	I	Hrs	Cr	MSE/LA1	ISE/LA2	ESE	Ext
Professional Core (Theory)													
1	BS	6MA202	Probability and Statistics	2	0	0	0	2	2	30	20	50	
2	ES	6CS201	Discrete Mathematics	3	1	0	0	4	4	30	20	50	
3	PC	6CS202	Data Structures	3	0	0	0	3	3	30	20	50	
4	PC	6CS203	Data Communication	3	0	0	0	3	3	30	20	50	
5	PC	6CS204	Computer Organization and Architecture	3	0	0	0	3	3	30	20	50	
6	PC	6CS205	Software Engineering	3	1	0	0	4	4	30	20	50	
Professional Core (Lab)													
7	PC	6CS251	Programming Lab 1	0	0	2	1	3	2	30	30	40	POE
8	PC	6CS252	Data Structures Lab	0	0	2	0	2	1	30	30	40	POE
9	PC	6CS254	Computer Organization and Architecture Lab	0	0	2	0	2	1	30	30	40	POE
			Total	**17**	**2**	**6**	**1**	**26**	**23**				

Notes:

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

For Lab courses: There shall be continuous assessment (LA1, LA2, ESE). The ESE is a separate head of passing. The Y in the PoE indicates external component for ESE.

Minimum two AICTE mandatory courses need to be completed for award of degree.

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

Walchand College of Engineering

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Credit System for S.Y. B.Tech. (Computer Science and Engineering) Sem-IV AY 2022-23

Sr.No.	Category	Course Code	Course Name	L	T	P	I	Hrs	Cr	MSE/LA1	ISE/LA2	ESE	Ext
Professional Core (Theory)													
1	BS	6CS225	Applied Mathematics for Computer Science and Engineering	3	0	0	0	3	3	30	20	50	
2	ES	6CS221	Formal Language and Automata Theory	3	1	0	0	4	4	30	20	50	
3	PC	6CS222	Operating Systems	3	0	0	0	3	3	30	20	50	
4	PC	6CS223	Database Engineering	3	0	0	0	3	3	30	20	50	
5	PC	6CS224	Computer Network	3	0	0	0	3	3	30	20	50	
Professional Core (Lab)													
6	PC	6CS274	Database Engineering Lab	0	0	2	0	2	1	30	30	40	POE
7	PC	6CS275	Computer Network Lab	0	0	2	0	2	1	30	30	40	POE
8	PC	6CS271	Programming Lab 2	0	0	2	1	3	2	30	30	40	POE
9	HS	6CS277	Presentation and Report Writing	0	0	0	1	1	1	15	15	20	
AICTE Mandatory Courses													
10	MC	6IC201	Environmental Science	2	0	0	0	2	0	30	20	50	
			Total	**17**	**1**	**6**	**2**	**26**	**21**				

Notes:

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

For Lab courses: There shall be continuous assessment (LA1, LA2, ESE). The ESE is a separate head of passing. The Y in the PoE indicates external component for ESE.

Minimum two AICTE mandatory courses need to be completed for award of degree.

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

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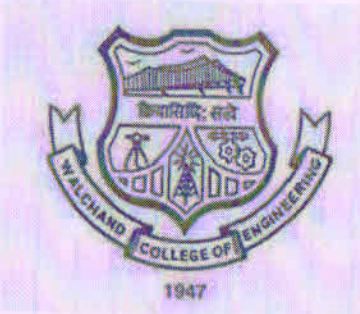

Course Contents for

T.Y. B.Tech. (Computer Science and Engineering)

Sem-I and II

AY 2023-24

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CSE

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CSE

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Date: 28/08/2023

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS301
Course Name	Compiler Design
Desired Requisites:	Formal Language and Automata Theory, Discrete Mathematics

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

Course Objectives	
1	To introduce fundamentals of compiler design and various tools used to design a compiler
2	To inculcate role of various phases involved during design of a compiler and impart in depth working of each phase
3	To exercise design of various phases of a compiler using compiler design tools and techniques
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Discuss the need of a compiler, fundamental concepts and various tools used to design a compiler.	Understanding
CO2	Demonstrate the role and working of each phase involved during compilation process.	Applying
CO3	Analyze the working of various phases of compiler	Analyzing

Module	**Module Contents**	**Hours**
I	**Module 1: Fundamentals of Compiler** Overview- Structure of a compiler, applications of compiler, one pass and two pass compiler. **Lexical analysis** - The role of a lexical analyzer, specification of tokens, recognition of tokens, LEX.	6
II	**Module 2 Syntax Analysis** Context-free grammar, writing grammars for context free environments, parse trees and ambiguity, role of parser, specification and recognition of tokens, top-down parsing, recursive descent and predictive parsers (LL), bottom-up parsing, operator precedence parsing, LR, SLR and LALR parsers.	9
III	**Module 3 Syntax Directed Translation & Run time environments** Syntax-directed definitions, evaluation orders for attributes of an SDD, S-attributed and L-attributed SDDs, construction of syntax tree, source language issues, storage organization and allocation strategies, parameter passing, symbol table organizations and generations, dynamic storage allocations.	6

IV	**Module 4 Intermediate Code Generation** Intermediate languages, declarations, different intermediate representations –quadruples, triples, trees, flow graphs, SSA forms, and their uses; assignment statements and Boolean expressions, case statements, back patching, procedure calls.	6
V	**Module 5 Code Optimization** Sources of optimization, basic blocks and flow graphs, optimization of basic blocks, loops in flow graphs, loop optimization, machine-independent optimization, machine-dependent optimization, dead-code Elimination, code improving transformations.	6
VI	**Module 6 Code Generation** Issues in the design of a code generator, run time storage management; simple code generator- register and address descriptors, code generation algorithm, design of the function getReg, DAG, peephole optimization, register allocation and assignment, selection of instruction, register allocation, parallel compilation, Just-in-Time compiler, study of compiler construction tools.	6

Text Books	
1	A.V. Aho, R. Shethi and J.D. Ullman, "Compilers - Principles, Techniques and Tools", Pearson Education, Second Edition, 2007.
2	D.M. Dhamdhere, "Systems Programming and Operating Systems", Tata McGraw- Hill Publishing Company limited, New Delhi, Second revised Edition, 2005.

References	
1	K Cooper, L Torczon, "Engineering a Compiler", Morgan Kaufmann, Second Edition, 2011
2	John J Donavan, "System Programming", Tata McGraw- Hill Publishing Company limited, New Delhi
3	Sumitabha Das, "Unix Concepts and Administration", TMGH, 3rd Edition
4	A.V. Aho, R. Shethiand J.D. Ullman, "Compilers - Principles, Techniques and Tools", Addison Wesley Publishing Company, 2007

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs07/preview
2	https://nptel.ac.in/courses/106108052

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	
CO3		3			2								3	

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

Assessment

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

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS302
Course Name	Design and Analysis of Algorithms
Desired Requisites:	Discrete Mathematics, Data Structure

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

Course Objectives	
1	To illustrate and apply the algorithm analysis techniques.
2	To discuss the efficient algorithm for various problem
3	To explain and demonstrate different algorithm techniques for real world problem
4	To compute and prove complexity class of various algorithm techniques.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Discuss the fundamentals of algorithm design and analysis techniques.	II	Understanding
CO2	Apply knowledge of computing and mathematics to algorithm design	III	Applying
CO3	Critically analyze the various algorithm design techniques for a given problem.	IV	Analyzing
CO4	Classify computational problems into P, NP, NP-Hard and NP Complete.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to Algorithm** Introduction, Evolution of Algorithms, Design of Algorithms, Need of correctness of Algorithms, Performance Analysis, Recurrence Equations: Solution of Recurrence Equations–Iteration Method and Recursion Tree Methods. Master's theorem, Towers of Hanoi.	7
II	**Module 2: Divide and Conquer Method** Binary Search, Merge Sort, Quick sort, Multiplication of Large Integers, Closest-Pair and Convex Hull Problems, Strassen's Matrix Multiplication.	6

III	**Module 3: Greedy Method** Minimum Cost Spanning Trees, Job Sequencing with Deadlines, Knapsack Problem, Optimal Merge Pattern, Huffman Trees.	6
IV	**Module 4: Dynamic Programming Method** Principle of Optimality, Floyd's Algorithm, Multi Stage Graph, Optimal Binary Search Trees, 0/1 Knapsack problem.	6
V	**Module 5: Backtracking & Branch and Bound Method** **Backtracking:** Introduction, n*n - Queen Problem, Sum of Subsets Problem, Graph Colouring, Hamiltonian Cycles. **Branch and Bound Method:** Breadth First Search & Traversal, Depth First Search & Traversal, Traveling Salesperson Problem	7
VI	**Module 6: Class of Problem & Parallel Algorithms** **Class of Problem**: P, NP, NP Complete and NP Hard Problems, Approximation Algorithms for NP-Hard Problems. **Parallel Algorithms:** Introduction, Parallel Evaluation of Expression, Basic Techniques and Parallel Algorithms.	7

Text Books	
1	Ellis Horowitz, Sartaj Sahni and Rajasekaran "Fundamentals of Computer Algorithms" , Galgotia Publications, 2nd Edition.
2	Aho, Hopfcraft and Ullman, Addison Wesley "Design and Analysis of Algorithms".

References	
1	Thomas Cormen, Leiserson, Rivest, and Stein "Introduction to Algorithms", PHI Publication.3rd Edition, 2009.
2	Goodman, "Introduction to Design and Analysis of Algorithm", McGraw Hill.
3	R.C.T. Lee, S.S. Tseng, R.C. Chang, "Introduction to the Design and Analysis of Algorithm".

Useful Links	
1	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of algorithms_tutorial.pdf
2	https://www.ebooks.com/en-in/book/1679384/algorithms-design-techniques-and-analysis/m-h-alsuwaiyel

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	2	3											3	2
CO3		3											2	
CO4		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)

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS303
Course Name	Artificial Intelligence
Desired Requisites:	Data structures, algorithm

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

Course Objectives

1	To acquaint students with the meaning, purpose, scope, applications, and effects of AI.
2	To solve problems by applying a suitable search method , and AI applications in Natural Language Processing, Computer vision and Robotics.
3	To understand and represent knowledge in AI systems.
4	To analyse real life problems and provide solutions by applying 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 Description**
CO1	Explain fundamental concepts and challenges in AI.	II	Understand
CO2	Apply the basic principles, models and algorithms of AI to recognize, model and solve problems.	III	Apply
CO3	Analyze knowledge representation techniques and problem solving strategies to common AI applications.	IV	Analyze
CO4	Assess suitable AI strategies to solve real life problems.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**AI - Inception and Scope** **Introduction to AI:** What is AI, History of AI, Foundations of AI, Turing test, AI problems, AI application areas, AI case studies; **Intelligent Agents:** Introduction, Structure of agents, Types of agents, Environments	5
II	**Problem Solving by Search** **Solving problems by searching**: Problem solving agents, Formulating problems, Solution search; **Search strategies:** BFS, DFS, Uniform cost, Depth limited; **Informed search methods:** Best first, A*, Hill climbing, Simulated annealing	7
III	**Knowledge Representation & Reasoning-I** **Knowledge based agents:** Introduction **Propositional logic:** Syntax, Semantics, Inference, Rules **First order predicate logic:** Syntax and semantics, Extensions and notational variations, Simple reflex agent; **Knowledge base creation:** Example; **Logical reasoning systems:** Introduction, Indexing, Retrieval, Unification, Logic programming systems - Prolog	7
IV	**Knowledge Representation & Reasoning-II** **Symbolic reasoning:** Introduction and logic nonmonotonic reasoning **Statistical reasoning:** Probability and Bayes' theorem, Rule based system , Dempster-Shafer theory, Bayesian networks, Fuzzy logic	8

