Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO560
Course Name	Research Methodology
Desired Requisites:	

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

CO1	**Classify** various methods to solve research problem.	Apply
CO2	**Construct** a research problem in respective engineering domain.	Apply
CO3	**Investigate** various data analysis techniques for a research problem.	Analyze
CO4	**Identify** various Intellectual Property Rights procedures	Apply

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

Text Books	
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	Formulate a Research Video
2	Publication Ethics Video
3	Introduction to Copyright Video
4	Roadmap for Patent Creation NPTEL Course: Link

CO-PO Mapping

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

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.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO501
Course Name	Mathematical Foundations of Computer Science
Desired Requisites:	Discrete Mathematics

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 introduce the mathematical fundamentals for computer science and engineering.
2	To study various sampling and classification problems.
3	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	explain the basic notions of discrete and continuous probability.	Apply
CO2	analyze the methods of statistical inference, and the role that sampling distributions play in those methods.	Analyze
CO3	perform correct and meaningful statistical analysis of simple to moderate complexity.	Create

Module	**Module Contents**	**Hours**
I	Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem	6
II	Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood	7
III	Linear algebra and statistics: vectors, vector multiplication, equation of line/plane/hyperplane, stats: gaussion distribution, log normal distribution, power law distribution, variance, co-variance	7
IV	Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of overfitting model assessment.	7
V	Graph Theory: Isomorphism, Planar graphs, graph coloring, Hamiltonian circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems	7
VI	Computer science and engineering applications: Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, Operating systems, Distributed systems, Bioinformatics, Machine learning.	6

Text Books	
1	Trivedi K., Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
2	
3	
References	
1	John Vince, Foundation Mathematics for Computer Science, Springer.
2	Mitzenmacher M. and Upfal E., Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University Press.
3	Tucker Alan, Applied Combinatorics, Wiley
Useful Links	
1	
2	
3	
4	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			3			
CO2	1			2		
CO3	2		3	2	1	
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	10	10	15	**35**
4	Analyze	10	10	15	
5	Evaluate				**35**
6	Create			30	**30**
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO502
Course Name	Advanced Data Structures
Desired Requisites:	Data Structures Basics

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 advanced data structures such as temporal data structures and geometric data structures.
2	To make students familiar with advanced concepts related to trees, graphs, hashing and string matching.
3	To contribute in choosing appropriate data structures and using them for solving real world problems.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	interpret and summarize the purpose and operation of advanced data structures	Understand
CO2	apply and demonstrate knowledge of advanced data structures for solving real world problems.	Apply
CO3	analyse algorithms, compare data structures and evaluate the performance of the advanced data structures	Evaluate

Module	**Module Contents**	**Hours**
I	**Temporal and Geometric data structures** **Temporal data structures** - Persistent data structures - Model and definitions, Partial persistence, Full persistence, Retroactive data structures – Retroactivity, Full retroactivity, Non-oblivious Retroactivity. **Geometric data structures** - One Dimensional Range Searching, Two-Dimensional Range Searching, constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.	8
II	**Advanced Trees** Binary Search Trees, AVL trees, Red-black trees, Splay Trees, Tango Trees	6
III	**Selected Graph Problems** Vertex coloring, edge coloring, Network flows: Max flow – Mincut theorem, Ford-Fulkerson Method, Push-relabel method, Random Graph based analysis.	6
IV	**Hashing** Hash Function, Basic Chaining, FKS Perfect Hashing, Linear Probing, Cuckoo Hashing Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists.	8

V	**String Matching** String Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Predecessor Problem, Tries, Trie node structure and its applications, Suffix trees and suffix arrays.	6
VI	**Miscellaneous** Dynamic trees - Link-cut Trees, Operations on link-cut trees, Dynamic Connectivity, Euler-Tour Trees, Other Dynamic Graph Problems.	6

Text Books	
1	Cormen Thomas H., Leiserson Charles E., Rivest Ronald L., Stein Clifford, *Introduction to Algorithms* PHI, Third Edition, 2009
2	Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars , *Computational Geometry - Algorithms and Applications*, Springer, Third Edition, 2008
3	Erik Demaine, Lecture Notes on MIT Courseware

References	
1	O'Rourke Joseph, *Computational Geometry in C*, Cambridge University Press
2	Diestel Reinhard, *Graph Theory*, Springer-Verlag, 2000
3	Brass Peter, *Advanced Data Structures*, Cambridge University Press.

Useful Links	
1	NPTEL Videos of 'Data Structures and Algorithms' Course: Link
2	Data Structures with Visualization: Link
3	Lecture Videos from Erik Demaine from MIT: Link
4	

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

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

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	5	5	10	**20**
3	Apply	5	5	20	**30**
4	Analyze	5	5	20	**30**
5	Evaluate	5	5	10	**20**
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO551
Course Name	Mathematical foundations of Computer Science Lab
Desired Requisites:	Discrete Mathematics, Programming

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

Course Objectives

1	To demonstrate fundamentals of Mathematical foundations of Computer Science.
2	To have hands-on of Probability, Random variables in computer Mathematics.
3	
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	apply the principles in mathematical foundations of computer science to design real time applications.	Apply
CO2	analyze the complex problems individually or in groups, develop and demonstrate the mathematical and logical basis to modern techniques in Computer Science.	Analyze

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in this domain. Initially, student would be able to understand the usage of different data structures, use them and apply its operations for solving real-world problems. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Student would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Implementation Details (with proper screenshots), Complexity of using particular data structure, Conclusion and Future work.

Text Books

1	Trivedi K., Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
2	
3	

References	
1	John Vince, Foundation Mathematics for Computer Science, Springer.
2	Mitzenmacher M. and Upfal E., Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University Press.
3	Tucker Alan, Applied Combinatorics, Wiley
Useful Links	
1	
2	
3	
4	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			1		1	
CO2	1	1	2			1
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment

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

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	30	60
Analyze	10	20	10	40
Evaluate				
Create				
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO552
Course Name	Advanced Data Structures Lab
Desired Requisites:	Data Structures Basics, Programming

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

Course Objectives

1	To impart knowledge of advanced data structures such as temporal data structures and geometric data structures.
2	To make students familiar with advanced concepts related to trees, graphs, hashing and string matching.
3	To contribute in choosing appropriate data structures and using them for solving real world problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	apply and demonstrate knowledge of advanced data structures for solving real world problems.	Apply
CO2	analyse algorithms, compare data structures and evaluate the performance of the advanced data structures	Evaluate
CO3	Create an application using novel data structures and/ or create our own abstract data type	Create

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in this domain. Initially, student would be able to understand the usage of different data structures, use them and apply its operations for solving real-world problems. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Student would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Implementation Details (with proper screenshots), Complexity of using particular data structure, Conclusion and Future work.

Text Books

1	Cormen Thomas H., Leiserson Charles E., Rivest Ronald L., Stein Clifford, *Introduction to Algorithms* PHI, Third Edition, 2009
2	Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars , *Computational Geometry* -

	Algorithms and Applications, Springer, Third Edition, 2008
3	Erik Demaine, Lecture Notes on MIT Courseware
References	
1	O'Rourke Joseph, *Computational Geometry in C*, Cambridge University Press
2	Diestel Reinhard, *Graph Theory*, Springer-Verlag, 2000
3	Brass Peter, *Advanced Data Structures*, Cambridge University Press.
Useful Links	
1	NPTEL Videos of 'Data Structures and Algorithms' Course: Link
2	Data Structures with Visualization: Link
3	Lecture Videos from Erik Demaine from MIT: Link

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			2			
CO2	3					2
CO3		2		2	1	
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	5	35
Analyze	10	10	10	30
Evaluate		10	10	20
Create			15	15
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO553
Course Name	Presentation and Technical Report Writing
Desired Requisites:	

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

Course Objectives

1	To provide an opportunity to students to do work independently on a topic.
2	To encourage creative thinking process in technical report writing
3	To enable students for good technical report writing and effective presentations.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	demonstrate the characteristics of technical and business writing.	Apply
CO2	use a variety of materials to produce appropriate visual presentation for documents, such as instructions, descriptions, and research reports.	Evaluate
CO3	produce documents related to technology and writing in the workplace and will have improved their ability to write clearly, concisely, and accurately.	Create

Course Content

This course introduces students to the discipline of technical communication. Preparation of visuals to supplement text, workplace communication, descriptions of mechanisms, explanations of processes, and writing reports are the major topics included.
This course is designed for students enrolled in technical degree programs for making them industry ready.

