B. Tech SEM I

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

AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Data Mining
Desired Requisites:	Statistics and 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 basic concepts, principles and techniques of data mining.
2	To compare various data mining tools.
3	To impart different data mining techniques to handle real world problems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Summarize the basic concepts and techniques of data mining	Understand
CO2	Apply data mining algorithms for solving real life problems	Apply
CO3	Evaluate optimized solution in data mining using complex and huge dataset	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction : Basic Concepts in Data Mining** Data mining background, classification of Data Mining, Data Mining Techniques. Data Preprocessing, Applications	7
II	**Data Mining Primitives** Data Mining Primitives, Architecture of Data Mining, Knowledge representation, Data generalization & summarization.	6
III	**Association Rule mining,** Frequent itemset generation,, Association Rule generation, correlation analysis, constraint based Association mining.	7
IV	**Classification & Prediction** Issues, Decision Tree, Bayesian classifier, Back propagation, Classification methods, Prediction, ensemble classification	7
V	**Cluster analysis** similarity metrics, Clustering methods, (partitioning based, hierarchical based, density based, grid based),	6
VI	**Introduction to Mining Complex Data sets** Mining spatial data, temporal data, Mining time series, mining text datasets, web mining	6

Text Books

1	Jiawei Han and Micheline Kamber, "*Data Mining – Concepts and Techniques*", 3rd Edition, The Morgan Kaufmann Series in Data Management Systems, 2011
2	M.H. Dunham , "*Data Mining: Introductory and Advanced topics*", 2nd Edition, Pearson, 2003
3	Ian Witten, Eibe Frank and Mark Hall, "*Data Mining: Practical Machine Learning Tools and Techniques*", 3rd Edition, 2011

References

1	Rajan Chattamvelli, "*Data Mining Methods : Concepts & Applications*", Narosa Publishing House International Publisher, 2010
2	Sushmita Mitra, Tinku Acharya, "*Data Mining Multimedia, Soft Computing and Biometrics*", WILEY Publication, 2003
3	
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105174/
2	https://www.mygreatlearning.com/blog/data-mining-tutorial/
3	https://www.coursera.org/specializations/data-mining

CO-PO Mapping

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

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

Bloom's Taxonomy Level	T1	T2	ESE	Total
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli
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AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem. VII
Course Code	
Course Name	Cryptography & Network Security
Desired Requisites:	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 elaborate the fundamental network security parameters
2	To impart various encryption techniques
3	To apprise security mechanisms and services against network threats

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Compare security aspects of information	Analyze
CO2	Practice various encryption algorithms by examining crypt-complexity	Apply
CO3	Compare access control mechanisms and authentication services	Analyze

Module	**Module Contents**	**Hours**
I	**Security Overview:** Services, Mechanism and Attacks, The OSI Security Architecture, Classical Encryption Techniques, Substitution Techniques, Transposition Techniques, Steganography	7
II	**Block Cipher:** Block Cipher Design Principles, Modes of Data Transfer, Symmetric Cipher Model, Data Encryption Standard, Security of 2DES, 3DES & AES	6
III	**Public Key Encryption:** Principles of Public-Key Cryptosystem, RSA Algorithm, Distribution of Public Keys, Diffie-Hellman Key Exchange	7
IV	**Authentication Functions and Services:** Hash Functions, Message Authentication Codes, Digital Signatures Kerberos, X.509 Certificates	7
V	**IP & Web Security:** IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction	6
VI	**Perimeter Security:** Intruders, Intruder Detection, Password Management, Malwares Firewall Configurations, Trusted Systems, Honeypots	6

Text Books

1	William Stallings, *"Cryptography and Network Security, Principles and Practices",* Pearson Publication, 8th Edition 2020
2	Atul Kahate, *"Cryptography and Network Security",* McGraw Hill Education India, 4th Edition, 2017