V	**Game playing and Introduction to Planning** **Game playing**: Introduction, Minimax search procedure, Alpha beta pruning; **Planning:** Introduction, Components of planning, Goal stack planning, Partial order planning	8
VI	**Learning and case study** **Learning:** Introduction, Rote learning, Inductive learning, Learning from examples, Explanation based learning; **Case study:** State of the art AI systems	5

Textbooks	
1	Elaine Rich and Kerin Knight, Artificial Intelligence, 3rd Edition, McGraw Hill. ISBN13: 9780070087705
2	Eugene, Charniak, Drew Mcdermott, Introduction to artificial intelligence, AddisonWesley. ISBN 0-07-052263-4.
3	Deepak Khemani,"A First Course in Artificial Intelligence", McGraw Hill Education (India), 2013.
4	Stuart Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", Prentice Hall, 3rd Edition, 2009

References	
1	Khemani D., "*Artificial Intelligence: Knowledge Representation and Reasoning*", IIT Madras, Lecture Notes.
2	Herbert A. Simon, The Sciences of the Artificial, MIT Press, 3rd Edition, 1998. ISBN: 9780262190510. George F Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Edu., 4th Edition. ISBN-13: 978-0-321-54589-3

Useful Links	
1	Artificial Intelligence: Knowledge Representation and Reasoning Course on NPTEL: Link
2	Artificial Intelligence Search Methods for Problem Solving Course on NPTEL: Link

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information

Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS351
Course Name	Design and Analysis of Algorithms Laboratory
Desired Requisites:	Knowledge of Mathematics, Data Structure & Programming Concepts

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 build solid foundation in algorithms and their applications.
2	To employ various design strategies for problem solving.
3	To provide a practical exposure of all algorithms.
4	To Synthesize efficient algorithms in common engineering design situations.

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	Practice different algorithm techniques for given problem	III	Applying
CO2	Identify appropriate data structure to implement selected algorithmic approach.	IV	Analyzing
CO3	Design and Implement an algorithm for complex problem.	VI	Creating
CO4	Exhibit technical and professional skill to demonstrate and convince accomplished algorithmic solution	III	Applying

List of Experiments / Lab Activities/Topics

List of Topics (Applicable for Interaction mode):

List of Experiments:

1. To implement the Towers of Hanoi problem.
2. To implement (Quick Sort/Merge Sort) Sorting algorithm using array as a data structure.
3. To implement different Search techniques (Linear/Binary) using array and/or trees.
4. To implement the Convex Hull problem using divide and conquer method.
5. To implement Strassen's Matrix Multiplication algorithm.
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's & Prim's algorithm and compare.
7. To implement the Huffman Coding algorithm.
8. To implement 0/1 Knapsack problem using dynamic programming.
9. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
10. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
11. To implement n*n Queen problem using Backtracking.
12. To implement the Hamiltonian cycle using Backtracking.
13. Implement any scheme to find the optimal solution for the Traveling Salesperson problem.

Textbooks	
1	Ellis Horowitz, Sartaj Sahni and Rajasekaran “Fundamentals of Computer Algorithms” , Galgotia Publications, 2nd Edition.
2	Aho, Hopfcraft and Ullman, Addison Wesley “Design and Analysis of Algorithms”.
References	
1	Thomas Cormen, Leiserson, Rivest, and Stein “Introduction to Algorithms”, PHI Publication.3rd Edition, 2009.
2	Goodman ,“Introduction to Design and Analysis of Algorithm”, McGraw Hill.
3	R.C.T. Lee, S.S. Tseng, R.C. Chang, “Introduction to the Design and Analysis of Algorithm”.
Useful Links	
1	https://www.tutorialspoint.com/data_structures_algorithms/algorithms_basics.htm
2	https://www.codechef.com/certification/data-structures-and-algorithms/prepare

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	
CO3				3	2								2	1
CO4				3	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.

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Course Information

Programme	B.Tech. (Computer Science & Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS352
Course Name	Programming Laboratory III
Desired Requisites:	Basics of Object-Oriented Programming

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

Course Objectives

1	To inculcate understanding of World Wide Web, Internet, the concepts of web applications development and web programming languages as well to inculcate understanding of state-of-the-art front-end and back-end development frameworks of web programming
2	To introduce selection of appropriate concepts of internet and web programming such as HTML, CSS, JavaScript, and other server-side scripting languages.
3	To introduce selection of appropriate concepts from different state-of-the-art frameworks/libraries and tools for developing a web application.
4	To infuse skills of combining different components from state-of-the-art technologies to design a web and mobile app to solve real world problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	summarize the different concepts and components of WWW, web development technologies and web security as well as state-of-the-art front-end, back-end web app development technologies & frameworks.	Understanding
CO2	illustrate the concepts of various state-of-the-art front-end, back-end web and mobile app development technologies & frameworks using different web development tools.	Applying
CO3	test the concepts and components of various state-of-the-art front-end, back-end web and mobile app development technologies & frameworks using web development tools.	Analyzing
CO4	select appropriate front-end, back-end web app development technologies, frameworks, tools and their components to solve real-world problems.	Evaluating
CO5	build a web app, individually or in a team by combining various state-of-the-art front-end, back-end app development technologies & frameworks for real-world problems.	Creating

Module	Module Contents
I	**Module 1: Introduction to World Wide Web, Markup Languages, Style sheet Languages** Client, Server, Communication, Protocols, Ports, Client-Server Architectures, Internet, World Wide Web, HTTP, HTTP Status Codes, Web Clients/Browsers, and Web Servers. **Experiments:** 1. Describe client, server, communication, ports, protocols, HTTP, browsers and web servers. Distinguish between client and server, Internet, WWW, and client-server architectures. 2. Get header information of a web page using browser's developer mode. Installation of web server. 3. Design and develop web pages using fundamental HTML elements, such as head, title, body, header, comment, etc. Also using HTML Formatting elements, such as abbr, address, etc 4. Design and develop web pages that embed images and client-side maps, audio and video and links, lists and tables, embed YouTube videos, graphics using canvas and SVG. 5. Design and develop web pages with styles, semantics and layouts, such as header, footer, section, data, div, etc. also using HTML APIs, web components. 6. 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 colour, RGB, HEX, HSL values, background image, background color, etc. 7. Design and develop web pages by applying CSS borders and margin properties, such as Border Width, Border Color, Margins, etc. Also apply CSS floating, overflow and positioning properties, such as float, overflow, position, etc. 8. Design and develop web pages by applying CSS page layout properties, such as display, padding, height, width, max-width, align, etc. 9. Design and develop web pages by applying CSS properties to links, lists and tables. 10. Design and develop web pages by using CSS navigation bars and dropdowns. 11. Design and develop web pages by using CSS Selectors. 12. Design and develop web pages by using inline CSS, internal CSS and external CSS.

II	**Module 2: Client-side Programming and Server-side Programming** JavaScript: Introduction to JavaScript, Basic Syntax, Variables, Data Types, Statements, Operators, Conditions, Loops, Functions, Arrays, Objects, Form Validation, DOM, JavaScript Objects, JavaScript Functions, Asynchronous JavaScript and any one of the state-of-the-art JavaScript libraries. Introduction to Server-side Programming, Installation of Web and database Server, Process user input, Efficient storage and delivery of information to and from databases, File handling and controlled access to the content, store session/state information, cookies, notifications and communication. **Note:** 1. One of the following server-side scripting languages can be used for the implementation: PHP, Node.js, or other state-of-art scripting languages. 2. One of the following databases can be used for data storage and retrieval: MySQL, MongoDB, Firebase or other state-of-art databases. **Experiments:** 1. Implement a script using JavaScript that changes HTML content, HTML attributes hides and show HTML elements, HTML output and window alert box for web pages. 2. Implement a script using JavaScript that shows use of JavaScript variables, data types and statements for web pages. 3. Implement a script using JavaScript that shows use of JavaScript Arithmetic, Assignment and String Concatenation operations for web pages. 4. Implement a script using JavaScript that shows use of JavaScript conditionals and loops for web pages. 5. Implement a script using JavaScript that shows use of JavaScript Functions, Arrays, and Objects for web pages. 6. Implement a script using JavaScript that shows use of Asynchronous JavaScript. 7. Design and develop web pages and insert JavaScript in head tag, body tag, external file, external URL and external folder. 8. Implement a script using JavaScript library. 9. Implement basic functionalities of server-side scripting language, such as data types, operators, conditionals, and loops. 10. Implement basic functionalities of server-side scripting language, such as objects, arrays, and functions. 11. Implement web page form validations using server-side scripting language. 12. Implement file handling using server-side scripting language. 13. Implement cookies using server-side scripting language. 14. Implement sessions using server-side scripting language. 15. Implement CRUD operations on database using server-side scripting language.
III	**Module 3: Web Application Framework/Library** State-of-the-art Front-End Framework library: One of the following technologies will be considered: Angular, React.js or other state-of-the-art front-end development framework/library. **Experiments:** 1. Installing framework and configuring Integrated Development Environment (IDE), and its dependencies. 2. Creating workspace, project and setting up the necessary environment. 3. Implementing the fundamental syntaxes and components of the framework. 4. Building and testing the application. 5. Deploying the application. 6. Implementing the fundamental syntaxes and components of the framework.

IV	**Module 4: Server-side Development Framework/Library Part I** State-of-the-art server-side Technology: Ruby on Rails, Flask or other state-of-the-art back-end development framework/library. Experiments: 1. Installing framework and configuring Integrated Development Environment (IDE), and its dependencies. 2. Creating workspace, project and setting up the necessary environment. 3. Implementing the fundamental syntaxes and components of the framework. 4. Implementing server-side validations and authentication for web application. 5. Implementing CRUD operations for web application. 6. Building and testing the application. 7. Deploying the application.
V	**Module 5: Server-side Development Framework/Library Part II** Django or another state-of-the-art framework/library. Experiments: 1. Installing framework and configuring Integrated Development Environment (IDE), and its dependencies. 2. Creating workspace, project and setting up the necessary environment. 3. Implementing the fundamental syntaxes and components of the framework. 4. Implementing server-side validations and authentication for web application. 5. Implementing CRUD operations for web application. 6. Building and testing the application. 7. Deploying the application
VI	**Module 6: Hosting Web Applications, Web Security** Building web application and Hosting web application. Web Security: Introduction, types of web threats, and prevention measures. **Experiments:** 1. Choosing a hosting server and selecting a plan for web hosting. 2. Choosing and configuring DNS address. 3. Uploading, configuring and running the website over the internet.
Text Books	
1	Vasan Subramanian, “Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node”, Apress, 2nd Edition, 2019, ISBN-13: 978-1484243909
2	Azat Mardan, “Full Stack JavaScript: Learn Backbone.js, Node.js, and MongoDB”, Apress, 2nd Edition, 2018, ISBN-13: 978-1484237175
References	
1	Felipe Coury, Ari Lerner, Carlos Taborda, “ng-book: The Complete Guide to Angular”, Create Space Independent Publishing Platform, 5th Edition, 2018, ISBN-13: 978-1985170285
Useful Links	
1	www.w3schools.com
2	Official framework websites for Documentation/Help

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

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

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Course Information

Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS341
Course Name	Mini-Project I
Desired Requisites:	Nil

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

Course Objectives

1	To provide hands-on experience in developing a small-scale software project.
2	To undergo project management techniques and project design principles.
3	To implement the project with appropriate programming languages and testing tools.
4	To develop analytical vision and skills to analyse, compare the outcome with other techniques.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Demonstrate present technological trends through seminar and presentation.	I	Remember
CO2	Demonstrate the appropriate selection of software tool for project implementation.	II	Understand
CO3	Work in teams and participate in group activity of software development.	III	Apply
CO4	Develop a software product and demonstrate its significance.	V	Evaluate

List of Experiments / Mini Project Activities/Topics

List of Topics(Applicable for Interaction mode):

List of Mini Project Activities:

1. Identify a real-world problem or challenge that requires a software solution.
2. Conduct a comprehensive analysis of existing technologies, research findings, and industry practices relevant to the problem.
3. Design an innovative software solution considering the identified problem and available resources.
4. Apply advanced project management techniques to create a project plan, including tasks, timelines, and resource allocation.
5. Collaborate within a team to execute the project plan, ensuring effective communication, task assignment, and progress monitoring.
6. Implement the software solution using appropriate programming languages, tools, and technologies.
7. Test and validate the developed software solution, ensuring its functionality, usability, and performance.
8. Evaluate the impact and effectiveness of the software solution, comparing it with existing alternatives and identifying areas for enhancement.
9. Prepare a comprehensive project report, including documentation, code, and other artifacts.
10. Present the mini project findings and outcomes through a technical presentation and demonstration.