Text Books

1	Suitable books based on the contents of the topic.

References

1	Suitable books based on the contents of the selected topic and research papers from reputed national and international journals and conferences.

Useful Links

1	As per the need of the topic of report and presentation

CO-PO Mapping

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

CO3		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

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 (Marks) (For lab Courses)

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO554
Course Name	Professional Skills 1
Desired Requisites:	

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

Course Objectives	
1	To provide a hands-on experience of software for model building
2	To provide a hands-on experience of using methods from libraries in basic Python libraries.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, students will be able to,		
CO1	Apply different methods of the software effectively	Apply
CO2	Develop the solution for computer science engineering problems using the software	Create

Course Content

This course is based on having hands-on experience when using Python programming languages for implementation. In the modern-day work environment, the computer engineer should be able to simulate and solve simple problems using existing APIs provided as a part of basic libraries. The employability of the student can be enhanced by providing software training of this course to every student.

Text Books

1	Suitable books based on the software selected.

References

1	Suitable books based on the contents of software selected

Useful Links

1	As per the need of the software training

CO-PO Mapping

	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	3		2			
CO2				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				
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 (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	20	20	10	**50**
Analyze				
Evaluate				
Create	10	10	30	**50**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO511
Course Name	Elective 1 - Introduction to Artificial Intelligence
Desired Requisites:	Data Structures, Probability

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 introduce the variety of concepts in the field of artificial intelligence.
2	To discuss the philosophy of AI, and how to model a new problem as an AI problem.
3	To prepare student to take a variety of focused, advanced courses in various subfields of AI.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Demonstrate first algorithms to solve each formulation.	Apply
CO2	Examine a variety of such as search, logic, Bayes nets, and MDPs, which can be used to model a new problem.	Analyze

Module	**Module Contents**	**Hours**
I	Introduction: Philosophy of AI, Definitions, Modelling a Problem as Search Problem, Uninformed Search	6
II	Heuristic Search, Domain Relaxations, Local Search, Genetic Algorithms	7
III	Adversarial Search, Constraint Satisfaction	7
IV	Propositional Logic & Satisfiability, Uncertainty in AI, Bayesian Networks	7
V	Bayesian Networks Learning & Inference, Decision Theory, Markov Decision Processes	7
VI	Reinforcement Learning, Introduction to Deep Learning & Deep RL	6

Text Books	
1	Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall, Third Edition (2009)
2	
3	

References	
1	Ian GoodFellow, Yoshua Bengio & Aaron Courville, Deep Learning, MIT Press (2016).
2	
3	

Useful Links	
1	NPTEL Videos of 'Introduction to Artificial Intelligence' Course: Link
2	
3	
4	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1				2		
CO2	2			3	1	2
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	10	10	30	**50**
4	Analyze	10	10	30	**50**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO512
Course Name	Elective 1 - Image Processing
Desired Requisites:	Mathematics – Linear Algebra, Probability Theory

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 knowledge about fundamentals of digital image processing.
2	To illustrate concepts of image transforms, image enhancement, image segmentation, morphological operations, color image processing, compression.
3	To apply the image processing algorithms to real world problems.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	explain fundamental concepts of digital image processing, mathematical transforms, image enhancement, segmentation, morphology, compression	Understand
CO2	apply image processing algorithms to solve real life problems and compare the results	Apply, Analyze
CO3	design and compare different image processing algorithms	Evaluate

Module	**Module Contents**	**Hours**
I	**Digital Image Fundamentals** **Introduction:** Concept, Fundamental Steps and Components of Image Processing System **Digital Image Fundamentals:** Image Acquisition, A simple image model, Sampling and Quantization, Imaging Geometry, Different types of digital images	6
II	**Image Transforms** 2D systems and Necessary Mathematical preliminaries, 2D Orthogonal and Unitary Transforms, 1-D DFT, KL-Transforms, Cosine, Hadamard Transforms, Introduction to Wavelet transforms	8
III	**Image Enhancement** Point Processing, Basic Gray Level Transformations, Histogram Processing, Spatial domain Filtering, Frequency 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, Hough Transform, Active Contour, Watershed Transform, Region-based Segmentation – region growing, region splitting and merging, Feature Extraction	8

V	**Image Compression** Fundamentals, Compression model, Lossless Vs Lossy Compression, Fundamentals of Information Theory, Run-length coding, Huffman coding, Dictionary-based compression, Predictive coding, Transform-based coding, Image Compression Standards	6
VI	**Morphological Image Processing** Introduction, Dilation and Erosion, Opening and Closing, The Hit-or-miss transformation, Basic Morphological Algorithms, Boundary Extraction, Region Filling, Extraction of connected components, Thinning, Thickening	6

Text Books	
1	Gonzalez R. C., Woods R. E., "*Digital Image Processing*", PHI, Second Edition. 2002
2	Jain A. K., "*Fundamentals of Digital Image Processing*", PHI
3	
4	

References	
1	Sonka Milan, Vaclav Hlavac, Boyle, "*Digital Image Processing and Computer Vision*", Cengage Learning, Third edition, 2013
2	S. Jayaraman, S. Esakkirajan, T. Veerkumar, "*Digital Image Processing*", Tata McGrawHill, Third edition, 2010
3	
4	

Useful Links	
1	NPTEL Videos of 'Digital Image Processing' Course: Link
2	Digital Image Processing Laboratory (Arizona): Link
3	Few Videos on DIP: Link
4	

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

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

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	5	5	10	**20**

3	Apply	5	5	20	**30**
4	Analyze	5	5	20	**30**
5	Evaluate	5	5	10	**20**
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO513
Course Name	Elective 2 - Data Science
Desired Requisites:	Database Concepts

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 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

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

CO1	Implement data collection and management using different technologies.	Apply
CO2	Explain how data is collected, managed and stored for data science.	Analyze
CO3	Study the key concepts in data science, including their real-world applications and toolkits used by data scientists.	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction to core concepts and technologies**: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications	6
II	**Data collection and management**: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.	6
III	**Data Preprocessing**: Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.	8
IV	**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.	8
V	**Data visualization**: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, visual encodings.	6
VI	**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.
3	
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	'Foundations of Data Science' : Link
2	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1				2		
CO2	2			3	1	2
CO3	1		2		1	1
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	10	10	30	**50**
4	Analyze	10	10	30	**50**
5	Evaluate				
6	Create				
Total		**20**	**20**	**20**	**20**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO514
Course Name	Elective 2 - Advanced Network Technologies
Desired Requisites:	Knowledge of Data Communication and Computer Networks

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 explain key concepts of wireless networks, standards, technologies and their basic operations.
2	To appraise architectures, functions and performance of wireless sensor network systems.
3	To examine SDN/NFV motivation and its benefits in data center

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	apply acquired knowledge to recognize the performance and related issues of different wireless network technologies	Apply
CO2	apply acquired knowledge to recognize the performance and related issues of Software Defined Networks	Apply
CO3	analyze different networks with case study and analyze SDN/NFV techniques in Data center	Analyze