References

1	Menezes, A. J., P. C. Van Oarschot, and S. A. Vanstone, "*Handbook of Applied Cryptography*", CRC Press, 2nd Edition, 2018
2	Schneier, Bruce, "*Applied Cryptography: Protocols & Algorithms*", Wiley Publication,2nd Edition, 2015
Useful Links	
1	https://www.researchgate.net/publication/26585503_Network_Security_Policies_and_Guidelines_for_Effective_Network_Management
2	https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
3	https://cis-india.org/internet-governance/publications/it-act/short-note-on-amendment-act-2008

CO-PO Mapping

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

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

Bloom's Taxonomy Level	T1	T2	ESE	Total
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

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AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Data Mining Lab
Desired Requisites:	Basic computer programming, Statistics

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 basic concepts, principles of data mining techniques
2	To develop programming skills of data mining tools
3	To introduce data mining approaches to handle real world datasets

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply appropriate data preprocessing and mining techniques	Apply
CO2	Compare various data mining algorithms	Analyze
CO3	Develop a data mining solution to solve real word problems	Create

List of Experiments / Lab Activities

List of Experiments:
Experiment 1: Perform data smoothing.
Experiment 2: Perform data transformation.
Experiment 3: Perform data normalization.
Experiment 4: Finding summary for dataset.
Experiment 5: Plotting various types of graphs from dataset.
Experiment 6: Data Preparation and Exploration Visualization Techniques
Experiment 7: Performance Metrics and Assessment Metrics for Prediction and Classification
Experiment 8: Supervised Learning Methods Classification
Experiment 9: Supervised Learning Methods Logistic Regression
Experiment 10: Unsupervised Learning Methods : Association Rules
Experiment 11: Unsupervised Learning Methods : Cluster Analysis
Experiment 12: Perform various data mining tasks using WEKA and KNIME OSS
Experiment 13: Using some sample data sets implement and test data mining techniques.

Text Books

1	Jiawei Han and Micheline Kamber, "*Data Mining – Concepts and Techniques*", 3rd Edition, The Morgan Kaufmann Series in Data Management Systems, 2011
2	Ian Witten, Eibe Frank and Mark Hall, "*Data Mining: Practical Machine Learning Tools and Techniques*", 3rd Edition, 2011

References

1	Chris Pal, Ian Witten, Eibe Frank, and Mark Hall, "*Data Mining: Practical Machine Learning Tools and Techniques",* Morgan Kaufmann Series in Data Management Systems, 4th Edition, 2013
2	Bostjan Kaluza, *"Instant Weka How-to*", Packt Publishing Limited, June 2013

Useful Links

1	https://nptel.ac.in/courses/110/107/110107092/
2	https://nptel.ac.in/courses/110/107/110107095/
3	https://www.coursera.org/specializations/data-mining

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

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				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5			**05**
Apply	20	20	20	**60**
Analyze	5	5	10	**20**
Evaluate		5	5	**10**
Create			5	**5**
Total	**30**	**30**	**40**	**100**

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Open Source Software Lab
Desired Requisites:	Unix Operating Systems, Software Engineering, Computer Network, Web Technology

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

Course Objectives

1	To introduce the open source software for software engineering
2	To contribute or develop software in open source environment
3	To compare various open source software

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Practice the open source software tools in software development	Apply
CO2	Analyze the economics of open source software	Analyze
CO3	Create open source software or contribute to existing open source software	Create

Module	**Module Contents**	**Hours**
I	**Introduction** Introduction to open sources- Need of Open Sources- Advantages of Open Sources-Applications of Open Sources- commercial aspects of Open source movement, Notion of Community, Guidelines for effectively working with FOSS community, Benefits of Community based Software Development Requirements for being open, free software, open source software, FOSS Licensing Models –GPL, AGPL, LGPL, FDL, Economy of FOSS, History of Linux, Kernel Versions.	3
II	**Open source development and FOSS languages** Proprietary software development model vs. Open Source software development model, models for FOSS- Cathedral model and Bazaar model. Software package management: RPM, DEB – building.	2
III	**Introduction to collaborative development** Developer communities, mailing lists, IRC, wiki, version control (git/github), bug tracking, handling non-technical issues, localization, accessibility, documentation FOSS code by doxygen.	2
IV	**Open source Virtualization and FOSS** Containerization technologies: docker, Container Images, alternative to virtualization: rocket, etc, Containerization of FOSS tools	2
V	**Configuration of Network services** DHCP, DNS, WINES, NFS, NIS, Web server, Ftp Server, Telnet Server, etc. GUI configuration tools: webmin or usermin.	2
VI	**Web Server Tools and FOSS CMS** Installation and Administration of Web Servers- LAMP, XAMPP, Apache, mysql, etc. Installation of Content Management Systems – WordPress, Joomla, Drupal, Moodle, MaheraXoops, Magento, social networking.	2