Textbooks	
1	Nil
References	
1	Nil

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	2												3	3
CO2	2	3											3	3
CO3		2		3	2								2	
CO4	2										3			3
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

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

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech SEM V
Course Code	6CS311
Course Name	Elective 1: Image Processing
Desired Requisites:	Basic knowledge of Graphics

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

Course Objectives

1	To learn fundamental of digital image processing.
2	To learn the concepts of image enhancement, image segmentation, compression etc and apply the algorithms to build applications.
3	To compare various algorithms and select the appropriate for a particular application.
4	To create initial background of the area of Image Processing to excel in this stream for further Research.
5	To develop engineering skills and intuitive understanding of the tools used in Image Processing.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Perceive general terminology of digital image processing.	Understanding-II
CO2	Apply various image processing algorithms that can be used in practical applications.	Applying-III
CO3	Analyze working of various algorithms specific to image processing techniques.	Analyzing-IV

Module	**Module Contents**	**Hours**
I	**Digital Image Fundamentals** Introduction and applications, Fundamental Steps and Components of Image Processing System Digital Image Fundamentals: Image Acquisition, A simple imagemodel, Sampling and Quantization, Imaging, Different types of digital images	6
II	**Image Transforms** 2D systems and Necessary Mathematical preliminaries, 2D Orthogonal and Unitary Transforms, Discrete Fourier Transform, KL-Transforms, Hadamard Transforms	6
III	**Image Enhancement** Point Processing, Basic Gray Level Transformations, Convolution and Correlation, HistogramProcessing, Spatial domain Filtering	6
IV	**Image Segmentation and Analysis** Edge Detection – using first and second order derivatives, LoG, Canny edge detector, Boundary Extraction – Connectivity, Heuristic Graph Search,Region-based Segmentation –region growing, region	8

	splitting and merging	
V	**Morphological Image Processing** Mathematical Morphology, Erosion and Dilation, Opening and Closing, Hit-or-Miss transformation, Basic morphological algorithm: Boundary extraction, Hole filling, Extracting of connected components. Thinning, Thickening	7
VI	**Image Compression** Fundamentals, Compression model, Lossless Vs Lossy Compression, Fundamentals of Information Theory, Run-length coding, Huffman coding,Dictionary-based compression, Image CompressionStandards	6

Text Books	
1	R. C. Gonzalez, R. E. Woods, Digital Image Processing, 4th Edition. 2018, PHI
2	A. K. Jain, Fundamentals of Digital Image Processing, PHI
References	
1	Milan Sonka, Vaclav Hlavac, Boyle, Digital Image Processing and Computer Vision, Cengage Learning
2	S. Jayaraman, S. Esakkirajan, T. Veerkumar, Digital Image Processing, Tata McGrawHill
3	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd ed.
Useful Links	
1	NPTEL course: Link
2	NPTEL course: Link

CO-PO Mapping

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

Assessment (for Theory Course)

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, quiz etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS312
Course Name	Elective 1: Internet of Things
Desired Requisites:	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 illustrate the basic concepts of Internet of Things.
2	To demonstrate working of Ardino, Node-MCU & Raspberry pi.
3	To develop the skill of providing solution for real life problems using IoT.

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 designing and development of applications in IoT.	II	Understanding
CO2	Illustrate the working of various protocols for communication among IoT devices.	III	Apply
CO3	Analyze and compare different IoT tools and techniques.	IV	Analyze
CO4	Valuate a solution to address real-world problems.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to Internet of Things** Introduction, Physical design of IoT, Logical Design of IoT, IoT Enabling Technology, Introduction to Arduino, Raspberry-Pi	07
II	**Communication Protocols & Interoperability** Basics of Networking, Communication Protocols, Sensor Networks, Machine-to Machine Communications, Interoperability.	06
III	**Data Analytics for IoT** Apache Hadoop, Apache Oozie, Apache Spark, Using Apache Storm for real time Data analysis.	06
IV	**Industrial IoT** Introduction to IIoT, AWS-IoT, Introduction to Lora-wan, Security challenges in IIoT, Cyber-Physical Systems, Industrial Control System	07
V	**Edge Computing** Introduction to Edge Computing, Benefits and challenges in edge computing, Edge device architecture, Security challenges in Edge Computing, Edge analytics and processing techniques.	07
VI	**Domain Specific IOT Case Studies** Home Automation, Smart Cities, Retail, Logistic, Agriculture, Industry, Healthcare.	06

Textbooks

1	S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.
2	S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.

References	
1	Arashdeep Bahga ,Vijay Madisetti Internet of Things an Hands on Approach,University Press.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs17

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1													
CO2			2	1										
CO3		3		1									1	
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	Third Year B. Tech., Sem V
Course Code	6OE371
Course Name	Open Elective 1: Data Science
Desired Requisites:	Probability and Statistics

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

Course Objectives	
1	To provide the knowledge and expertise to become a proficient data scientist.
2	To critically evaluate data visualizations based on their design and use for communicating.
3	

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Acquaint core concepts and technologies in Data Science.	Understanding
CO2	Demonstrate data collection and management using different technologies.	Applying
CO3	Analyse and interpret large data sets in the context of real-world problems.	Analyzing

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to core concepts and technologies** Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications	4
II	**Module 2 Data Collection and Management** Introduction, Sources of data, Data collection, Exploring and fixing data, Data storage and management, Using multiple data sources.	7
III	**Module 3 Data Preprocessing** Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.	8
IV	**Module 4 Data Visualization** Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, visual encodings.	6
V	**Module 5 Data Analysis** Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Correlation, Linear Regression, Least Squares, Residuals, Regression Inference, classification, classifiers.	8
VI	**Module 6 Recent trends** Recent trends in various data collection and analysis techniques, various visualization techniques, Case Study, application development methods used in data science.	6

Text Books	
1	Adhikari Ani and DeNero John. Computational and Inferential Thinking, The Foundations of Data Science, UC Berkeley.

2	Jiawei Han, Micheline Kamber and Jian Pei. Data Mining Concepts and Techniques. Morgan Kaufmann, Third Edition.
References	
1	O'Neil Cathy and Schutt Rachel. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
2	Leskovek Jure, Rajaraman Anand and Ullman Jeffrey. Mining of Massive Datasets. v2.1, Cambridge University Press.
3	
Useful Links	
1	
2	

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

Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	6CS353
Course Name	Humanities I-Project Management and Ethics
Desired Requisites:	Software Engineering

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

Course Objectives

1	To provide in-depth coverage of project management principles using tools.
2	To Understand the Project management tools practiced in the IT industry.
3	To Comprehend the hands-on exploration of project management tools used on Software 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	Be familiar with project management concepts and tools used in software development in industry.	II	Understanding
CO2	Utilize project management tools for developing a variety of software applications.	III	Applying
CO3	Get acquainted with the use of project management tools to achieve quality and industry readiness.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Topics (Applicable for Interaction mode):

1. Overview of different project management tools (e.g Jira).
2. Perform version control and code management using GitHub and SVN.
3. Understanding Version management using Jira.
4. Understanding Workflow and task management.
5. Understanding user and role management.
6. Understanding Project Monitoring and Reporting.
7. Understanding Issue management.
8. Understanding Bug tracking and reporting.
9. Performing software testing using tools (e.g Testlink)
10. Ethical Conduct for Engineers

Textbooks

1	Jira Project Management A Complete Guide - 2019 by Gerardus Blokdyk . The Art of Service
2	Jira Quick Start Guide: Manage your projects efficiently using the all-new Jira by Ravi Sagar
3	Dr.K.V.K.K.Prasad, "Software Testing Tools"

References

1	JIRA Essentials, Third Edition, Patrick Li,Packt enterprise

2	Nina Godbole, “Software Quality Assurance: Principles And Practice”, Alpha Science International, Ltd (August 1, 2004)

Useful Links	
1	https://www.atlassian.com/
2	https://www.javatpoint.com/jira-tutorial
3	https://www.javatpoint.com/software-engineering-case-tools-for-software-metrics
4	https://www.javatpoint.com/github
5	https://www.javatpoint.com/software-testing-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											2	
CO2					3									
CO3				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.

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS321
Course Name	Cloud Computing
Desired Requisites:	Operating System, Computer Networks

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

Course Objectives	
1	An understanding of fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges.
2	Providing basic ideas and principles in cloud management techniques, virtualization techniques and cloud software deployment considerations.
3	Exploring cloud computing driven open source and commercial systems and applications.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Explain the core concepts of the cloud computing paradigm, classify different hypervisors and virtualization techniques based on their characteristics.	Understand
CO2	Apply fundamental concepts in cloud infrastructure models, cloud computing architecture and various deployment models.	Apply
CO3	Illustrate the fundamental concepts of cloud security, privacy, interoperability.	Analyse
CO4	Assess open and commercial cloud platforms to solve problems on the cloud.	Evaluate

Module	Module Contents	Hours
I	**Principles of distributed computing** Eras of computing, Elements of distributed computing – General concepts and definitions, components of a distributed system, architectural styles for distributed computing, models for inter-process communication, Technologies for distributed computing – Remote procedure call, distributed object frameworks. GraphQL, REST API	7
II	**Introduction to Cloud Computing** Cloud Computing (NIST Model) Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics & Disadvantages,Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Role of Open Standards.	5
III	**Cloud Computing Architecture** Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS), Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud.	7

IV	**Virtualization** Introduction, characteristics of virtualized environments, Taxonomy of virtualization Techniques, Virtualization and cloud computing, Pros and Cons of virtualization, technology Examples, Micro-services, Serverless architecture, Hypervisors, Containerization.	6
V	**Cloud Security** Type of attack, Security stack of IaaS, PaaS, SaaS, Gartner's seven cloud computing security Risks, Other cloud security issues: Virtualization, Access Control and identity Management, Application security, Data life cycle management, AWS IAM.	6
VI	**Case Study on Open Source & Commercial Clouds** Eucalyptus, Microsoft Azure, Amazon EC2, Open Stack, Open Nebula, AWS, Free Amazon tiers and Google compute, Problems related to Big data analytics, Metering and Monitoring of cloud infrastructure.	8

Text Books	
1	RajkumarBuyya, James Broberg, Andrzej M. Goscinski ,"Cloud Computing: Principles and Paradigms", Wiley, 1 Edition 2013. 2 3
2	GautamShroff,"Enterprise Cloud Computing - Technology, Architecture, Applications", Cambridge University Press, 2010.
3	Ronald L. Krutz, Russell Dean Vines ,"Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley- India,2010.