Module	Module Contents	Hours
I	**Fundamentals of Wireless Communication** Wireless Communication System, Wireless Media Frequency Spectrum, Technologies in Digital Wireless Communication, Wireless Communication Channel Specifications, Types of Wireless Communication Systems, Dense wavelength division multiplexing **Wireless Body Area Networks** Properties, Network Architecture, Network Components, Design Issues, Network Protocols, WBAN Technologies, Research issues and applications	7
II	**Wireless Personal Area Networks and Wireless Local Area Networks Wireless Metropolitan Area Networks** Properties, Network Architecture, Components, Technologies and Protocols (Wifi 6, 5G, Optical Networking, SONET SDH Standard), Research issues and Applications	6
III	**Wireless Wide Area Networks and Wireless Ad Hoc Networks** Properties, Network Architecture, Components, Technologies and Protocols, Research issues and Applications	7
IV	**Evolution of Software Defined Networking (SDN)** Separation of Control Plane and Data Plane: Concepts, Advantages and Disadvantages, OpenFlow protocol. Control Plane: Introduction of existing SDN Controllers including Floodlight and Open Daylight projects. Data Plane: Software-based and Hardware based; Programmable Network Hardware. Programming SDNs: Northbound Application Programming Interface	7

V	**Network Virtualization** Concepts, Applications, Existing Network Virtualization Framework (VMWare and others),(assignments related to Mininet based examples) **Network Functions Virtualization (NFV) and SDN:** Network architecture, NFV Infrastructure, NFV Management and Orchestration (MANO), NFV and SDN	6
VI	**Data Center Networks** Data Center Networks: Packet, Optical and Wireless Architectures, Network Topologies. Use Cases of SDNs: Data Centers, Backbone Networks, Home Networks, Traffic Engineering.	6

Text Books	
1	Sunilkumar S., Mahabaleshwar Manvi, Kakkasageri S., "Wireless and Mobile Networks: Concepts and Protocols", Wiley Second edition, 2016.
2	Schiller J, "Mobile Communications", Addison Wesley, 2000
3	Stallings W, "Wireless Communications and Networks", Pearson Education, Schiller, 2005.
4	Nadeau Thomas D., "SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies", Ken Gray Publisher: O'Reilly Media, August 2013.
5	Goransson Paul and Black Chuck, "Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann, June 2014.

References	
1	Stojmenic Ivan, "Handbook of Wireless Networks and Mobile Computing", John Wiley and Sons Inc 2002.
2	Yi Bing Lin and Imrich Chlamtac, "Wireless and Mobile Network Architectures", John Wiley and Sons Inc 2000.
3	Pandya Raj, "Mobile and Personal Communications Systems and Services", PHI 2008.
4	Dargie W. and Poellabauer C., "Fundamentals of Wireless Sensor Networks –Theory and Practice", Wiley 2010.
5	Kazem Sohraby, Minoli Daniel and Znati Taieb, "wireless sensor networks -Technology, Protocols, and Applications", Wiley Interscience, 2007.
6	Hara Takahiro, Zadorozhny Vladimir I, and Buchmann Erik , "Wireless Sensor Network Technologies for the Information Explosion Era", Springer, 2010.

Useful Links	
1	Coursera Link

CO-PO Mapping

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

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

Assessment

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)

Bloom's Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand				
3	Apply	15	15	40	67
4	Analyze	5	5	20	33
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5CO515
Course Name	Elective 2- Advanced Database Systems
Desired Requisites:	Database Engineering Basics

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 comprehend the essential principles of the design, analysis and use of contemporary DBMS systems.
2	To implement Web database applications that interact with a back end DBMS.
3	To provide the methodology to implement the complex and real world database applications.
4	To implement data warehouse to perform OLAP operations.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply fundamental concepts involved in advanced databases in complex data handling applications.	Apply
CO2	Analyze the architectures and performance of different databases for domain specific applications.	Analyze
CO3	Apply the acquired knowledge in databases to design and build the different business applications.	Create

Module	**Module Contents**	**Hours**
I	**Parallel Database** Introduction, I/O parallelism, Inter-query parallelism, Intra-query parallelism, Intra-operation parallelism, Inter-operation parallelism, parallel query processing.	7
II	**Distributed Database** Distributed dbms, Data fragmentation, Replication, and allocation techniques for distributed database, Query processing in distributed databases.	6
III	**Multimedia Databases** Multimedia database system fundamentals, Multimedia data access, Multimedia information modelling and querying, Multimedia storage and retrieval.	6
IV	**Spatial Databases** Types of spatial data and queries, Application involving spatial data, Spatial indexes, Indexing based on space filling curves, Grid files, r-trees: point and region data.	8
V	**Data Warehouse and OLAP** Introduction to Decision Support, Data Warehousing, Creating and maintaining a warehouse. OLAP: Multidimensional data Model, OLAP	7

	Queries, Database design for OLAP.	
VI	**Advanced Topics** Case Studies and Applications-Graph Database, NoSql database, Firebase etc.	5

Text Books	
1	Silberschatz, Korth & Sudarshan, "Database System Concepts." MGH. 6th Edition 2011
2	Ramakrishnan & Gehrke, "Database Management System." MGH. 3rd Edition 2003
3	Spatial database by Shashi shekhar,sanjay chawla "Pearson education"
4	

References	
1	Jeffrey A. Hoffer, Mary B. Prescott, Fred R. McFadden, "Modern Database Management." Pearson, 6th Edition 2002.
2	V.S. Subrahmanian, "Multimedia database systems", Springer.
3	Jiawei Han and Micheline Kamber, "Data Mining –concepts and Technique", 3rd Edition, Morgan Kaufmann, 2012.
4	

Useful Links	
1	Parallel processing :- Link
2	Distributed database:- Link
3	NoSQL Databases:- MongoDB , Cassandra
4	Graph Database:- Link

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1				2		
CO2		2		3		
CO3			2	3	1	
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	10	10	20	**40**
4	Analyze	10	05	20	**35**
5	Evaluate				
6	Create		05	20	**25**
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO521
Course Name	Advanced Algorithms and Applications
Desired Requisites:	Design and Analysis of Algorithms Basics

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 introduce students to the advanced methods of designing and analysing algorithms.
2	To allow students choose appropriate algorithm and use it for a specific problem.
3	To impart knowledge of different classes of problems along with recent developments in the area of algorithmic design.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	apply algorithms involving different strategies for problem solving	Apply
CO2	analyze algorithm for given problem at hand	Analyze
CO3	evaluate the complexity of the algorithm	Evaluate

Module	**Module Contents**	**Hours**
I	**Elementary Algorithms** **Sorting:** Review of various sorting algorithms **Graph:** Topological sorting, Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.	8
II	**Graph Algorithms** **Matroids:** Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to Minimum Spanning Tree. **Shortest Path in Graphs:** Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.	6
III	**Parallel Algorithms** Introduction, Data and Temporal parallelism, RAM and PRAM Model, Shared Memory and Message Passing Models, PRAM Algorithms: Prefix Sum, List Ranking, Merging two sorted lists, Matrix multiplication, Analysis of PRAM Algorithms.	7
IV	**Modulo Representation and DFT** **Modulo Representation of integers/polynomials**: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation, Powers of an element, The RSA public-key cryptosystem. **Discrete Fourier Transform (DFT):** In complex field, DFT in modulo ring.	7

	Fast Fourier Transform algorithm.	
V	**NP-completeness:** Basic concepts of complexity classes- P, NP, NP-Hard, NP-Complete, Examples, Proof of NP-hardness and NP-completeness. **One or more of the following topics based on interest-** Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm	6
VI	**Recent Trends** Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.	5

Text Books	
1	Cormen Thomas H., Leiserson Charles E., Rivest Ronald L., Stein Clifford, *Introduction to Algorithms* PHI, Third Edition, 2009
2	Aho, Hopcroft, Ullman, *The Design and Analysis of Computer Algorithms*, Addison-Wesley Pub. Co., 1974.
References	
1	Kleinberg and Tardos, *Algorithm Design*, Pearson Education Limited
2	Robert Sedgewick, "*Algorithms in C++*", Addison-Wesley Professional, Third Edition
Useful Links	
1	NPTEL Videos of '*Data Structures and Algorithms*' Course: Link
2	Data Structures with Visualization: Link