List of Experiments / Lab Activities

1. Compare the various Linux Distributions and their usage
2. Comparison of various Open Source tools : Project management
3. Comparison of various Open Source tools: bug tracking
4. Comparison of various Open Source tools: version control system
5. Comparison of various Open Source tools: CMS
6. Compilation and installation of Linux Kernel
7. Creation Of RPM/DEB packages
8. Excise the development of Open Source Software:-Develop simple software for basic needs such as calculator, editor or any small noticeable contribution in existing FOSS.
9. Configuration of Server based services and their uses
10. Docker container : An open source software development platform

Text Books	
1	Andrew M. St. Laurent , "*Understanding Open Source and Free Software Licensing*", First edition, O'Reilly Media, Inc, ISBN:9780596005818
2	Paul Kavanagh, "*Open Source Software: Implementation and Management*", First edition, Digital Press, 2004, ISBN**:** 9780080492001.
3	Stefan Koch, "*Free/Open Source Software Development*", First edition, Idea Group Publishing, 2004.
References	
1	Zhao Jiong, "*A Heavily Commented Linux Kernel Source Code*", Third edition, Old Linux Publications, 2019
2	Stefan Koch · "*Free/Open Source Software Development*", First edition, IGI Publishing, 2004, ISBN-13: 978-1591403692
Useful Links	
1	https://bitnami.com/
2	https://labs.play-with-docker.com/
3	https://github.com/mit-pdos/xv6-public
4	https://www.gnu.org/software/fsfe/projects/ms-vs-eu/halloween1.html

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			1		3								2	
CO2									2		3			
CO3												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				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5			**05**
Apply	20	20	20	**60**
Analyze	5	5	10	**20**
Evaluate		5	5	**10**
Create			5	**5**
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli
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AY 2021-22

Course Information

Programme	B.Tech. (Information Techology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	4IT491
Course Name	Agile Software Tools and Practices Lab
Desired Requisites:	Software Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	-				
Interaction	3 Hrs/week	**Credits: 3**			

Course Objectives

1	To define basics of Software Testing and techniques.
2	To discuss project management cycle for software development.
3	To illustrate Agile development techniques for software development.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Demonstrate use of automation testing tools	Apply
CO2	Implement project management techniques like planning, risk analysis, scheduling.	Apply
CO3	Evaluate software development life cycle using Agile tools and DevOps.	Evaluate

Module	**Module Contents**	**Hours**
I	**Software Testing Introduction:** Introduction, Importance of Software testing, How to conduct Software testing, Basic terminology of Software testing, Manual Testing Process, Difference between Manual and Automated Testing, Software testing Roles and Responsibilities, V Model of Software Development	7
II	**Test Case Design Techniques** Static Techniques, Dynamic Techniques, Black-box Test Techniques, White-box Test Techniques, Experience-based Test Techniques, Levels of Software Testing	6
III	**Types of Software Testing:** **i) Functional Testing:** Unit Testing, Integration Testing, System Testing, User Acceptance Testing, Sanity/Smoke Testing, Regression Testing. **ii) Non Functional Testing:** Performance Testing. (Load, Stress, Spike and Endurance Testing), Usability Testing, Compatibility Testing, Reliability Testing, Security Testing	7
IV	**Project Management** Software Product Management, Requirements Analysis/Design, Planning and Scheduling, Monitoring, Risk Analysis, Project Leadership, Teamwork, Project Organization and Team Structures, Resource Allocation, Software Quality Management Software Testing Standards	6
V	**Agile testing** The Fundamentals of Agile Software Development, Extreme Programming, Aspects of Agile Approaches, The Differences between Testing in Traditional and Agile Approaches, Status of Testing in Agile Projects, Role and Skills of a Tester in an Agile Team, Agile Testing Methods, Assessing Quality Risks and Estimating Test Effort, Techniques in Agile Projects, Tools in Agile Projects	6