References	
1	Barrie Sosinsky,"Cloud Computing Bible", Wiley-India, 2010.
2	
3	

Useful Links	
1	
2	

CO-PO Mapping

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

Assessment

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

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AY 2023-24

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS322
Course Name	Advanced Database System
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	An understanding of the fundamentals in object-based databases and explore the database centric design issues involved in application development, the advances in database system.
2	Providing the methodology to implement the complex and real-world database applications.
3	Evaluation and analysis of the different types of advanced 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	**Exploit** the fundamental concepts involved in advanced databases and apply it in complex data handling.	III	Apply
CO2	**Analyse** the architectures and performance of different databases using **modern tools** for domain specific applications.	IV	Analyse
CO3	**Recommend** the optimal database-based solution to solve real world problem.	V	Evaluate
CO4	**Apply** the acquired knowledge in databases to **design** and **build** the different business applications.	VI	Create

Module	**Module Contents**	**Hours**
I	**Object-Based Databases** Overview, Complex Data Types, Structure Types and Inheritance in SQL, Table Inheritance, Arrays and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Object-Relational Mapping	5
II	**Application development & Administration** Application Programs and User Interfaces, Application Architectures, Standardization, Rapid Application Development, Application Performance, Application Security. Performance Tuning, Performance Benchmarks, Other issues in Application Development	6
III	**Data Warehousing** Introduction, Data Warehouse Building Blocks, Data Warehouse Architecture, Data warehouse design process, dimensional modelling, conceptual modelling, Multi-dimensional data – cube, building the data warehouse – Data Extraction, Transformation and Loading (ETL Process)	8

IV	**Distributed and Cloud Databases** **Distributed databases:** Homogeneous & heterogeneous databases, distributed data storage, distributed transactions, concurrency control in distributed databases, distributed query processing, Heterogeneous distributed databases. **Cloud Databases – I** Introduction, Architecture of a cloud data storage system, Data Models, Transactions and replication, Deployment models, Comparison of Relational databases and Cloud databases, Challenges to develop Cloud Databases.	4 3
V	**Cloud Databases – II** Case study of any four NoSQL databases: Voldemort , MongoDB , Cassandra , Neo4J , Cloud Native , Data Lake	7
VI	**Spatial, Temporal Data and Mobility** Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.	6

Textbooks	
1	Silberschatz, Korth, Sudarshan "Database system concepts" MGH 6th Edition.
2	Raghu Ramkrishnan "Database Management System" MGH
3	Paulraj Ponniah "Data Warehousing - Fundamentals for IT Professional" 2nd Edition. Wiley

References	
1	Thomas Connolly & Carolyn Begg "Database Systems : A practical approach to design, implementation & Management" Pearson 3rd Edition
2	RamezElmasri and ShamkantNavathe, "Fundamentals of Database Systems" Benjamin Cummings, 2nd Ed, 1994.
3	Open source databases official websites
4	W. H. Inmon, "Building the Data Warehouse" Wiley Dreamtech India Pvt. Ltd...
5	RALPH KIMBALL, "The Data Warehouse Life cycle Tool kit" WILEY STUDENT EDITION

Useful Links	
1	https://nptel.ac.in/courses/106/106/106106093/
2	https://freevideolectures.com/course/2280/database-design/37
3	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
4	https://onlinecourses.nptel.ac.in/noc21_cs58/preview
5	https://docs.oracle.com/en/database/oracle/oracle-database/21/dwhsg/

CO-PO Mapping

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

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AY 2023-24

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS323
Course Name	Machine Learning
Desired Requisites:	Basic knowledge of mathematics and statistics

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

Course Objectives	
1	To acquaint students with the meaning, purpose, scope, stages, applications, and effects of machine learning concepts.
2	To share the basic tasks and algorithms in machine learning.
3	To provide understanding of how system learns in supervised and unsupervised learning.
4	To understand how machine learning algorithms works for real life problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain need of using Exploratory Data Analysis and Machine Learning tasks.	II	Understand
CO2	Analyse different learning paradigms and ML techniques to solve real world problems.	IV	Analyze
CO3	Apply different ML algorithms to provide solution for various problems.	III	Apply
CO4	Assess the performance of various machine learning algorithms using standard performance metrics.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Data and Exploratory Data Analysis** Data types and sources, Data summarization, Data visualization, Data pre-processing, Types of learnings	6
II	**Supervised Machine Learning: Regression** Linear regression, Multiple linear regression, Train, dev and test dataset, Performance measure, Bias-variance trade off, Regularization	7
III	**Supervised Machine Learning: Classification** **Binary classification:** Logistic regression, Decision tree based CART, C4.5, SVM, **Multi-class classification:** Multiclass, Multi-label paradigms, Extension of SVM; **Ensemble methods:** Bagging, Boosting, Random Forest	7
IV	**Supervised learning: Advanced** Introduction, Logistic regression using single neuron, Implementing neural networks in python, Activation functions, Multi-layer perceptron, Hyperparameters	7
V	**Unsupervised Learning** **Anomaly Detection:** Introduction, Basic techniques for univariate data, LOF, iForest, **Clustering:** Introduction, BIRCH, Fuzzy clustering	6

VI	**Reinforcement Learning and case study** Introduction, Elements of RL, Bellman equation, Q-learning, Recommender system, Case study of the state-of-the-art application	7

Textbooks	
1	Andriy Burkov , The Hundred-Page Machine Learning Book
2	Mitchell T. M., "Machine Learning", MGH
3	Marsland S., "*Machine Learning: An Algorithmic Perspective*", Chapman & Hall/CRC, 2nd edition 2014.
4	Oliver Theobald, Machine Learning for Absolute Beginners

References	
1	AI and Machine Learning For Coders: A Programmer's Guide to Artificial Intelligence by Laurence Moroney
2	Machine Learning in Action by Peter Harrington

Useful Links	
1	Introduction to Machine Learning Course on NPTEL: Link
2	Machine Learning Specialization on deeplearning.ai: Link

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

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

Assessment

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

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Course Information

Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS371
Course Name	Advanced Database System Laboratory
Desired Requisites:	Database Engineering

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

Course Objectives

1	Practicing the concepts/techniques studied in theory course.
2	Providing hands-on with different database servers / platforms / tools.
3	Designing and implementation of the database based applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Scrutinize different database servers, application architectures / models, frameworks and identify optimal one, suitable for particular application.	IV	Analyze
CO2	Select the advanced/modern databases and recommend for prediction and modelling of complex real world data.	V	Evaluate
CO3	Design and build the different enterprise applications using modern tools.	VI	Create

List of Experiments / Lab Activities/Topics

List of Topics(Applicable for Interaction mode):

List of Lab Activities:

1. Minimum 12 assignments or 6 mini-projects should be practice/perform based on the understanding of concepts covered in theory course.
2. The detail list of assignments/mini-projects will be display by subject teacher.
3. Explore to all the state of the art technology related to each module in theory course.
4. Use industry standard development tools for above laboratory work.
5. All assignments/laboratory work should follow software engineering standards.

Textbooks

1	Silberschatz, Korth, Sudarshan "Database system concepts" MGH 4th Edition
2	Raghu Ramkrishnan "Database Management System" MGH

References

1	Thomas Connolly & Carolyn Begg "Database Systems : A practical approach to design, implementation & Management" Pearson 3rd Edition

2	RamezElmasri and ShamkantNavathe, “Fundamentals of Database Systems” Benjamin Cummings 2nd Ed, 1994
3	Official websites of open source databases
Useful Links	
1	Parallel processing :- https://docs.oracle.com/cd/A58617_01/server.804/a58238/ch2_succ.htm
2	Distributed database:- https://docs.oracle.com/database/121/ADMIN/ds_concepts.htm#ADMIN12134
3	www.mongodb.com , https://cassandra.apache.org
4	https://neo4j.com/developer/cypher/

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1													2	
CO2					2								2	
CO3					3						1		2	3
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	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 Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS372
Course Name	Machine Learning Laboratory
Desired Requisites:	Knowledge of mathematics, statistics and programming concepts

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 perform practical implementation of the different ML algorithms and techniques.
2	To introduce application machine learning algorithms to real-life problems.
3	To get insights of how pure ML algorithms can be used.
4	To develop research interest towards this field.

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 different Exploratory Data Analysis techniques to perform data analysis.	III	Apply
CO2	Analyse and implement supervised and unsupervised ML algorithms.	IV	Analyze
CO3	Design and apply ML algorithms to solve real life problems.	VI	Create
CO4	Evaluate the performance of different machine learning models using standard performance metrics.	V	Evaluate

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Exploratory Data Analysis: Perform following operations on any open dataset available in Python/Kaggle:
   a. Load data into a data frame from a .cvs or any other file format.
   b. Identification of variables and data types.
   c. Display number of rows and columns.
   d. Find Missing Values.
   e. Replace/eliminate missing values
   f. Change column name(s) to short/easy names if required.
   g. Drop unessential columns (feature selection).
   h. Add new columns, if required.
   i. Display first/last n (=5 or 10) rows.
   j. Find mean/min/max of numeric columns.
   k. Find mode of non-numeric columns.
   l. Display unique values in each column.
   m. Display summary of dataframe.
2. Data visualization: Using various plots such as Scatter plot, bar graph, histogram, box plot, explore the relationship between attributes of a dataset using python or t-SNE.
3. Implement and train linear/multiple regression on any open dataset. Report accuracy and F - score.
4. Implement and train logistic regression on any suitable dataset. Report accuracy and F - score.
5. Implement and train SVM classification algorithm using python libraries. Report accuracy and F - score.

6. Implement and train CART for classification task. Report accuracy and F - score.
7. Implement and train single neuron network for logistic regression. Report accuracy and F - score.
8. Implement and train single neuron network for linear regression. Report accuracy and F - score.
9. Implement and train Random Forest. Report accuracy and F - score.
10. Implement LOF algorithm for anomaly detection.
11. Implement BIRCH clustering.
12. Implement Fuzzy-KMeans clustering.
13. Observe effect of dimensionality reduction by implementing a ML model with and without PCA.
14. Design and analyze reinforcement learning based problem.

Textbooks	
1	Bell J., "*Machine Learning Hands-On for Developers and Technical Professionals*", Wiley 2015
2	Mitchell T. M., "Machine Learning", MGH
3	Marsland S., "*Machine Learning: An Algorithmic Perspective*", Chapman & Hall/CRC, 2nd edition 2014.

References	
1	

Useful Links	
2	Introduction to Machine Learning Course on NPTEL: Link
3	Machine Learning Course on CourseEra: Link

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

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AY 2023-24

Course Information	
Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS342
Course Name	Mini-Project II
Desired Requisites:	Nil

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

Course Objectives

1	To use latest design and development tools .
2	To undergo project management techniques and project design principles.
3	To implement the project with appropriate programming languages and testing tools.
4	To develop analytical vision and skills to analyse, compare the outcome with other techniques.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Demonstrate present technological trends through seminar and presentation.	I	Remember
CO2	Demonstrate the appropriate selection of software tool for project implementation.	II	Understand
CO3	Work in teams and participate in group activity of software development.	III	Apply
CO4	Develop a software product and demonstrate its significance	V	Evaluate

List of Experiments / Mini Project Activities/Topics

List of Topics(Applicable for Interaction mode):

List of Mini Project Activities:

1. Mini Project 2 should be on customer specific requirements useful to real life or industry specific, major focus should be on AI/Machine learning /Cyber Security/cloud computing/ Image Processing / Internet (Web) of Things
2. At the end of the semester the project group should achieve all the proposed objectives of the problem statement.
3. The work should be completed in all aspects of design, implementation and testing.
4. Project report should be prepared and submitted in soft and hard form along with all the code and datasets.
5. Group should demonstrate the work with various test cases and results obtained and explain future scope.
6. The group should participate in technical symposiums, paper presentations to demonstrate their work and findings in technical community.