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1				2		
CO2	2			3		
CO3	1		1			2
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	5	5	10	**20**
3	Apply	5	5	20	**30**
4	Analyze	5	5	20	**30**
5	Evaluate	5	5	10	**20**
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO522
Course Name	Soft Computing
Desired Requisites:	Basic knowledge of mathematics

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

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	analyze soft computing techniques and their roles in building intelligent machines	Analyze
CO2	evaluate fuzzy logic and neural networks techniques to solve various engineering problems	Evaluate
CO3	build prototyping applications using genetic algorithms and hybrid approaches	Create

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

IV	**Genetic Algorithms:** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition	7
V	**Hybrid Systems:** Introduction to Hybrid Systems, Adaptive Neuro Fuzzy Inference System(ANFIS)	6
VI	**Deep Learning:** Spark auto encoder, Convolutional neural networks, Recurrent neural networks, Deep belief networks	7

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

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

Useful Links	
1	

CO-PO Mapping

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

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

Assessment

The assessment is based on 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)

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO571
Course Name	Advanced Algorithms and Applications Lab
Desired Requisites:	Design and Analysis of Algorithms Basics, Programming

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

Course Objectives

1	To introduce students to the advanced methods of designing and analysing algorithms.
2	To allow students choose appropriate algorithm and use it for a specific problem.
3	To impart knowledge of different classes of problems along with recent developments in the area of algorithmic design.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	apply and analyse algorithms involving different strategies for problem solving	Analyse
CO2	evaluate the complexity of the algorithm	Evaluate
CO3	develop the solution for open-ended problems and document it	Create

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in this domain. Initially, student would be able to understand the concepts involved, perform proper initialization, employ programming strategy and apply it for problem solving. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Student would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Programming Strategy used, Implementation Details (with proper screenshots), Conclusion and Future work.

Text Books

1	Cormen Thomas H., Leiserson Charles E., Rivest Ronald L., Stein Clifford, *Introduction to Algorithms* PHI, Third Edition, 2009
2	Aho, Hopcroft, Ullman, *The Design and Analysis of Computer Algorithms*, Addison-Wesley Pub. Co., 1974.

References	
1	Kleinberg and Tardos, *Algorithm Design*, Pearson Education Limited
2	Robert Sedgewick, "*Algorithms in C++*", Addison-Wesley Professional, Third Edition
3	
Useful Links	
1	NPTEL Videos of '*Data Structures and Algorithms*' Course: Link
2	Data Structures with Visualization: Link
3	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			2			
CO2	3					2
CO3		2		2	1	
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	5	35
Analyze	10	10	10	30
Evaluate		10	10	20
Create			15	15
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO572
Course Name	Soft Computing Lab
Desired Requisites:	Programming knowledge

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

Course Objectives

1	To demonstrate knowledge of implementation of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms and hybrid systems
2	To evaluate soft computing based solutions of real-world problems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	apply appropriate soft computing technique for creating prototyping applications	Apply
CO2	evaluate soft computing techniques in building intelligent machines	Evaluate

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in this domain. Initially, student would be able to understand the usage of different data structures, use them and apply its operations for solving real-world problems. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Student would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Implementation Details (with proper screenshots), Complexity of using particular data structure, Conclusion and Future work.

Text Books

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

References

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

Useful Links	
1	
2	
3	
4	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	3		1			2
CO2			1		1	
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	20	50
Analyze				
Evaluate	10	20	20	50
Create				
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO573
Course Name	Industrial Project
Desired Requisites:	Domain knowledge of mechanical engineering

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 review and increase students' understanding of the specific topics
2	To induce learning management of values
3	To teach how research papers are written and read such papers critically and efficiently and to summarize and review them to gain an understanding of a new field, in the absence of a textbook
4	To teach how to judge the value of different contributions and identify promising new directions in specified area

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply the existing knowledge on real life problems	Apply
CO2	Investigate the selected topic/ system	Analyze
CO3	Build models and verify that the outcomes of the work have solved the specified problems	Create

Course Content

The Industrial Project work will start in semester II and should be an industrial problem with research potential and should involve scientific research review, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Students should undergo industrial projects in a registered company/organization after consulting with the faculty guide assigned by the department. Industrial projects should be based preferably in the area in which the candidate is interested to undertake the dissertation work. The student has to be in regular contact with the guide and the topic of the industrial project must be mutually decided. The examination shall consist of the preparation of a report consisting literature review, detailed problem statement, methodology, implementation details, results etc., according to the type of work carried out. The work has to be presented in front of the examiners panel formed by DPGC for evaluation.

1. This course will have students assigned to Industry Mentor and a Guide (from institute) to enable students to be acquainted with Industry standards and become industry ready.
2. Based upon the Area of Interest, at least 50% students will have Industry Mentor allocated.
3. With the mutual consent of Industry Mentor, Guide and student, the small Mini-project topic/ Task allocation would be finalized.
4. The meeting of the concerned would be held every week and updates and progress would be documented.

5. The submission of a Mini-project would be done with a Presentation Seminar and document which will talk about the prototype/ models built, new tools and techniques, and coding standard learnt.	
Text Books	
1	As per topic Selected and Journal papers, Conference papers, Handbooks
References	
1	As per topic Selected and Journal papers, Conference papers, Handbook
Useful Links	
1	Project Ideas: Link
2	CSE Project Ideas: Link

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

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 the 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 (Marks) (For lab Courses)

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO574
Course Name	Professional Skills 2
Desired Requisites:	

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

Course Objectives	
1	To provide a hands-on experience of using LaTeX software for Reports and presentations
2	To enhance the paper writing and presentation skills of students.

Course Outcomes (CO) with Bloom's Taxonomy Level At the end of the course, students will be able to,		
CO1	Use of the LaTeX software related to Report writing and presentations effectively	Apply
CO2	Write a paper based on work done as a part of Industrial Project	Create
CO3		

Course Content

This course is based on using LaTeX software as a tool to write report and Research Paper. LaTeX is a high-quality typesetting system which includes features designed for the production of technical and scientific documentation. LaTeX is the de facto standard for the communication and publication of scientific documents. LaTeX is available as free software.

Text Books	
1	Suitable books based on the software selected.

References	
1	Suitable books based on the contents of software selected

Useful Links	
1	As per the need of the software training

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2					
CO2			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				
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 (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	20	20	10	**50**
Analyze				
Evaluate				
Create	10	10	30	**50**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO523
Course Name	Elective 3 – Natural Language Processing
Desired Requisites:	Mathematics – Linear Algebra, Probability Theory

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 build AI applications such that it will enable computer to read text, hear speech and interpret it.
2	To acquaint students with the basics of text processing
3	To illustrate steps involved in building text mining applications
4	To share the importance of different set of features for machine learning tasks

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	explain fundamental concepts of text processing	Understand
CO2	apply text processing algorithms to derive different representations of text	Apply
CO3	automate the real-life problems by choosing appropriate features and models	Evaluate
CO4	develop models for Information Retrieval and Chatbot application	Creating

Module	**Module Contents**	**Hours**
I	**Introduction** Introduction, Steps Involved, Tokenization, Stemming, Lemmatization, Regular expressions- extraction of information using Regex, Text Normalization, Minimum edit distance, Document Similarity measures - Cosine and cluster measures, exploration of python libraries like NLTK, SciPy, re.	4
II	**Language Models** Information Retrieval & Language Models Introduction, IDF, Tf-Idf, Boolean Model, Vector Space Model, N-gram Language Models, Spelling correction - Edit distance, Advanced smoothing for language modelling, POS tagging, Performance Measures, Precision, Recall, F-measure	5
III	**Distributed Word Representation** Vector Space Model - word vectors, GloVe/Word2Vec model, word embedding, Contextual Embeddings, Deriving Word Vectors from Corpus, Word Senses and WordNet	4
IV	**Text Classification** Constituency Grammars, Context-Free Grammar, Constituency Parsing, Dependency Parsing, Lexicons for Sentiment, Distributional Semantics, Topic Models, Sentiment Classification	4
V	**Sequence Classification** Sequence Labelling for Parts of Speech and Named Entities, Deep Learning Architectures for Sequence Processing, Models for Sequential tagging – MaxEnt, CRF, Recurrent Neural network relevant to NLP	5