VI	**DevOps Testing** DevOps**,** Version control with Git, Git, Jenkins, Maven, Integration with Jenkins, Continuous Integration and Continuous Delivery CI/CD: Jenkins Creating pipelines, Setting up runners Containers and container orchestration (Dockers and Kubernetes) or application development and deployment.	7

List of Experiments / Lab Activities

List of Experiments:

1. Demonstrate Debugging Tool.
2. Implement White Box Testing(Manual)
3.Implement Black Box Testing(Manual)
4.Implement Unit Testing(Automated): TestNG
5.Implement Performance Testing(Automated) using JMetre:
6. Demonstrate Test Management Tool:TestStuff
7. Demonstrate Test Management Tool:TestLink
8. Demonstrate Web-Test Automation Tool- Selenium IDE
9. Demonstrate Web-Test Automation Tool- Selenium Web-Driver
10.Demonstrate Project Management Tool:JIRA
11. Implement Test automation using DevOps.
12. Demonstrate project life cycle using Agile framework.

Text Books

1	Glenford J. Myers, Corey Sandler, Tom Badgett, "*The Art of Software Testing*", Third edition, Wiley, 2011, ISBN: 978-1-118-13315-6
2	Ron Patton, Corey Sandler, Tom Badgett, "*Software Testing*", Second edition, Sams, 2005
3	Lisa Crispin and Janet Gregory, "*Agile Testing: A Practical Guide for Testers and Agile Teams*", First edition, Addison-Wesley Signature Series, 2009.
4	Teresa Luckey, Joseph Phillips, "*Software Project Management For Dummies*", First edition, Wiley, 2006, ISBN: 9780471749349.

References

1	Lee Copeland, "*A Practitioner's Guide to Software Test Design*", First edition, Artech House, 2003, ISBN-13: 978-1580537919.
2	Joakim Verona · "*Practical DevOps*", First edition, Artech House, 2016, ISBN-13: 9781785886522, 1785886525.
3	Henry· "*Software Project Management: A Real-World Guide To Success*", First edition, Pearson Education, 2004, ISBN- 9788131717929, 8131717925.

Useful Links

1	https://www.javatpoint.com/software-testing-tutorial
2	https://www.guru99.com/software-testing.html
3	https://www.getzephyr.com/insights/developing-devops-testing-strategy-benefits-best-practices-tools
4	https://www.softwaretestinghelp.com/agile-scrum-methodology-for-development-and-testing/

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			1		3								2	
CO2									2		3			
CO3												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 evaluations (ISE) of 10 marks each, 1 mid-sem examination (MSE) of 30 marks and 1 end-sem examination (ESE) of 50 marks. MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE.

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

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AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Project 1
Desired Requisites:	

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

Course Objectives

1	To identify real life needs and project requirements
2	To elaborate technical solutions through latest design & development tools
3	To compare and analyze the IT platforms for efficient solutions

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Integrate project at every stage of the software development life cycle	Apply
CO2	Recommend project plans that address real-world challenges	Evaluate
CO3	Develop software projects with strategic goals	Create

List of Experiments / Lab Activities

List of Experiments:

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

1. Application can be based on any trending new technology.
2. Application can be extension to previous projects.
3. Project group should achieve all the proposed objectives of the problem statement.
4. The work should be completed in all aspects of design, implementation and testing and follow software engineering practices.
5. Project reports should be prepared and submitted in soft and hard form along with the code and other dependency documents. Preferable use online code repositories (github/bitbucket)
6. Project will be evaluated continuously by the guide/panel as per assessment plan.
7. Presentation and report should use standard templates provided by department.