Textbooks

1	Nil

References	
1	Nil
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	2												3	3
CO2	2	3											3	3
CO3		2		3	2								2	
CO4	2										3			3

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

Assessment

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

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

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

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS331
Course Name	Elective II: Remote Sensing & GIS
Desired Requisites:	Fundamentals of Image processing

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

Course Objectives	
1	To introduce the fundamentals of Remote Sensing (RS) and geographical information systems (GIS)
2	To explore various Remote Sensing satellites, their characteristics and data products
3	To inculcate advantages, limitations and interdisciplinary applications of RS and GIS

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Explain fundamental concepts of RS and GIS	Understand
CO2	Interpret and Demonstrate various satellite sensor data, GIS data collected from different resources and GIS database management system.	Apply
CO3	Compare and Analyze RS and GIS data using modern tools and techniques	Analyze
CO4	Select and Verify suitable RS and GIS data and data products to design solution for various interdisciplinary problems using RS and GIS tools and techniques.	Evaluate

Module	**Module Contents**	**Hours**
I	**Concepts and Foundation of Remote Sensing** Introduction, Remote Sensing System, Electromagnetic Energy, Electromagnetic Spectrum and its Characteristics, Energy Interaction in the Atmosphere and with the Earth‟s Surface, Resolution in Remote Sensing, Applications of Remote Sensing.	7
II	**Sensors, Platforms and Satellite Data Products** Broad Classifications of Sensors and Platform, Earth Observation Satellite and Sensors, Data Reception, Transmission and Processing, Remote Sensing Data and Data Products	6
III	**Satellite Image Interpretation and Processing** Interpretation Procedure and Elements, Interpretation strategies and keys, Digital Image processing and Image Analysis steps, Image Rectification and Restoration, Image Enhancement, Image Transformation	7

IV	**GIS – An Overview** Introduction, Geographical concepts and Terminology, Difference between Image Processing system and GIS, Various GIS packages and their salient features, Essentials components of GIS, Utility of GIS, Applications of GIS, GPS, Introduction to ArcGIS	7
V	**GIS Data** Introduction, GIS Data types and Data Representation, Data Acquisition, Georeferencing of GIS Data, Raster and Vector data, Remote Sensing Data in GIS, GIS Database and Database Management System	7
VI	**Spatial Data Analysis** Measurements in GIS-Lengths, Perimeters, and Areas, Queries, Reclassification, Buffering and Neighborhood Functions, Map Overlay, Spatial Interpolation	5

Text Books	
1	Chandra, A.M. and Ghosh, S.K., "Remote Sensing and GIS", Narosa Publishing House. 2008
2	Lo, C.P. and Young, A.K.W., "Concepts and Techniques of Geographical Information System", Prentice Hall India. 20012
3	
References	
1	Lillesand, T.M. and Kieffer, "Remote Sensing and Image Interpretation", - 6th Edition, John Wiley and Sons. 2012
2	Chang, K, "Introduction to Geographical Systems", 4th Edition, Tata McGraw-Hill. 2010
Useful Links	
1	https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ce08
2	https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce10
3	https://www.usgs.gov
4	https://bhuvan.nrsc.gov.in/bhuvan_links.php#

CO-PO Mapping

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

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Course Information

Programme	B.Tech. (Computer Science & Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS332
Course Name	Elective II: Soft Computing
Desired Requisites:	

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

Course Objectives

1	Understand comparative performance of soft and hard computing approaches.
2	Provide to students a sound foundation of mathematical, scientific and engineering principles to formulate, solve and analyse learning problems using soft computing.
3	Imbibe capability for innovation in soft computing.
4	Understand hybrid applications of ANN, Fuzzy and GA

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Interpret soft computing schemes using knowledge of discrete mathematics, data structures, theory of computer science and computer architectures.	Understand
CO2	Demonstrate machine learning processes.	Apply
CO3	Compare and analyse soft computing schemes.	Analyse
CO4	Design schemes using soft computing	Create
CO5	Evaluate various schemes of soft computing	Evaluate

Module	**Module Contents**	**Hours**
I	**Module 1: Fundamentals of Neural Networks** Introduction: Soft Computing vs. Hard Computing, Why Soft Computing? Basics: Human Brain, Model of Artificial Neuron, Neural Network Architectures, Characteristics of Neural Networks, Learning Methods; McCulloch-Pitts model.	6
II	**Module 2: Back Propagation Networks (BPN)** BPN Architecture, Back propagation learning, applications: Parity Problem, Encoder Decoder, CNN, RCNN, LeNet, AlexNet, Case study on Post-Blast Re-Entry Time Prediction.	7
III	**Module 3: Unsupervised Learning** Introduction, Self-Organising Maps, ARTI Architecture, ART1 Algorithm, Applications of ART1, case study on anomaly detection	7
IV	**Module 4: Fuzzy Systems** Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.	7
V	**Module 5: Genetic Algorithm** Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc. Solving single-objective optimization problems using GAs.	7

VI	**Module 6: Hybrid Systems** Integration of neural networks, fuzzy logic and genetic algorithms: Hybrid Systems; Neuro-Fuzzy hybrids, Neuro-Evolutionary Hybrids, Fuzzy-Evolutionary Hybrids, GA-based BPN, Simplified Fuzzy ARTMAP.	5

Text Books	
1	"Neural Networks, Fuzzy Logic and Genetic Algorithms", S. Rajasekaran, G. A. VijayalakshmiPai, PHI (ECE).

References	
1	MIT-OCW
2	Hertz, Krogh, Palmer"Introduction to the Theory of Neural Computation"
3	B. Yegnanarayana, PHI, "Artificial Neural Networks"
4	David E. Goldberg, Addison Wesley, "Genetic Algorithms"

Useful Links	
1	https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html

CO-PO Mapping

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

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS333
Course Name	Wireless Sensor Network
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 various protocols required to understand the working of WSN.
2	To develop skills to solve real-world problems.
3	To introduces latest trends in WSN.

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**
1	realize concepts, needs and constraints related to WSN	2	Understanding
2	analyze various network architecture, protocols, communication & processing mechanism used with WSN	4	Analyze
3	apply integrations, nodes, tools & techniques to Crete applications pertaining to domain specific requirements effectively	5	Create

Module	**Module Contents**	**Hours**
I	**WSN CONCEPTS & ARCHITECTURES** **Concepts:** Need, Challenges, Benefits, Design principles & Enabling Technologies for Wireless Sensor Networks. Data acquisition, Preprocessing analysis & Mining. **Architecture** Single Node & 3 layer Architecture – Four Components [Sensing, Processing, Trans-receiver & Power unit], Energy Consumption of Sensor Nodes, Optimization Goals and Figures of Merit.	7
II	**WSN NETWORK AND PROTOCOLS** Network types, Devices, Communications. Classifications (static, mobile, deterministic & Non-deterministic) MAC Protocols, Low Duty Cycle Protocols And Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS, Schedule based protocols, Routing Protocols Energy Efficient Routing, Challenges and Issues in Transport layer protocol.	7
III	**WSN Interoperability:** IoT, Cloud platforms, Drones, Robotics, AR/VR and AI, Coverage and connectivity issues in WSN Localization techniques in WSN.	6

IV	**NODES, PLATFORMS & TOOLS** Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.	7
V	**SENSOR NETWORK PRIVACY & SECURITY** Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.	7
VI	**APPLICATION DOMAINS & CASE STUDIES** **Domains:** Surveillance, HealthCare & Medical, IoT, Forecasting etc. **Potential Case studies**: Under Water Sensor Network, Environmental monitoring, Industrial automation and control, Smart cities and Internet of Things (IoT) integration, Case studies based on 5G/6G, Smart devices and mobile emerging technologies.	6

Textbooks	
1	C. Siva Ram Murthy and B. S. Manoj, ―Ad Hoc Wireless Networks Architectures and Protocols‖, Prentice Hall, PTR, 2004.
2	Holger Karl , Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks‖, John wiley publication, Jan 2006.
3	"Wireless Sensor and Robot Networks: From Topology Control to Communication Aspects" by Abdelhamid Mellouk and Nadjib Badache.
References	
1	Feng Zhao, Leonidas Guibas, ―Wireless Sensor Networks: an information processing approach‖, Elsevier publication, 2004.
2	Charles E. Perkins, ―Ad Hoc Networking‖, Addison Wesley, 2000.
Useful Links	
1	Wireless Ad Hoc and Sensor Networks- https://nptel.ac.in/courses/106105160
2	https://www.coursera.org/learn/smart-device-mobile-emerging-technologies

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		1										
CO3	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)

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AY 2023-24

Course Information

Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS381
Course Name	Elective III Lab: iOS Lab
Desired Requisites:	Programming Lab III

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

Course Objectives

1	To inculcate understanding of swift fundamentals for iOS mobile app development.
2	To introduce selection of appropriate concepts of swift fundamentals for iOS mobile app development.
3	To infuse skills of combining different components for iOS mobile app development to solve real world problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	illustrate the concepts of fundamentals of Swift for iOS application development	III	Applying
CO2	test the concepts and components of swift for iOS app development technologies	IV	Analysing
CO3	select appropriate components of swift for iOS app development technologies to solve real-world problems.	V	Evaluating
CO4	build an iOS app, individually or in a team by combining Swift iOS app development concepts for real-world problems.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

Experiments based on the following concepts will be conducted.

Module 1: Getting Started with App Development

Introduction to swift and playground (Xcode 14), debugging, building and running an app, and Interface Builder

Module 2: Swift Language Basics

Core Data Types, Constants & Variables, String Type, Tuples & Optionals, Statements &Operators, Control Flow & Decisions, Functions, Strings

Module 3: Basic Object-Oriented Programming using Swift

Structures: Types versus instances, Member and static methods, Custom initialization & De-initialization, Classes: Initialization, Methods, Properties

Module 4: Introduction to UIKit

Introduction to UIKit, Displaying Data, Controls in Action, Auto Layout and Stack Views

Module 5: Navigation and Workflows

Optionals, Type Casting and Inspection, Guard, Constant and Variable Scope, Enumerations, Segues and Navigation Controllers

Module 6: Build Your App

Application design cycle, iterate over the design, create a prototype

Textbooks	
1	Develop in swift fundamentals – Apple Education
2	Develop in swift Data Collections - Apple Education
References	
1	Develop in swift fundamentals notes
2	Best Book for Step-by-step Learners: Swift: A Step-by-Step Guide for Absolute Beginners by Daniel Bell
Useful Links	
1	https://docs.swift.org/swift-book/GuidedTour/GuidedTour.html
2	https://docs.swift.org/swift-book/documentation/the-swift-programming-language/

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	2
CO2				2	2								1	1
CO3				2	2								1	1
CO4				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, and preferably to only one PO.