VI	**Case Study** Machine Translation and Encoder-Decoder Models, Discourse Coherence, Question Answering, Chatbots & Dialogue Systems, Sentiment Analysis and Opinion Mining, Text Generation using Language Models	4

Text Books	
1	Steven Bird, Ewan Klein, and Edward Loper, "*Natural Language Processing with Python*", O'reilly Publications, 2009.
2	Yoav Goldberg**, "***Neural Network Methods for Natural Language Processing",* Synthesis Lectures on Human Language Technologies, 2017
References	
1	Dan Jurafsky and James H. Martin, "*Speech and Language Processing*", Standford University, 3rd Edition, 2020
2	Jason Brownlee, "*Deep Learning for Natural Language Processing*", 2017.
3	Karthiek Reddy Bokka, Shubhangi Hora, Tanuj Jain, Monicah Wambugu, "*Deep Learning for Natural Language Processing: Solve your natural language processing problems with smart deep neural networks*",
Useful Links	
1	NLP Course on NPTEL: Link
2	Applied NLP Course on NPTEL: Link
3	NLP Resources by Mausam: Link
4	NLTK Book: Link

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

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

Assessment

The assessment is based on 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)

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO524
Course Name	Elective 3 –Data Compression and Encryption
Desired Requisites:	Computer Network Basics

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 introduce the students Lossless and Lossy compression techniques for different types of data.
2	To introduce the students to the data encryption techniques.
3	To introduce the students to the advanced network security and ethical hacking concepts.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	illustrate different data compression techniques, cryptography techniques, network security and ethical hacking concepts.	Apply
CO2	analyse different data compression techniques, cryptography techniques, network security and ethical hacking concepts.	Analyse

Module	**Module Contents**	**Hours**
I	**Introduction to Data Compression** **Compression Techniques:** Loss less compression, Lossy compression, measure of performance, modelling and coding, different types of models, and coding techniques **Text Compression:** Minimum variance Huffman coding, extended Huffman coding, Adaptive Huffman coding. Arithmetic coding, Dictionary coding techniques, Sliding Window Compression: LZ 77, LZ 78, LZW	8
II	**Audio Compression** High quality digital audio, frequency and temporal masking, lossy sound compression, μ-law and A-law companding, and MP3 audio standard	4
III	**Image and Video Compression** **Image Compression:** PCM, DPCM JPEG, JPEG –LS, and JPEG 2000 standards **Video Compression:** Analog Video, Digital Video, Intra frame coding, motion estimation and compensation, introduction to MPEG-2, H-264 encoder and decoder	8

IV	**Introduction to Data Security** Security goals, cryptography, stenography cryptographic attacks, services and Mechanics. Substitution cipher, transposition cipher, stream and block cipher, and arithmetic modes for block ciphers. Data encryption standard, double DES, triple DES, attacks on DES, AES, key distribution centre.	8
V	**Number Theory and Asymmetric Key Cryptography** Primes, factorization, Fermat's little theorem, Euler's theorem, and extended Euclidean algorithm. RSA, attacks on RSA, Diffie Hellman key exchange, key management, and basics of elliptical curve cryptography.	6
VI	**Network Security** Malware, Intruders, Intrusion detection system, firewall design, antivirus techniques, digital Immune systems, biometric authentication, Web Security Considerations, SSL Architecture, TLS, Secure Electronic Transactions and introduction to ethical hacking.	5

Text Books	
1	Khalid Sayood, *"Introduction to Data Compression"*, Fifth Edition, Morgan Kaufmann, 2020, ISBN-10: 9351073904
2	David Saloman, *"Data Compression: The complete reference"*, 2011, Springer publication, ISBN-10: 9788184898002
3	Behrouz Forouzen, *"Cryptography and Network Security"*, Tata Mc Graw –Hill Education, 2011, ISBN-10: 0070660468
4	William Stallings, *"Cryptography and Network Security: Principles and Practice"*, Pearson Education Asia Publication, 7th Edition, 2017, ISBN-10: 9789332585225

References	
1	Jean-Loup Gailly, Mark Nelson, *"The Data Compression Book"*, 2nd Edition, BPB Publication, 1996, ISBN-10: 817029729X
2	Colt McAnlis, Aleks Haecky, *"Understanding Compression: Data Compression for Modern Developers"*, Shroff/O'Reilly; First edition, 2016, ISBN-10: 935213446X
3	Atul Kahate, *"Cryptography and Network Security"*, 4th Edition, McGraw-Hill, 2019, ISBN-10: 9353163307
4	Bruce Schnerer, *"Applied Cryptography: Protocols, Algorithms, and Source Code in C"*, John Willey & Sons Inc. Publication, 2nd Edition, 1995, ISBN-10: 9780471117094

Useful Links	
1	Coursera Week 5 of Algorithms -II Course: Link
2	Coursera Course: Cryptography I: Link
3	SWAYAM Course: Cyber Security: Link
4	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2		2		1	
CO2				2	1	2
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High						

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

Assessment
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	10	10	30	**50**
4	Analyse	10	10	30	**50**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	4CO525
Course Name	Elective 3 –Theory and Applications of Remote Sensing & GIS
Desired Requisites:	Fundamentals of Image processing

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

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Understand and summarize fundamental concepts in RS and GIS	Understand
CO2	Interpret and Apply various satellite RS data and demonstrate GIS data and GIS database management system	Apply
CO3	Compare and examine data and data Products of RS and GIS	Analyse
CO4	Select and Verify RS and GIS data and data products to design solution for various interdisciplinary problems	Evaluate

Module	**Module Contents**	**Hours**
I	**Concepts and Foundation of Remote Sensing** Introduction, Remote Sensing System, Electromagnetic Energy, Electromagnetic Spectrum and its Characteristics, Energy Interaction in the Atmosphere and with the Earth's Surface, Resolution in Remote Sensing, Broad Classifications of Sensors and Platform, Earth Observation Satellite and Sensors, Data Reception, Transmission and Processing, Remote Sensing Data and Data Products.	7
II	**Satellite Image Interpretation and Processing** Interpretation Procedure and Elements, Interpretation strategies and keys, Digital Image processing and Image Analysis steps, Image Rectification and Restoration, Image Enhancement, Spatial Filtering, Image Transformation, Image Classification and Analysis.	4
III	**Applications of Remote Sensing** Land use Land Cover Mapping, Crop Inventory, Ground Water Mapping, Urban Growth, Flood Plain Mapping, Disaster Management.	2
IV	**GIS – An Overview** Introduction, Geographical concepts and Terminology, Difference between Image Processing system and GIS, Various GIS packages and their salient features, Essentials components of GIS, Utility of GIS, GPS	4
V	**GIS Data**	

	GIS Data types and Data Representation, Data Acquisition, Georeferencing of GIS Data, Raster and Vector data, Raster to Vector conversion, Remote Sensing Data in GIS, GIS Database and Database Management System	5
VI	**GIS Spatial Data Analysis and Applications** Measurements in GIS-Lengths, Perimeters, and Areas, Queries, Reclassification, Buffering and Neighborhood Functions, Map Overlay, Spatial Interpolation, Analysis of Surfaces, Network Analysis, GIS Applications	4

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

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

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

CO-PO Mapping

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

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

Assessment

The assessment is based on 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)

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO526
Course Name	Elective 4 - Machine Learning
Desired Requisites:	Data Science