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

Text Books

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

References

1	https://www.youtube.com/watch?v=0oSDa2kf5I8 (report writing)
2	

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

CO-PO Mapping

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

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

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	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand				
Apply	15	10	10	**35**
Analyze	5	10	5	**20**
Evaluate	5	5	10	**20**
Create	5	5	15	**25**
Total Marks	**30**	**30**	**40**	**100**

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AY 2021-22

Course Information

Programme	B.Tech. (Information Techology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Open Elective -3: Data Visualization and Interpretation
Desired Requisites:	Programming languages like C, C++

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 visualize the data into scientific form for interpretation and processing
2	To demonstrate data analysis using various libraries and techniques
3	To compare a well-structured typeset articles, books, reports

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply the key techniques to visualize data models	Apply
CO2	Analyze dataset and use appropriate visualization techniques	Analyze
CO3	Create articles, reports using Open source tool (LATEX)	Create

Module	**Module Contents**	**Hours**
I	**Introduction to Data Science -** Overview of the Data Science process, Introduction to Data Science technologies, Introduction to Machine Learning, Regressions, Classification, Clustering, Recommendation Systems	5
II	**Working with Data in R –** Variables , Vectors, Matrices, lists & Data frames , Logical vectored operators Image data type, Image representation, categorical data using Factors in R	8
III	**Data/Image Visualization using libraries –** Using graphs to visualize data, Basic plotting in R, Manipulating the plotting window, Advanced plotting using lattice library in R. Image visualization in using Image processing tools	6
IV	**Models in Machine Learning –** Regression Models, Classification Models, Unsupervised Learning Models, Recommendation Models. Models considered: – Linear regression: lm() – Logistic regression: glm() – Poisson regression: glm() – Survival analysis: Surv(), coxph() – Linear mixed models: lme()	8
V	**Data Reporting using LaTeX –** LATEX Software installation, LATEX typesetting basics, LATEX math typesetting, Tables and matrices, Mathematics in Latex	6
VI	**Case Studies –** Titanic Survival analysis, face detection, Housing price prediction analysis, Customer segmentation analysis, Iris data analysis	6

Text Books

1	Dr. Mark Gardner, Beginning R:statistical Programming Languages, Wrox (Amazon),Mar2013
2	Griffithas, Higham, Learning LATEX ,Amazon,2014

References

1	Basic Data Analysis Tutorial, by Jacob Whitehill, Department of Computer Science, University of the Western Cape, 24/07/2009 [UWCDataAnalysisTutorial.pdf]
2	NPTEL, Edx, Coursera (MOOC courses)

Useful Links	
1	Module I https://www.coursera.org/learn/what-is-datascience?specialization=introduction-data-science#syllabus
2	Module II, III, IV and VI https://onlinecourses.nptel.ac.in/noc21_cs23/preview https://www.coursera.org/learn/r-programming/home/welcome
3	Module V https://www.overleaf.com/learn/latex/Free_online_introduction_to_LaTeX_(part_1)

CO-PO Mapping

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

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

Assessment

The assessment is based on 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

Bloom's Taxonomy Level	T1	T2	ESE	Total
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective 3: Software Defined Network
Desired Requisites:	Computer Networks, Cloud Computing

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 elaborate fundamental knowledge of software defined network
2	To impart Software Defined Network operation in data centre
3	To introduce the network administration through virtualization and open flow

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Interpret the abstraction of control plane in software defined network	Understand
CO2	Analyze the implications of traditional network architectures to software defined network	Analyze
CO3	Develop a network function for data centre applications	Create