Assessment

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

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

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

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6CS382
Course Name	Elective III Lab: Robotics Lab
Desired Requisites:	Basic programming skills (e.g., proficiency in Python or C++) Understanding of linear algebra and calculus Familiarity with algorithms and data structures

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

Course Objectives	
1	Understand the fundamental concepts and terminologies related to robotics.
2	Design and analyze the kinematics and dynamics of robotic systems.
3	Implement robot perception algorithms for sensing and interpreting the environment.
4	Develop motion planning algorithms to generate optimal robot trajectories.
5	Design and implement robot control algorithms for various tasks.
6	Gain practical experience in programming and controlling robotic systems.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Apply kinematic equations to solve robot manipulator positioning problems.	Applying
CO2	Analyze the performance of a robotic system based on kinematic and dynamic models.	Analyzing
CO3	Evaluate the impact of uncertainty and noise on robot perception and control algorithms.	Evaluating
CO4	Create novel solutions by integrating perception, planning, and control algorithms for a given robotic application.	Creating

Module	Module Contents	Hours
I	Introduction to Robotics • Definition of robotics • History and evolution of robotics • Applications and domains of robotics Robot Kinematics and Dynamics • Coordinate systems and transformations • Forward and inverse kinematics • Jacobians and velocity control • Robot dynamics and control	02

II	Robot Perception • Sensor types and characteristics • Localization and mapping • Object recognition and tracking • Introduction to computer vision techniques	02
III	Motion Planning • Path planning algorithms (e.g., A*, Dijkstra's) • Sampling-based algorithms (e.g., RRT, PRM) • Trajectory generation and optimization • Collision avoidance techniques	02
IV	Robot Control • PID control and its variants • Adaptive and robust control • Force and impedance control • Task-level control and behavior-based architectures	02
V	Robot Programming and Simulation • Robot programming languages (e.g., ROS, Python) • Simulation environments (e.g., Gazebo, V-REP) • Integration of perception, planning, and control	02
VI	Robot Applications and Emerging Trends • Robotic manipulation • Mobile robotics and autonomous navigation • Human-robot interaction • Current trends in robotics research and industry • Automated drone Application and its demonstration	03

Experiment List

Introduction to Robotics:

- Introduction to basic robotic hardware and components.
- Familiarization with robotic systems and architectures.
- Basic programming of robotic systems using robot-specific languages or platforms.

Robot Control and Motion Planning:

- Implementing basic robot control algorithms (e.g., open-loop control, closed-loop control).
- Programming robot movements and trajectories.
- Implementing motion planning algorithms for robot path planning.

Sensors and Perception:

- Working with different sensors used in robotics (e.g., proximity sensors, range finders, vision sensors).
- Calibrating and integrating sensors with the robot system.
- Implementing perception algorithms for tasks such as object detection, tracking, and localization.

Robot Localization and Mapping:

- Implementing localization techniques (e.g., odometry, sensor fusion) to determine the robot's position in the environment.
- Implementing mapping algorithms to create a map of the robot's surroundings.
- Implementing Simultaneous Localization and Mapping (SLAM) algorithms.

Robot Vision and Image Processing:

- Implementing image processing techniques for robot vision tasks.
- Implementing object recognition and tracking algorithms.
- Integrating vision capabilities for tasks such as pick-and-place or visual servoing.

Robot Path Planning and Navigation:

- Implementing path planning algorithms (e.g., A*, Dijkstra's algorithm) for robot navigation.
- Implementing obstacle avoidance algorithms for safe robot movement.
- Integrating perception, localization, and mapping for autonomous robot navigation.

Robot Manipulation and Grasping:

- Implementing robot manipulation algorithms for tasks like pick-and-place or object manipulation.
- Implementing grasping algorithms to enable the robot to grasp and manipulate objects.
- Designing end-effectors and grippers for specific manipulation tasks.

Human-Robot Interaction:

- Implementing human-robot interaction techniques (e.g., speech recognition, gesture recognition).
- Developing robot behavior and interaction protocols for specific applications.
- Designing and implementing interfaces for intuitive robot control and communication.

Text Books	
1	"Robotics: Modelling, Planning, and Control" by Roland Siegwart, et al. Link: https://link.springer.com/book/10.1007/978-3-319-60042-0
2	"Robotics: Science and Systems" edited by Sebastian Thrun, et al. Link: http://www.roboticsproceedings.org/
3	"Introduction to Robotics: Mechanics and Control" by John J. Craig Link: http://cat.middlebury.edu/~shields/jennings/classes/s09/cs462/materials/craig-introduction_to_robotics_mechanics_and_control.pdf
4	"Robotics, Vision and Control: Fundamental Algorithms in MATLAB" by Peter Corke Link: http://www.petercorke.com/RVC/
5	"Robotics: Discover the Science and Technology of the Future" by Harry Henderson Link: https://archive.org/details/Robotics_202102
6	"Robotics: A Project-Based Approach" by James L. Adams Link: https://archive.org/details/roboticsprojectb00adam
References	
1	"Introduction to Autonomous Robots: From Kinematics to Control" by Nikolaus Correll, et al.
2	"Robotics: Modelling, Planning, and Control" by Roland Siegwart, et al.
3	"Introduction to Robotics: Mechanics and Control" by John J. Craig
4	"Robotics, Vision and Control: Fundamental Algorithms in MATLAB" by Peter Corke
Useful Links	
1	https://www.ros.org/
2	http://www.petercorke.com/RTB/
3	http://gazebosim.org/
4	https://gym.openai.com/
5	https://robotacademy.net.au/
6	(https://www.cyberbotics.com/) and RoboDK (https://robodk.com/).

CO-PO Mapping

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

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 & Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6OE378
Course Name	Open Elective II - Soft Computing
Desired Requisites:	

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

Course Objectives

1	Understand comparative performance of soft and hard computing approaches.
2	Provide to students a sound foundation of mathematical, scientific and engineering principles to formulate, solve and analyse learning problems using soft computing.
3	Imbibe capability for innovation in soft computing.
4	Understand hybrid applications of ANN, Fuzzy and GA

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Interpret soft computing schemes	Understand
CO2	Demonstrate machine learning processes.	Apply
CO3	Compare and analyse soft computing schemes.	Analyse

Module	**Module Contents**	**Hours**
I	**Module 1 Introduction to Soft Computing and Fundamentals of Neural Networks:** Introduction: Soft Computing, Soft Computing Vs. Hard Computing. Neural Networks, Fuzzy Logic, Genetic Algorithms. Artificial Neural Network: Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs	7
II	**Module 2 Supervised Learning Network:** Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network, Radial Basis Function Network, Time Delay Neural Network, Functional Link Networks, Tree Neural Networks.	7
III	**Module 3 Unsupervised Learning Networks:** Fixed Weight Competitive Nets, Kohonen Self- Organizing Feature Maps, Learning Vector Quantization, Counter propagation Networks, Adaptive Resonance Theory Network Stability Analysis of a Class of Artificial Neural Network Systems: Stability Conditions of a Class of Non-Linear Systems	5
IV	**Module 4 Introduction to Fuzzy Logic and Fuzzy Logic Controller:** Classical Sets and Fuzzy Sets, Fuzzy Relations, Membership Functions, Operations on Fuzzy sets, Fuzzification Methods, Defuzzification Methods **Fuzzy Rule Base and Approximate Reasoning:** Truth Values and Tables in Fuzzy Logic, Fuzzy Propositions, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert System, Fuzzy Decision Making **Fuzzy Logic Control Systems:** Control System Design, Architecture and Operation of FLC System, FLC System Models, Application of FLC Systems	8

V	**Module 5 Genetic Algorithm** Fundamentals: Biological background, Creation of Offsprings, Working Principle, Encoding, Reproduction ; Mathematical Foundations; Data Structure: Mutation, Crossover, Selection; Applications	7
VI	**Module 6 Hybrid Systems** Integration of neural networks, fuzzy logic and genetic algorithms: Hybrid Systems; Neuro-Fuzzy hybrids, Neuro-Evolutionary Hybrids, Fuzzy-Evolutionary Hybrids, GA-based BPN, Simplified Fuzzy ARTMAP. Applications of Soft Computing to different engineering systems.	5

Text Books	
1	"Neural Networks, Fuzzy Logic and Genetic Algorithms",S. Rajasekaran, G.A.VijayalakshmiPai, PHI (ECE).
2	Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa, John Wiley & Sons, 2018, 3rdEdition.

References	
1	Hertz, Krogh, Palmer"Introduction to the Theory of Neural Computation"
2	B. Yegnanarayana, PHI, "Artificial Neural Networks"
3	David E. Goldberg, Addison Wesley, "Genetic Algorithms"
4	Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms: Industrial Applications, Lakshmi C. Jain, N. M. Martin, CRC Press, 1998.

Useful Links	
1	https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html

CO-PO Mapping

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

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

Assessment (for Theory Course)

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-2024

Course Information	
Programme	Third Year B.Tech
Class, Semester	Sem I and Sem II
Course Code	6HS303
Course Name	Humanities II : German Language
Desired Requisites:	10+2 level English

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

Course Objectives	
1	To acquire German language skills both written and spoken
2	Enable students to communicate in German language in day to day situations

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Communicate clearly in German in different scenario	Apply
CO2	Handle oral and written communications in German language confidently	Understand

Module	**Module Contents**	**Hours**
I	**Module 1 : Greetings** 1. To introduce oneself and others 2. Greeting people/colleagues at office/work-place etc. 3. Exchanging information about country of origin 4. Place of residence, professions 5. Things that we eat and drink	4
II	**Module 2 :** 1. Date and Days of Week 2. Names of months 3. Numbers 1 to 1000 4. Names of Continents, Countries and their Capitals 5. Languages and Nationalities, main cultural festivals 6. Health and Parts of body	5
III	**Module 3 :** **Sentence Structure and Vocabulary Building** 1.Alphabet, 2.Personal Pronouns 3.German Articles 4.Genders 5.Plural Forms 6. Nouns	2
IV	**Module 4 :Grammar** 1.Forming questions, 2.Prepositions, 3. Conjunctions,4.Verbs ,5.Dative and Accusative forms with examples, 6. Opposites	6
V	**Module 5 : Oral Communication** 1. Asking for and telling telephone numbers with dial code numbers 2. Making request 3. Word order in sentences/statements and full question 5. Speak on given topic 6. Asking questions (Forming Question)	5

VI	**Module 6 : Written Communication : Basic Writing Skills** 1. Paragraph Writing 2. Comprehension 3. Short Essay Writing 4. Filling in Personal Information	4

Text Books	
1	.Hartmut Auf der strasse, Heiko Bock, Mechthild Gerdes, Jutta Mueller, Helmut Mueller,"Themen Aktuell1- Deutsch als Fremdsprache-Kursbuch",Max Hueber Verlag,Munich,Germany and Langers International Pvt.Ltd.,New Delhi ,ISBN: 3-19-0001690-9,Reprint 2014
2	.Hartmut Auf der strasse, Heiko Bock, Mechthild Gerdes, Jutta Mueller,Helmut Mueller,"Themen Aktuell1- Deutsch als Fremdsprache-Arbeitsbuch",Max Hueber Verlag,Munich,Germany and Langers International Pvt.Ltd.,New Delhi ,ISBN: 3-19-011690-3,Reprint 201
3	Alan B, Jones A."Themen Aktuell 1- Deutsch als Fremdsprache - Glossar",Max Hueber Verlag, Munich,Germany and Langers International Pvt.Ltd.,New Delhi ,ISBN: 3-19-0001690-9,Reprint 2014
References	
1	Archana Gogate, "German Workbook", Shubhasha Publications,Pune, Reprint July 2016
2	Stefanie Dengler,Paul Rusch,Helen Schmitz,Tanja Sieber, "Netzwerk A1- Deutsch als FremdspracheKursbuch ",Klett Langenscheidt, Munich,Germany and GOYAL Publishers Pvt. Ltd.,New Delhi, First Indian edition-2015
3	Stefanie Dengler,Paul Rusch,Helen Schmitz,Tanja Sieber, "Netzwerk A1- Deutsch alsFremdspracheArbeitsbuch ",Klett Langenscheidt,Munich,Germany and GOYAL Publishers Pvt.Ltd.,New Delhi, First Indian edition-2015
4	Stefanie Dengler,Paul Rusch,Helen Schmitz,Tanja Sieber, Gavin Schalliol"Netzwerk A1- Deutsch alsFremdsprache- Glossar ",Klett Langenscheidt, Munich, Germany and GOYAL Publishers Pvt.Ltd.,New Delhi, First Indian edition-2015
Useful Links	
1	www.klett-sprachen.de/netzwerk
2	www.cornelsen.de/studio-d