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	10	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives	
1	To formulate machine learning problems corresponding to different applications.
2	To illustrate a range of machine learning algorithms along with their strengths and weaknesses.
3	To apply machine learning algorithms to solve problems of moderate complexity.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	implement a range of machine learning algorithms along with their strengths and weaknesses.	Apply
CO2	apply machine learning algorithms to solve typical problems in Machine Learning.	Apply
CO3	analyze various machine learning tools	Analyze

Module	**Module Contents**	**Hours**
I	Statistical Decision Theory - Regression, Classification, Bias Variance, Linear Regression, Multivariate Regression	4
II	Linear Classification, Logistic Regression, Support Vector Machines	4
III	Neural Networks - Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation Decision Trees, Regression Trees	5
IV	Bootstrapping & Cross Validation, Class Evaluation Measures, Confusion Matrix, F1 score, ROC curve	4
V	Clustering, KMeans, HDBSCAN, Hierarchical Clustering, Birch Algorithm, CURE Algorithm, Density-based Clustering	6
VI	Hyper-parameter tuning, Deployment of Machine Learning models, introduction to deep learning	3

Text Books	
1	Jason Bell, "Machine Learning Hands-On for Developers and Technical Professionals" Wiley 2015
2	Tom M. Mitchell "Machine Learning" MGH
3	Stephen Marsland, Taylor & Francis "Machine Learning: An Algorithmic Perspective" (CRC)
4	Trevor Hastie, Robert Tibshirani, Jerome H. Friedman "The Elements of Statistical Learning".

References	
1	William Whsieh “Machine Learning Methods in the Environmental Sciences, Neural Networks” Cambridge Univ Press.
2	Richard O Duda, Peter E. Hart and David G. Stork, John “Pattern classification” Wiley &Sons Inc., 2001
3	Chris Bishop “Neural Networks for Pattern Recognition” Oxford University Press, 1995
4	

Useful Links	
1	NPTEL Videos of ‘Introduction to Machine Learning’ Course: Link
2	
3	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	2	3	4	5	6
CO1	2		2	1		
CO2		1	1	2		
CO3			2	3	2	2
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on 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)					
Bloom’s Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand				
3	Apply	20	10	30	**60**
4	Analyze		10	30	**40**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO527
Course Name	Elective 4 - Internet of Things
Desired Requisites:	Basic programming knowledge

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 illustrate the basic concepts of Internet of Things.
2	To demonstrate working of Physical Devices
3	To illustrate Advanced concepts of IOT.
4	To develop the skill of providing solution for real life problem using IOT.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Explain Basic concepts of IOT.	Understanding
CO2	Identify how IOT devices works	Apply
CO3	To assess different IOT operations.	Evaluate
CO4	To Design a IOT solution to solve a real-world problem.	Create

Module	**Module Contents**	**Hours**
I	**Introduction to IoT** Introduction to IoT, Future of IoT, Applications of IoT, Advantages of IoT, Enabling Technologies. Overview of Internet of Things, building blocks of IoT, characteristics of IoT systems and IoT levels. IoT and M2M, IoT design methodology, Technology Considerations- IoT Problem Statement, IoT , Technology Enablers, IoT Technology Stack, IoT, Data Considerations, IoT Projects, Introduction to Complexity, IoT Challenges	4
II	**IoT Physical Devices & Endpoints** Microprocessor, Microcontroller, Microcomputer hardware and software concepts. Study and usage of Prototyping boards like - Arduino, Intel edison, raspberry pi etc. (from software and hardware perspective) programming using sketches and python. Other PL used for IoT. A generic design methodology for IOT.	4
III	**IOT Communication** Introduction to communication architecture- Network protocol stack, Different protocols: RF: ZigBee, Blue Tooth, BLE, Zwave, Mesh network. Communication Channels: GSM/GPRS, 2G, 3G, 4G, 5G, LTE, WiFi, IoT protocols: MQTT/MQTTS, CoAP, 6LoWPAN, like TCP, UDP, HTTP/S., Comparison of the different IoT protocols, advantages and disadvantages (limitations) of these IoT protocols. IPv4 addressing problem for IoT and introduction to IPv6 is required to address more devices. Application issues with RF protocol - power consumption, LOS, reliability, Security aspects. Showcase the GSM module.	4
IV	**IOT Testing:**	3

	Introduction, Challenges in IoT Testing, IOT Testing framework, IOT Testing Tools, Best practices for effective IOT software testing	
V	**Data and Analytics for IoT,** An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools. Fundamentals of Stream data processing and Batch data processing. **Cloud platform and framework for developing IoT** An introduction to the use of cloud platforms and frameworks for developing IoT applications. Sample use case, Temperature sensor Arduino as edge and sending data to AWS cloud.	8
VI	**Case Studies:** **IoT Applications Retail, Healthcare & Agriculture, IoT Architecture**, what is digital disruption? Examples of Digital Disruption. Case Study: Agriculture, Healthcare, Activity Monitoring, smart cities, smart home	3
Text Books		
1	Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach" , Universities Press, 2015.	
2	S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.	
3	S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.	
References		
1	Stephanie Moyerman, "Getting Started with Intel Edison", Published by Maker Media, Inc., San Francisco, 2016. CA 94111.	
2	Agus Kurniawan, "Arduino Uno: A Hands-On Guide for Beginner ,1st	
3	John Boxall, "Arduino Workshop: A Hands-On Introduction with 65 Projects", No Starch Press, Inc. San Francisco, CA USA, 2013.	
Useful Links		
1	Internet sources: Arduino site, Intel IoT site, Raspberry pi site.	
2	https://onlinecourses.nptel.ac.in/noc21_cs17	
3	https://www.softwaretestinghelp.com/internet-of-things-iot-testing/	
4	https://www.clariontech.com/blog/iot-testing-framework	

CO-PO Mapping						
	Programme Outcomes (PO)					
PO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3		1			
CO2	1		3			
CO3				2		1
CO4				2		3
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment					
The assessment is based on 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)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember		5	5	10
2	Understand	5	5	10	20

3	Apply	5		10	15
4	Analyze	10	5	15	30
5	Evaluate		5	10	15
6	Create			10	10
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO528
Course Name	Elective-4 Computer Vision
Desired Requisites:	Digital Image Processing

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 impart knowledge of advanced techniques in computer vision.
2	To acquaint students with the concepts of color image processing, texture analysis, object recognition, video processing, 3D imaging etc. by applying the algorithms to build applications.
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,		
CO1	Demonstrate the knowledge of the various concepts of computer vision.	Applying
CO2	Study and Analyse computer vision algorithms to build practical application	Analyze
CO3	Design and assess algorithms for real world computer vision problems	Evaluating

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	4
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.	6
III	**Representation & Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal components for description, Relational Descriptors	4
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	5

	Restoration Model, Noise Models, Restoration using spatial filtering, Reduction using frequency domain filtering.	
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	5
VI	**3D Vision** Introduction to 3D imaging and its applications. Study of any Research Paper(s) based on the current trends in 3D imaging or any case study	3

Text Books	
1	R. C. Gonzalez, R. E. Woods, Digital Image Processing, 4th Edition. 2018, PHI
2	Sonka Milan, Vaclav Hlavac, Boyle, "Digital Image Processing and Computer Vision", Cengage Learning, Third edition, 2013

References	
1	S. Jayaraman, S. Esakkirajan, T. Veerkumar, "Digital Image Processing", Tata McGraw Hill, Third edition, 2010
2	D. A. Forsyth, J. Ponce, "Computer Vision – A Modern approach", Pearson Education, Prentice Hall, 2005
3	Linda Shapiro, George C. Stockman, "Computer Vision", Prentice Hall, 2000

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

CO-PO Mapping

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

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				
3	Apply	10	8	15	33
4	Analyse	10	7	25	30
5	Evaluate		5	20	25
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO575
Course Name	A B Elective Lab 1- Natural Language Processing Lab
Desired Requisites:	Statistics and Probability, Programming

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

Course Objectives

1	To make students do practical implementation of the different AI and ML concepts and techniques.
2	To make students familiar with steps involved in applying machine learning algorithms to real-life problems
3	To get insights of how pure AI 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,

CO1	apply and analyse text processing algorithms to derive different representations of text	Analyse
CO2	automate the real-life problems by choosing appropriate features and models and document the steps involved	Evaluate
CO3	develop models for Information Retrieval and Chatbot application	Create

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in this domain. Initially, student would be able to understand the concepts involved, perform pre-processing and apply text processing algorithms to derive different representations of text. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Students would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Implementation Details (with proper screenshots), Conclusion and Future work.