Module	**Module Contents**	**Hours**
I	**Basic Networking Device and SDN** Basic Packet Switching Terminology, Historical Background, The Modern Data Center, Traditional Switch Architecture, Autonomous and Dynamic Forwarding Tables in SDN	7
II	**Introduction to SDN** SDN Implications: Research and Innovation, Cost, Industry, Data Centre Innovation, Data Centre Needs, Real Time Case Study of Data Centre, Virtualization, Network Virtualization, Network Function Virtualization	6
III	**Open Flow Protocol and SDN** OpenFlow: Flow Table structure, Flowtable Actions, Flow messages, Legacy Mechanisms Evolve Toward SDN, SDN Applications, Alternate SDN Methods.	7
IV	**SDN in Data Centre** Data Centre Definition, Data Centre Demands, Tunneling Technologies for the Data Centre, Path Technologies in the Data Centre, Ethernet Fabrics in the Data Centre, SDN Use Cases in the Data Centre, Open SDN versus Overlays in the Data Centre, Real-World Data Centre Implementations.	7
V	**Application of SDN** Consistent Policy Configuration, Global Network View, Wide Area Networks, Service Provider and Carrier Networks, Campus Networks, Hospitality Networks, Mobile Networks, In-Line Network Functions, Optical Networks, SDN vs. P2P/Overlay Networks.	6
VI	**Network Function Virtualization** Existing Network Virtualization Framework (VMWare and others), Virtualization and Data Plane I/O, Services Engineered Path	6

Text Books	
1	Chuk Black, Timothy Culver "*Software Defined Networks:A Comprehensive Approach*", 2nd Edition, Wiley publication, 2016.
2	Thomas Erl, Zaigham Mahmood and Ricardo Puttini,*" Cloud Computing: Concepts, Technology & Architecture",* Pearson, 1st Edition, 2010
References	
1	Thomas D. Nadeau, "*Software Defined Networks, An Authoritative Review of Network Programmability Technologies*", Ken Gray Publisher, August 2013, ISBN: 978-1-4493-4230-2.
Useful Links	
1	https://www.katacoda.com/courses/kubernetes
2	https://aws.amazon.com/

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

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				
Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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Course Information	
Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective 3 :Visual Computing
Desired Requisites:	C programming

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 elaborate need of developing graphics application in visual computing
2	To introduce the algorithmic development of graphics primitives like: line, circle, polygon etc.
3	To represent and transform the media data for application development

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Draw Geometric primitives using OpenGL	Analyze
CO2	Implement basic transformations on objects using OpenGL.	Apply
CO3	Implement clipping algorithm on lines using OpenGL.	Apply

Module	**Module Contents**	**Hours**
I	**Graphics Primitives:** Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.	7
II	**2D transformation :** Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing	6
III	**2D Viewing** viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping	7
IV	**3D concepts and object representation:** 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces	7
V	**3D transformation** 3D scaling, rotation and translation, composite transformation	6

VI	**3D viewing:** viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations	6

Text Books	
1	Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008
2	Shallini Govil-Pai, Principles of computer Graphics , Springer
References	
1	M MRaiker, Computer Graphics using OpenGL, Filip learning/Elsevier
2	Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd/ 4thEdition, Pearson Education,2011
Useful Links	
1	https://www.cs.uregina.ca/Links/class-info/405/WWW/Lab1/
2	http://people.csail.mit.edu/hasinoff/320/
3	http://www.cs.toronto.edu/~kyros/courses/320/

CO-PO Mapping

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

Bloom's Taxonomy Level	T1	T2	ESE	Total
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Professional Elective 3 : High Performance Computing
Desired Requisites:	Parallel Computing

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 process communication in parallel programs
2	To elaborate the effect of process communication on the performance of parallel programs
3	To define algorithms in parallel processing for a given problem

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Select appropriate methodologies to solve the real-world problem	Apply
CO2	Analyse the algorithm to optimize the communication and computation costs	Analyze
CO3	Design the appropriate algorithm for engineering problems	Create

Module	**Module Contents**	**Hours**
I	**Basic communication operations** One to all, All to All, All Reduce, Prefix Sum, Scatter Gather, All to All personalized communications	7
II	**Analytical Modelling of Parallel Programs** Sources of overhead, performance matrix, Effect of granularity on performance	6
III	**Analytical Modelling of Parallel Programs** Scalability, Minimum execution time, cost optimal execution time	7
IV	**Dense matrix algorithms** Matrix Vector, Matrix-Matrix multiplications, Solving linear equations	7
V	**Sorting** Issues, sorting network, Bubble sort	6
VI	**Graph Algorithms** MST, SSSP, APSP	6