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

Walchand College of Engineering, Sangli

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AY 2023-2024

Course Information

Programme	Third Year B.Tech
Class, Semester	Sem I and Sem II
Course Code	6HS304
Course Name	Humanities II : French Language
Desired Requisites:	10+2 level English

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

Course Objectives

1	To acquire French language skills both written and spoken
2	Enable students to communicate in French language in day to day situations

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Communicate clearly in French in different scenario	Apply
CO2	Handle oral and written communications in French language confidently	Understand

Module	Module Contents	Hours
I	**Module 1 :** 1. To introduce oneself and others 2. Greeting people/colleagues at office/work-place etc. 3. Exchanging information about country of origin 4. Place of residence, professions 5. Things that we eat and drink	4
II	**Module 2 :** 1. Date and Days of Week 2. Names of months 3. Numbers 1 to 1000 4. Names of Continents, Countries and their Capitals 5. Languages and Nationalities, main cultural festivals 6. Health and Parts of body	5
III	**Module 3 :** **Sentence Structure :** 1.Alphabet, 2.Personal Pronouns 3. French Articles 4.Genders 5.Plural Forms 6. Nouns	2
IV	**Module 4: Grammar** 1.Opposites ,2. Plurals, 3.preposition, 4. Adjectives,5. Gender, 6. Negation	6
V	**Module 5 : Spoken Language** 1. Asking for and telling telephone numbers with dial code numbers 2. Making request 3. Word order in sentences/statements and full question 5. Speak on given topic 6. Asking questions (Forming Question)	5

VI	**Module 6 : Basic Writing Skills** 1. Paragraph Writing 2. Comprehension 3. Short Essay Writing 4. Filling in Personal Information	4

Text Books	
1	Jumelage
2	En Èchanges
Refe	

CO-PO Mapping

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

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

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

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

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information

Programme	B.Tech. (all branches)
Class, Semester	Third Year B. Tech., Sem. V/VI
Course Code	**6HS306**
Course Name	Introduction to Entrepreneurship
Desired Requisites:	--

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

Course Objectives

1	To create the awareness among the students for innovation, startup and the entrepreneurial eco system.
2	To provide the platform of the entrepreneurial process for the generation of creative ideas to explore the feasibility of enterprise formation.
3	To provide the background, tools, and life skills to participate in the entrepreneurial process within a large company, in a new venture, or as an investor.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	**Exploit** the concept, meaning and features of entrepreneurship.	Apply
CO2	**Analyse** the business environment in order to identify business opportunities	Analyse
CO3	**Evaluate** the legal and financial conditions for starting a business venture.	Evaluate
CO4	**Interpret** the business plan, pitch to the investor and **build** the enterprise.	Create

Module	**Module Contents**	**Hours**
I	**THE ENTREPRENEURIAL PERSPECTIVE** The Entrepreneurial Mind-Set , Corporate Entrepreneurship , Generating and Exploiting New Entries	4
II	**FROM IDEA TO THE OPPORTUNITY** Human Centric Design Approaches, Creativity and the Business Idea , Identifying and Analysing Domestic and International Opportunities , Protecting the Idea and Other Legal Issues for the Entrepreneur	5
III	**FROM THE OPPORTUNITY TO THE BUSINESS PLAN** The Business Plan: Creating and Starting the Venture , The Marketing Plan , The Organizational Plan , The Financial Plan	4
IV	**FROM THE BUSINESS PLAN TO FUNDING THE VENTURE** Sources of Capital , Informal Risk Capital, Venture Capital, and Going Public	4
V	**FROM FUNDING THE VENTURE TO LAUNCHING, GROWING, AND ENDING THE NEW VENTURE** Strategies for Growth and Managing the Implications of Growth , Accessing Resources for Growth from External Sources , Succession Planning and Strategies for Harvesting and Ending the Venture	5

VI	**Case Study and Experience Sharing** Case study of 3 to 4 successful entrepreneurs covering above theory. Case study of 2 to 3 failure entrepreneurs.	4

Text Books	
1	Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd , "ENTREPRENEURSHIP" MGH 10th Edition.
2	Howard , Allan , Donald "Entrepreneurship : Theory / Process / Practice" Cengage Learning 4th Edition
3	William Bygrave , Andrew Zacharakis "Entrepreneurship" Wiley 2nd Edition
References	
1	Lee A. Swanson "Entrepreneurship and Innovation Toolkit" 3rd Edition
2	Lee A. Swanson "BUSINESS PLAN DEVELOPMENT GUIDE" 8th Edition
3	Hitesh Jhanji "ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT" Lovely Professional University, India
Useful Links	
1	https://www.youtube.com/watch?v=uhU5I2LcshU
2	https://open.umn.edu/opentextbooks/textbooks/business-plan-development-guide
3	https://open.umn.edu/opentextbooks/textbooks/entrepreneurship-and-innovation-toolkit

CO-PO Mapping

	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1											3				
CO2							2								
CO3									3						
CO4										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 in-semester examinations in the form of online quiz and group activity of 30 marks each as LA1 and LA2. There shall be End-Sem examination (ESE) of 40 marks. LA1 shall be typically on modules 1,2 and 3, and LA2 shall be typically on modules 4,5 and 6. ESE shall be on all modules. The list of assignments / group activity will be shared at the end of each module.

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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	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)

Walchand College of Engineering, Sangli

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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.				

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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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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.				

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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)

Walchand College of Engineering, Sangli

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AY 2024-25

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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AY 2024-25

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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AY 2024-25

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)

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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	

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

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	6CS431
Course Name	Elective V: Computer Forensics
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 understand the principles and methodologies of cyber forensics.
2	To develop practical skills in collecting, preserving, and analyzing digital evidence.
3	To apply forensic tools and techniques to investigate cybercrimes.
4	To comprehend the legal and ethical considerations in cyber forensics investigations.

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 principles and methodologies of cyber forensics.	II	Understanding
CO2	Develop practical skills in collecting, preserving, and analyzing digital evidence.	III	Applying
CO3	Apply forensic tools and techniques to investigate cybercrimes.	IV	Applying
CO4	Comprehend the legal and ethical considerations in cyber forensics investigations.	V	Evaluating

Module	**Module Contents**	**Hours**

I	Introduction to Cyber Forensics :
	• Overview of Cyber Forensics
	  • Definition and scope of cyber forensics
	  • Importance in digital investigations
	• Cybercrime Landscape
	  • Types of cybercrimes
	  • Common attack vectors and threats
	• Fundamentals of Digital Forensics
	  • Key concepts and principles
	  • Goals and objectives of cyber forensics
		6

II	Digital Evidence Collection and Preservation:
	• Understanding Digital Evidence
	  • Types of digital evidence
	  • Characteristics and properties of digital evidence
	• Evidence Collection Procedures
	  • Legal considerations and best practices
	  • Chain of custody and documentation
	• Evidence Preservation Techniques
	  • Data imaging and duplication
	  • Hashing and integrity verification
		8

III	Forensic Tools and Techniques:
	• Introduction to Forensic Tools
	  • Types of forensic software and hardware
	  • Popular forensic toolkits and their capabilities
	• File System Analysis
	  • Recovering deleted files and partitions
	  • File carving techniques
	• Network Forensics
	  • Investigating network traffic
	  • Analyzing logs and packets
		10

IV	Network and Memory Forensics :
	• Network Forensics
	  • Protocols and network analysis tools
	  • Detecting and analyzing network-based attacks
	• Memory Forensics
	  • Understanding volatile data
	  • Memory acquisition and analysis techniques
		8

V	Mobile Device and Multimedia Forensics :
	• Mobile Device Forensics
	  • Forensic challenges with smartphones and tablets
	  • Acquisition and analysis of mobile data
	• Multimedia Forensics
	  • Analyzing digital images, audio, and video
	  • Authenticity and tampering detection techniques
		8

VI	Legal and Ethical Considerations in Cyber Forensics :
	• Laws and Regulations
	  • Overview of relevant cybercrime laws
	  • Jurisdictional issues and international cooperation
	• Ethical Guidelines
	  • Professional codes of conduct
	  • Ethics in handling digital evidence
		6

Textbooks	
1	"Computer Forensics: Investigating Network Intrusions and Cybercrime" by EC-Council Press.
2	"Digital Forensics for Dummies" by Linda Volonino and Reynaldo Anzaldua.
3	"File System Forensic Analysis" by Brian Carrier.
4	"Investigating the Cyber Breach: The Digital Forensics Guide for the Network Engineer" by Joseph Muniz and Aamir Lakhani.

References	
1	"Handbook of Digital Forensics and Investigation" by Eoghan Casey.

2	"The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics" by John Sammons.
Useful Links	
1	Digital Forensics Framework (DFF): https://en.wikipedia.org/wiki/Digital_Forensics_Framework
2	National Institute of Standards and Technology (NIST) Digital Forensics Website : https://www.digitalforensics.com/?utm_source=google&utm_medium=cpc&utm_campaign=DF-BRS-America&utm_content=602729920252&utm_term=digital%20forensics%20firm&utm_position=&utm_device=c&utm_placement=&utm_target=&utm_matchtype=p&gad_source=1&gclid=CjwKCAjwoPOwBhAeEiwAJuXRh_r2b3fheICpS0PqG9kG8WoBNMNWgcJdvnKiHHed1PwUxaeYyAMYcRoCFo8QAvD_BwE

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

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

Assessment

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

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AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	6CS432
Course Name	Elective V: Computer Vision
Desired Requisites:	Digital Image Processing

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

Course Objectives	
1	To impart knowledge of advanced techniques in computer vision.
2	To acquaint students with the concepts of image processing and computer vision
3	To allow students to compare various algorithms and select the one most appropriate for a particular application.

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 basic concepts, terminology, theories, models and methods in the field of computer vision,	II	Understand
CO2	Apply computer vision techniques and algorithms to solve various problems	II I	Apply
CO3	Analyze different techniques in computer vision for segmentation, image analysis, feature extraction and representation, object tracking and motion detection.	IV	Analyze
CO4	Evaluate the performance of computer vision algorithms using suitable metrics and techniques	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Color Image Processing** Color Fundamentals, Color models, Gray level to color transformations, Basics of Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation	6
II	**Texture Analysis** Definition, Types of texture, Texels, Texture analysis – concept and categories, Approaches to texture analysis, Statistics, Texture descriptors - statistical - Auto-correlation, co-occurrence matrices and features, edge density and direction, local binary partition, Law's texture energy measures, Wavelets and texture analysis.	7
III	**Representation & Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal components for description, Relational Descriptors	6

IV	**Object Recognition & Restoration** **Object Recognition:** Object Detection Vs recognition, Patterns and Pattern Classes, Knowledge Representation, Statistical Pattern Recognition, Neural Nets, Syntactic Pattern Recognition,Optimization Techniques in Recognition. **Restoration:** Image Restoration Model, Noise Models,Restoration using spatial filtering, Reduction using frequency domain filtering.	8
V	**Moving Object Detection and Tracking** Introduction, Background Modeling, Connected Component Labeling, Shadow Detection, Single Object Tracking, Discrete Kalman Filtering, Particle-filter based tracking, Mean-shift tracking, Segmentation tracking via graph cuts	6
VI	**3D Vision** Introduction to 3D imaging ,applications. Case study based on the current trends in 3D imaging	6

Textbooks	
1	R. C. Gonzalez, R. E. Woods, Digital Image Processing, 4th Edition. 2018, PHI
2	A. K. Jain, Fundamentals of Digital Image Processing, PHI

References	
1	Milan Sonka, Vaclav Hlavac, Boyle, Digital Image Processing and Computer Vision, Cengage Learning
2	S. Jayaraman, S. Esakkirajan, T. Veerkumar, Digital Image Processing, Tata McGrawHill
3	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd ed.