Text Books

1	Steven Bird, Ewan Klein, and Edward Loper, "*Natural Language Processing with Python*", O'reilly Publications, 2009.
2	Yoav Goldberg**, "***Neural Network Methods for Natural Language Processing",* Synthesis Lectures on Human Language Technologies, 2017

References	
1	Dan Jurafsky and James H. Martin, "*Speech and Language Processing*", Standford University, 3rd Edition, 2020
2	Jason Brownlee, "*Deep Learning for Natural Language Processing*", 2017.
3	Karthiek Reddy Bokka, Shubhangi Hora, Tanuj Jain, Monicah Wambugu, "*Deep Learning for Natural Language Processing: Solve your natural language processing problems with smart deep neural networks*",
Useful Links	
1	NLP Course on NPTEL: Link
2	Applied NLP Course on NPTEL: Link
3	NLP Resources by Mausam: Link
4	NLTK Book: Link

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2					
CO2		3				2
CO3			1	2	2	
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	5	35
Analyze	10	10	10	30
Evaluate		10	10	20
Create			15	15
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO576
Course Name	A B Elective Lab 1- Data Compression and Encryption Lab
Desired Requisites:	Computer Network Basics, Programming

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

Course Objectives

1	To introduce the students Lossless and Lossy compression techniques for different types of data.
2	To introduce the students to the data encryption techniques.
3	To introduce the students to the advanced network security and ethical hacking concepts.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	illustrate different data compression techniques, cryptography techniques, network security and ethical hacking concepts.	Apply
CO2	analyse different data compression techniques, cryptography techniques, network security and ethical hacking concepts.	Analyse

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in this domain. Initially, students would be able to understand the concepts involved, perform pre-processing and apply different encryption algorithms to data. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Students would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Implementation Details (with proper screenshots), Conclusion and Future work.

Text Books

1	Khalid Sayood, *"Introduction to Data Compression"*, Fifth Edition, Morgan Kaufmann, 2020, ISBN-10: 9351073904
2	David Saloman, *"Data Compression: The complete reference"*, 2011, Springer publication, ISBN-10: 9788184898002
3	Behrouz Forouzen, *"Cryptography and Network Security"*, Tata Mc Graw –Hill Education, 2011, ISBN-10: 0070660468
4	William Stallings, *"Cryptography and Network Security: Principles and Practice"*, Pearson Education Asia Publication, 7th Edition, 2017, ISBN-10: 9789332585225

References	
1	Jean-Loup Gailly, Mark Nelson, *"The Data Compression Book"*, 2nd Edition, BPB Publication, 1996, ISBN-10: 817029729X
2	Colt McAnlis, Aleks Haecky, *"Understanding Compression: Data Compression for Modern Developers"*, Shroff/O'Reilly; First edition, 2016, ISBN-10: 935213446X
3	Atul Kahate, *"Cryptography and Network Security"*, 4th Edition, McGraw-Hill, 2019, ISBN-10: 9353163307
4	Bruce Schnerer, *"Applied Cryptography: Protocols, Algorithms, and Source Code in C"*, John Willey & Sons Inc. Publication, 2nd Edition, 1995, ISBN-10: 9780471117094
Useful Links	
1	Coursera Week 5 of Algorithms -II Course: Link
2	Coursera Course: Cryptography I: Link
3	SWAYAM Course: Cyber Security: Link

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2		2		1	
CO2				2	1	2
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment

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

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	5	35
Analyze	10	10	10	30
Evaluate		10	10	20
Create			15	15
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	3CO577
Course Name	A B Elective Lab 1- Theory and Applications of Remote Sensing & GIS Lab
Desired Requisites:	Fundamentals of Image processing, Programming

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

Course Objectives

1	To inculcate and demonstrate knowledge of Remote Sensing (RS) and Geographic Information System (GIS)
2	To practice RS and GIS tools and techniques using RS and GIS data and data products
3	To provide students hands on experience on processing RS and GIS data and use the advanced concepts in computer science and engineering (DIP, RDBMS, ML, etc) to solve various interdisciplinary problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Practice theory and concepts of RS and GIS	Apply
CO2	Verify and process data and data products of RS and GIS using tools/software	Evaluate
CO3	Design solutions for various interdisciplinary problems using RS and GIS tools/software and advanced concepts in computer science and engineering (DIP, RDBMS, ML, etc.).	Create

Mini Project Guidelines

Course Contents:

Students are expected to practice on RS and GIS tools/software and get acquainted with characteristics and features of the tools/software. Initially students will be given few assignments in order to help them to understand the features and scope of the software along with limitations. Course faculty will help students during practical hours and solve their queries through discussion and demonstration. Further, students will select an application (RS and GIS based) and study it in detail through research papers, define their problem statement and implement the same on the basis of theory and practical knowledge acquired during theory and practical hours respectively. The progress of the work done and discussion would be documented from time-to-time. Students would submit a brief report of the work he/she has carried out during the semester.

Text Books

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

	Prentice Hall India. 20012
References	
1	Lillesand, T.M. and Kieffer, "Remote Sensing and Image Interpretation", John Wiley and Sons, 6th Edition. 2012
2	Chang, K, "Introduction to Geographical Systems", Tata McGraw-Hill, 4th Edition. 2010
Useful Links	
1	NPTEL: https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ce08 https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce10
2	https://www.usgs.gov
3	https://bhuvan.nrsc.gov.in/bhuvan_links.php#
4	https://webapps.itc.utwente.nl/sensor/default.aspx?view=searchsen

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			2			
CO2	2			2		
CO3	3	2		2		2
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	05	35
Analyze				
Evaluate	10	10	10	30
Create		10	25	35
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO578
Course Name	A B Elective Lab 1- Machine Learning Lab
Desired Requisites:	Linear Algebra, Probability theory, Programming

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

Course Objectives

1	To apply various Machine learning techniques.
2	To evaluate Machine Learning algorithms.
3	To build prototype machine learning system.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	apply machine learning techniques to solve real world problem	Apply
CO2	demonstrate comparative performance of applications.	Evaluate
CO3	build typical machine learning application in a team work	Create

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in this domain. Initially, student would be able to understand the usage of different data structures, use them and apply its operations for solving real-world problems. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Student would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Implementation Details (with proper screenshots), Complexity of using particular data structure, Conclusion and Future work.

Text Books

1	Jason Bell "Machine Learning Hands-On for Developers and Technical Professionals" Wiley 2015.
2	Tom M. Mitchell "Machine Learning" MGH.
3	Stephen Marsland, Taylor & Francis "Machine Learning: An Algorithmic Perspective" (CRC).