Text Books

1	Anath Grama, Ansul Gupta, George Karypis, Vipin Kumar*," Introduction to parallel computing"*, Second Edition, Pearson Education ,2003
2	Charles Severancem , Kevin Dowd, *"High Performance Computing"*, OpenStax CNX Publications,2021

References

1	Horrowitz, Sahni Rajasekaran, *"Computer Algorithms*", Computer Science, W. H. Freeman and company Press, New York,1996
2	Trobec, R., Slivnik, B., Bulić, P., Robič, B. *"Introduction to Parallel Computing",* Springer Publications, 2018

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_me61/preview
2	https://www.geeksforgeeks.org/introduction-to-parallel-computing/
3	https://hpc.llnl.gov/training/tutorials/introduction-parallel-computing-tutorial

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

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				
Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Professional Elective 3 : System Programming
Desired Requisites:	Data Structures and Operating Systems

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 basic concepts in systems programming.
2	To elaborate the structure and design of assemblers, linkers and loaders.
3	To define the concepts of high level programming languages

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	To apply the execution process of high level programming	Apply
CO2	To analyze the working of compiler	Analyze
CO3	To compare various compilers, linkers and loaders	Analyze

Module	**Module Contents**	**Hours**
I	**Overview of System Software:** Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Levels of System Software, Overview of Language Processors Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables	7
II	**Assemblers:** Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86 , Algorithm of Single Pass Assembler, Multi-Pass Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler,	6
III	**Macro and Macro Processors:** Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design Of a Macro Pre-processor, Design of a Macro Assembler, Functions of a Macro Processor, Basic Tasks of a Macro Processor, Design Issues of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors	7
IV	**Linkers and Loaders:** Introduction, Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders	7
V	**Scanning and Parsing**: Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatic Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC, **Compilers**: Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization	6

VI	**Interpreters & Debuggers:** Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger	6

Text Books	
1	D M Dhamdhere, *System Programming*, McGraw Hill Publication, second revised edition, 2009
2	Srimanta Pal, *System Programming*, Oxford University Press, 2011
3	R.K. Maurya & A. Godbole, *System Programming and Compiler Construction*, Dreamtech Press, 2014
References	
1	Leland L. Beck, *System Software – An Introduction to Systems Programming*, Pearson Education Asia,3rd edition, 2000
2	Santanu Chattopadhyay, *System Software*, Prentice-Hall India, 2007
3	R K Maurya and Anand A Godbole *System Programming and Compiler Construction (Includes Labs)*, Dreamtech Press, 2014
Useful Links	
1	www.cs.jhu.edu/~scott/pl/lectures/parsing.html
2	www.en.wikipedia.org/wiki/System_programming
3	https://nptel.ac.in/courses/106/106/106106197/

CO-PO Mapping

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

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

Assessment

The assessment is based on 2 in-semester evaluations (ISE) of 10 marks each, 1 mid-sem examination (MSE) of 30 marks and 1 end-sem examination (ESE) of 50 marks.
MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE.

Assessment Plan based on Bloom's Taxonomy Level

Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

B. Tech SEM-II

Walchand College of Engineering, Sangli
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AY 2021-22

Course Information

Programme	B.Tech. (Information Techology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Techno-Socio Activity
Desired Requisites:	--

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

Course Objectives

1	To propose a structured and rational solution to address the relevant skills
2	To motivate students towards the desirous need of industry, economy and society
3	To provide opportunity to integrate IT based solutions with various enterprises

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Employ the programme for welfare of society and environment	Apply
CO2	Appraise pragmatic skills for national and international competitions	Analyze
CO3	Recommend and propose engineering solution for industry and community	Evaluate

List of Experiments / Lab Activities

Assessment is based on the rubric decided by department

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

1. Each student or group of students may work for the welfare of the environment, society through programmes such as tree plantation, blood donation campaigns etc.
2. Each student or group of students participating in technical events/competition/exhibition.
3. Certification of the MOOC courses (beyond syllabus) / Programming competition/ interaction with industry
4. Developing any innovative gadget / solution / system and technology transfer in the interest of Nation / Society / Institute (WCE)
5. Publishing papers /articles in national / international conferences / journals or similar contributions
6. Coordinating students' clubs / services like SAIT/WLUG/Lab administration or any other
7. Organizing techno-socio activity for the students / community in rural areas, unprivileged areas