Useful Links	
1	NPTEL course: Link
2	NPTEL course: Link

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													
CO2	3		2		2								3	
CO3		3		3										2
CO4				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 canbe 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 VIII
Course Code	6CS433
Course Name	Elective V: Search Engine Design and Optimization
Desired Requisites:	Programming Laboratory – 3, Data Mining

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

Course Objectives	
1	To inculcate understanding of detailed functions of search engines and different SEO techniques.
2	To illustrate working of different search engine designs and different SEO techniques.
3	To emphasize on optimizing design of search engines and use of SEO techniques.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	describe working of search engines and SEO techniques	II	Understand
CO2	illustrate various SEO techniques and use SEO tools	III	Apply
CO3	analyze strengths and weaknesses of SEO techniques and use appropriate SEO technique as per real life scenario and analyze the performance of a website on a search engine using tools and analytical data	IV	Analyze
CO4	compare and contrast different SEO techniques	IV	Analyze

Module	**Module Contents**	**Hours**
I	**Search Engines and SEO Overview** SEO – What is it, History, Evolution and Importance, Types of SEO Techniques, How Search Engines Work, SERP, Google Search Engine Architecture and Algorithm, How Machine Learning in Search Works, Panda Update, Other advanced Search Engine algorithms	5
II	**Keyword Research and Analysis** What is keyword, Importance of Keyword, Keyword Phrases and Keyword Length, Keyword-Value Pyramid, where to start, Keyword Density, Finding Keywords, Keyword Selection Tips, Common Keyword Problems and Solutions, Keyword Analysis Tools	6
III	**On-page Optimization Techniques** The difference – On-page and Off-page optimization, On-page Optimization Techniques - The Page Title, Meta Descriptions & Meta Keywords, Headings, Bold Text, Domain Names & Suggestions, Canonical Tag, Meta Tags, Images and Alt Text, Internal Link Building, The Sitemap, Invisible Text, Server and Hosting Check, Robots Meta Tag, Doorway Pages, 301 Redirects, 404 Error, Duplicate content	9

IV	**Off-page Optimization Techniques** Local marketing of websites on the basis of locations, Social Media optimization techniques, Introduction of link building and its types, Directory submission, Blog and article submission, Forum posting, Forum signatures and commenting, Free classifieds, Classifieds posting, Press release submission, Video submission, Business listing submission, Guest blog, Detail knowledge on Link building and backlinks, Social bookmarking, Photo & Video Sharing, Infographics sharing, Document Sharing, Content Marketing and its importance, Question and answers, Web 2.0 submission, Importance of backlinks / Link building, Home page promoting tips and techniques, Strategies to build qualitative and relevant backlinks, Competitors backlink research and submission. Tracking the links, Submission to do follow websites, RSS Feed submissions.	7
V	**User Interface, Local and Social Media SEO** UX/UI, SEO and UX/UI, Best Practices. Local SEO and its importance, Local Searches, NAP, Directories, Top Local Search Signals, Reviews and Feedback. Introduction to social media SEO and their importance, Social Media Impact on SEO, social media and Local SEO.	6
VI	**SEO Tools, Reporting and Tracking, AI tools for SEO** Keyword Research Tools, On-page SEO Tools, Link Building Tools,Technical SEO Tools, Rank Tracking Tools, Analytics Tools, and Local SEO Tools, AI Tools for SEO	6

Textbooks	
1	Jessie Stricchiola, Stephan Spencer, Eric Enge, "The Art of SEO - Mastering Search Engine Optimization".
2	Moz, "Beginner's Guide to SEO".

References	
1	Adam Clarke, "SEO 2021: Learn search engine optimization with smart internet marketing"

Useful Links	
1	https://analytics.google.com/analytics/academy/course/6

CO-PO Mapping

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

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

Assessment

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

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AY 2024-25

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	6CS434
Course Name	Elective VI: Systems Testing and Quality Assurance Techniques
Desired Requisites:	Software Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	03 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 03			

Course Objectives

1	Understand scalable processes for software life cycle for producing efficient high-quality enterprise software.
2	Acquaint a structured methodology for software lifecycle management encompassing development to maintenance support through eventual retirement phases.
3	Gain proficiency in leveraging existing resources for software development ensuring sustained software quality.
4	Familiarize with methods and tools for quality assurance and maintenance of software applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	articulate a robust set of scalable methods and procedures for software development, resulting in the efficient production of high-quality software for large systems.	II	Understand
CO2	demonstrate a structured software lifecycle management methodology into organizational practices, effectively guiding software projects through all stages from development to retirement.	III	Apply
CO3	practice effectively utilizing available resources for software development, resulting in a reduction of costs while maintaining consistent high-quality standards.	III	Apply
CO4	examine a comprehensive understanding of various methods and tools utilized for testing and maintaining software applications.	IV	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction** **Software Testing:** Introduction, Meaning, what is Bug? Reasons for Bugs, Cost of Bugs, Software Tester Task. **Introduction to Software Development Models**: Software Testing: Testing axioms, Terms & Definitions **Testing Fundamentals**: Types, Black Box, White Box, Static & Dynamic Testing. Static Black Box Testing.	06
II	**Dynamic Black Box Testing:** Test to Pass & Test to Fail, Equivalence Partitioning, Data Testing, State Testing, Other Black Box Testing Techniques. **Static White Box Testing:** Formal Reviews, Peer Reviews, Coding Standards and Guidelines. Review Checklist **Dynamic White Box Testing:** Comparison with Debugging, Testing Pieces: Unit & Integration Testing Configuration Testing: Overview, Software and Hardware Devices. Deciding Hardware Configurations.	07

III	**Compatibility Testing:** Overview, Backward and Forward Compatibility. Testing Multiple versions. Data Sharing Compatibility **User Interface Testing:** Effective UI, Testing for Disabled. Data Coverage & Code Coverage	05
IV	**Documentation Testing:** Types of Documentation, Importance of Documentation Testing. **Security Testing:** Threat Modelling, Buffer Overrun, Safe String Functions, Computer Forensics **Web Site Testing:** Web Page Fundamentals, Black Box Testing: Text, Hyperlinks, graphics, Forms. Gray Box Testing & White Box Testing, Configuration and Compatibility Testing **System Testing:** Recovery Testing, Security Testing, Stress Testing, Performance Testing	08
V	**Planning Testing:** Goals, Test phases, Strategy, Resource Requirements, Schedule, Test Cases, Bug Reporting, Metrics. **Test Cases:** Test Case Planning, Design, Cases, Procedures, Organization and Tracking. **Bug Life Cycle and Tracking System.**	07
VI	**Testing, QA and QC:** Quality Management, Quality Planning Process, Quality Assurance Process, Quality Control process **Organisational Structures:** CMM Capability Maturity Model, ISO 9000.	06

Textbooks	
1	KshirasagarNaik and PriyadarshiTripathy, Software Testing and Quality Assurance: Theory and Practice, John Wiley & Sons, Inc.

References	
1	William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2	Louise Tamres, "Software Testing", Pearson Education Asia, 2002
3	Robert V. Binder, "Testing Object-Oriented Systems-Models, Patterns and Tools", Addison Wesley, 1999.
4	CemKaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993

Useful Links	
1	https://nptel.ac.in/courses/106105150
2	https://freevideolectures.com/course/4875/nptel-software-testing

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

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AY 2024-25

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	6CS435
Course Name	Elective VI: Augmented Reality Virtual Reality (ARVR)
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 gain the knowledge of historical and modern overviews and perspectives on virtual reality.
2	To learn the fundamentals of sensation, perception, and perceptual training.
3	To identify and examine state-of-the art AR and VR design problems and solutions from the industry and academia.
4	To have the scientific, technical, and engineering aspects of augmented and virtual reality 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 Description**
CO1	Understand the concepts, technologies, and applications of virtual and augmented reality (VR/AR).	II	Understanding
CO2	Apply the concepts of AR and VR to design solutions for interdisciplinary problems.	III	Applying
CO3	Compare and differentiate between AR/VR technologies in terms of their taxonomy, hardware components, software requirements, user interaction models, and application areas.	IV	Analyzing
CO4	Evaluate the key performance metrics of AR/VR systems while designing solutions.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction** Introduction to Augmented-Virtual, Mixed and extended Reality, Taxonomy, technology and features of augmented reality, difference between AR, VR, MR and ER, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.	6
II	**AR software development** AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit. **VR systems** VR as a discipline, Basic features of VR systems, Architecture of VR systems, VR hardware : VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays.	7
III	**Virtual Reality Perception** Perception of Space and Time, Perceptual Stability, Attention, and Action, Perception: Design Guidelines, Adverse Health Effects, Motion Sickness, Eye Strain, Seizures, and Aftereffects, Hardware Challenges, Latency, Measuring Sickness, Reducing Adverse Effects, Adverse Health Effects: Design Guidelines	7

IV	**Virtual Reality Interaction** Content Creation, Concepts of Content Creation, Environmental Design, Affecting Behavior, Transitioning to VR Content Creation, Content Creation: Design Guidelines, Interaction, Human-Centered Interaction, VR Interaction Concepts, Input Devices, Interaction Patterns and Techniques, Interaction: Design Guidelines	7
V	**Virtual Reality Toolkit** Open Source Framework for the Community, Data and Machine Learning Visualization Design and Development in Spatial Computing, Character AI and Behaviors, The Virtual and Augmented Reality Health Technology Ecosystem	6
VI	**Applications** Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR	6

Textbooks	
1	The VR Book, Human Centered Design for Virtual Reality Jason Jerald ACM Books.
2	Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufm ann, 2013.
3	Creating Augmented and Virtual Realities Erin Pangilinan, Steve Lukas, Vasanth Mohan.
4	Augmented Reality for Developers: Build practical augmented reality applications with Unity, ARCore, ARKit, and Vuforia" by Jonathan Linowes and Krystian Babilinski.

References	
1	John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
2	Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
3	Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer.

Useful Links	
1	http://msl.cs.uiuc.edu/vr/
2	https://developers.google.com/ar/develop
3	NPTEL

CO-PO Mapping

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

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 Engineering)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	6CS492
Course Name	Project Work II
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	12 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 6			

Course Objectives

1	To experience project management principles to become IT industry savvy
2	To utilize state of the art CASE tools especially for design, development and testing phases.
3	To acquaint the ability to map technical skills to real life applications from customers perspective.
4	To practice of specifying & using artifacts as per quality standards

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	summarize understanding of the problem and articulate it clearly.	II	Understanding
CO2	implement the proposed solution using appropriate tools and techniques.	III	Applying
CO3	identify use of modern engineering tools, software, and techniques utilized during project implementation.	IV	Analyzing
CO4	assess the performance of proposed solution for different measures.	V	Evaluating
CO5	build a solution for identified problem and prepare comprehensive project documentation including reports, technical papers, and design documents	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Preferably project work is to be continued from Project-I
2. Students should maintain a project log book containing weekly progress of the project
3. At the end of the semester project group should achieve all the proposed objectives of the problem statement.
4. The work should be completed in all aspects of design, implementation and testing.
5. Project report and technical artifacts should be prepared, submitted in soft and hard form along with all the code and datasets.
6. Group should demonstrate the work with various test cases and results obtained and explain future scope.
7. The group should participate in technical symposiums, paper presentations to demonstrate their work and findings in technical community.

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.