References

1	William Whsieh "Machine Learning Methods in the Environmental Sciences" Neural Networks., Cambridge Univ Press.
2	Richard O Duda, Peter E. Hart and David G. Stork "Pattern classification" John Wiley &Sons Inc.,

	2001.
3	Chris Bishop “Neural Networks for Pattern Recognition” Oxford University Press, 1995.
Useful Links	
1	‘Scikit-learn’ tutorial: Link
2	
3	
4	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	3					
CO2		1				
CO3			3			3
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom’s Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	5	35
Analyze	10	10	10	30
Evaluate		10	10	20
Create			15	15
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO579
Course Name	A B Elective Lab 1- Internet of Things Lab
Desired Requisites:	Basic Programming Knowledge

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

Course Objectives

1	To apply various IOT techniques.
2	To deliver hand-on experience in the field
3	To inculcate interest in different domain areas
4	To build prototype in IOT system.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	apply IOT techniques to solve real world problem	Apply
CO2	To Demonstrate basics of IOT	Apply
CO3	To analyse and evaluate the solutions and compare them.	Evaluate
CO4	build typical IOT application in a team work	Create

Mini Project Guidelines

Course Contents:

Students are expected to carry out independent research work on the chosen topic in IOT domain. Apply IOT operations for solving real-world problems. In discussion with the concerned faculty during laboratory hours, the student would plan the Mini project and prepare a synopsis. The progress of the work done and discussion would be documented from time-to-time. The final system would be checked if it meets the requirements specified and the corrections if any would be incorporated in discussion with the faculty. Student would submit a brief Project Report that must include proper documentation including Introduction, Literature survey, Hardware & Software Requirements, System Design Architecture or Block Diagram, Implementation Details (with proper screenshots), Conclusion and Future work.

Text Books

1	Mandler B., Barja J., Campista Mitre, M.E., Cagá_ová, D. Chaouchi, H. Zeadally, S. Badra, M. Giordano, S. Fazio, M. Somov, A. Vieriu, R.-L., "Internet of Things. IoT Infrastructures" , Springer International Publishing, Second International Summit, IoT 360° 2015, Rome, Italy, October 27-29, 2015. Revised Selected Papers, Part I
2	Kyung, C.-M., Yasuura, H. Liu, Y. Lin, Y.-L., "Smart Sensors and Systems", Springer International Publishing,2017.

References	
1	Hersent Olivier, Boswarthick David , Elloumi Omar , “The Internet of Things: Key Applications and Protocols”, Wiley-Blackwell, Second Edition ,2012
2	S. Misra, A. Mukherjee, and A. Roy, 2020. *Introduction to IoT*. Cambridge University Press.
3	S. Misra, C. Roy, and A. Mukherjee, 2020. *Introduction to Industrial Internet of Things and Industry 4.0*. CRC Press.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs17/preview
2	https://www.tinkercad.com/things/55ubLwvGK0g-1st-iot-project

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	3					
CO2		1				
CO3			3			3
CO4						3
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
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 (Marks)				
Bloom’s Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	5	35
Analyze	10	10	10	30
Evaluate		10	10	20
Create			15	15
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5CO580
Course Name	A B Elective Lab 1- Computer Vision Lab
Desired Requisites:	Digital Image Processing, Programming

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

Course Objectives	
1	To dig up theoretical and practical knowledge in computer vision
2	To demonstrate the use of various algorithms in the course
3	To inculcate interest in different domain areas and related real time applications

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Demonstrate knowledge of various techniques of color image processing and computer vision related to theoretical knowledge gained.	Applying
CO2	To analyse and evaluate the results of various algorithms for building solution of real time problems	Evaluating

List of Experiments / Lab Activities

List of Experiments:

Lab sessions are to be utilized for problem solving/designing/implementation, to ensure that students have properly learnt the topics covered in the theory course. The partial list is as follows (the list may be updated during actual implementation) :

1. Work around with different different color models and perform color transformations
2. Implement and apply different texture analysis techniques
3. Implement and / or apply different ways of representing images
4. Implement and / or apply different object recognition techniques
5. Implement different ways of detecting moving objects

Text Books	
1	R. C. Gonzalez, R. E. Woods, Digital Image Processing, 4th Edition. 2018, PHI
2	Sonka Milan, Vaclav Hlavac, Boyle, "Digital Image Processing and Computer Vision", Cengage Learning, Third edition, 2013

References	
1	S. Jayaraman, S. Esakkirajan, T. Veerkumar, "Digital Image Processing", Tata McGraw Hill, Third edition, 2010
2	D. A. Forsyth, J. Ponce, "Computer Vision – A Modern approach", Pearson Education, Prentice Hall, 2005

3	Linda Shapiro, George C. Stockman, “Computer Vision”, Prentice Hall, 2000
Useful Links	
1	NPTEL course: Link
2	NPTEL course: Link

CO-PO Mapping						
Programme Outcomes (PO)						
PO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	1		3			
CO2	3		2	3		
1:Low, 2:Medium, 3:High						

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 the 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 (Marks) (For lab Courses)				
Bloom’s Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	20	20	25	**65**
Analyze				
Evaluate	10	10	15	**35**
Create				
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5OE109
Course Name	Open Elective: Machine Learning in Practice
Desired Requisites:	

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 introduce python and mathematical concepts required for machine learning
2	To prepare data for machine learning
3	To implement supervised and unsupervised learning algorithm

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Apply data cleaning and hyperparameter tuning for data preparation.	Apply
CO2	Implement different Machine Learning algorithms.	Apply
CO3	Evaluate performance of the machine learning algorithm.	Evaluate

Module	**Module Contents**	**Hours**
I	Introduction: Applications of Machine Learning, Introduction to python: basic constructs of python (list, tuples, strings, dictionary), pandas, NumPy, matplotlib	4
II	Data Cleaning: handling NA values, handling categorical features, Data normalization, Train/test split, cross-validation	4
III	Linear algebra and statistics: vectors, vector multiplication, equation of line/plane/hyperplane, stats: gaussian distribution, log normal distribution, power law distribution, variance, co-variance	5
IV	supervised learning: linear regression, K-NN, logistic regression, decision tree	4
V	Ensemble models: tree-based algorithms, Bagging, Boosting, Stacking, cascading, Unsupervised learning: clustering algorithms: KMeans, HDBSCAN	6
VI	Model Performance: Confusion matrices, F1 score, MAE, RMSE, Hyper-parameter tuning, deployment	3

Text Books	
1	Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2	Introduction to Machine Learning Edition 2, by Ethem Alpaydin
3	
4	

References	
1	
2	

Useful Links	
1	NPTEL ‘Introduction to Machine learning’ video: Link
2	
3	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1				2		
CO2	2			3		
CO3	1		1			2
The strength of mapping is to be written as 1,2,3; Here, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on 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)					
Bloom’s Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	20	10	30	**60**
4	Analyze				
5	Evaluate		10	30	**40**
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5IC501
Course Name	Value Education
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs./week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 0**			

Course Objectives	
1	To impart knowledge on value of education and self- development.
2	To imbibe good values in students.
3	To highlight importance of character.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to		
CO1	Explain value of education and self- development.	Understanding
CO2	Summarize importance of good character, and Behavior development.	Understanding

Module	**Module Contents**	**Hours**
I	1. Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. 2. Moral and non- moral valuation. Standards and principles. 3. Value judgments	6
II	1. Importance of cultivation of values 2. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. 3. Honesty, Humanity. Power of faith, National Unity. 4. Patriotism. Love for nature, Discipline	6
III	1. Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. 2. Punctuality, Love and Kindness. 3. Avoid fault Thinking. 4. Free from anger, Dignity of labour. 5. Universal brotherhood and religious tolerance. 6. True friendship. 7. Happiness Vs suffering, love for truth. 8. Aware of self-destructive habits. 9. Association and Cooperation. 10. Doing best for saving nature	7
IV	1. Character and Competence –Holy books vs Blind faith.	7

	2. Self-management and Good health. 3. Science of reincarnation. 4. Equality, Nonviolence, Humility, Role of Women. 5. All religions and same message. 6. Mind your Mind, Self-control. 7. Honesty, Studying effectively	

Text Books	
1	Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi
References	
1	https://www.tripurauniv.ac.in/Content/pdf/StudyMaterialsDetail/MA%20Education%203rd%20Semester/EDCN-901C-Value%20Education.pdf
2	https://www.dypiemr.ac.in/images/value-added-courses/vac/Content-for-Value-Education.pdf

Useful Links	
1	https://www.youtube.com/watch?v=JK59OcZv8H4
2	https://www.youtube.com/watch?v=XqQCI_ZhtxA

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1						
CO2						
CO3						
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 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	20	20	60	100
3	Apply				
4	Analyze				
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**