Text Books

1	

References

1	

Useful Links

1	

CO-PO Mapping

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

CO1			1		3							2	
CO2									2		3		
CO3												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

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand				**05**
Apply	20	20	20	**60**
Analyze	10	5	10	**20**
Evaluate		5	5	**10**
Create			5	**5**
Total	**30**	**30**	**40**	**100**

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Project - 2
Desired Requisites:	Project - 1

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	16 Hrs/Week				
Interaction	-	**Credits: 08**			

Course Objectives

1	To identify real life needs and project requirements
2	To elaborate technical solutions through latest design & development tools
3	To compare and analyze the IT platforms for efficient solutions

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Integrate project at each stage of the software development life cycle	Apply
CO2	Recommend project plans that address real-world challenges	Evaluate
CO3	Develop software projects with strategic goals	Create

List of Experiments / Lab Activities

List of Experiments:

Project is to be carried out in a group of maximum 5 to 6 students. Project is to be carried based research paper from journals.

Each group will carry out a project by developing any application software based on the following areas.

1. Application can be based on any trending new technology.
2. Application can be extension to previous projects.
3. Results of the project is to be tested and validated against standard data set.
4. Project group should achieve all the proposed objectives of the problem statement.
5. The work should be completed in all aspects of design, implementation and testing and follow software engineering practices.
6. Project reports should be prepared and submitted in soft and hard form along with the code and other dependency documents. Preferable use online code repositories (github/bitbucket)
7. Project will be evaluated continuously by the guide/panel as per assessment plan.
8. Presentation and report should use standard templates provided by department.
9. Preferably student should present/publish article.

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

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

Text Books

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

References	
1	https://www.youtube.com/watch?v=0oSDa2kf5I8 (report writing)
Useful Links	
1	https://pats.cs.cf.ac.uk/wiki/lib/exe/fetch.php?media=project-report.pdf
2	http://users.iems.northwestern.edu/~hazen/Writing%20Project%20Reports%202004a.pdf
3	https://www.upgrad.com/blog/java-project-ideas-topics-for-beginners/
4	https://www.geeksforgeeks.org/computer-science-projects/

CO-PO Mapping

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

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

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	10	10	**35**
Analyze	5	10	5	**20**
Evaluate	5	5	10	**20**
Create	5	5	15	**25**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B.Tech., Sem VIII
Course Code	
Course Name	Professional Elective 4 :Wireless Networks
Desired Requisites:	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 Objective

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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

Text Books

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

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

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				
Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Final Year B. Tech., Sem VIII				
Course Code					
Course Name	Professional Elective 4: Advanced Data Structures				
Desired Requisites:	Computer Programming, Data Structures.				
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 time complexity issue & balanced search trees
2	To impart advanced knowledge of Graph and Heap data structures
3	To compare data structures and algorithms in real applications

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Solve real world problems using advanced data structures	Apply
CO2	Compare different data structures	Analyse
CO3	Evaluate time complexity of different algorithms	Evaluate

Module	**Module Contents**	**Hours**
I	**Data Structure and Time Complexity:** Review of Basic Concepts: Abstract data types, Algorithms, Big Oh, Small Oh, Omega and Theta notations, Solving recurrence equations, Data structures & its effect on time complexity, Iterative Vs Recursive coding, amortized analysis.	6
II	**Advance Tree Structures:** Binary Trees, Binary search trees, Threaded Binary trees, Height balanced AVL trees, Splay trees: A self-Adjusting-Data Structure.	7
III	**Heaps:** Balanced Search Trees as Heaps, Array-Based Heaps, Heap-Ordered Trees and Half-Ordered Trees, Leftist Heaps, Skew Heaps, Binomial Heaps, Changing Keys in Heaps, Fibonacci Heaps, Double-Ended Heap Structures and Multidimensional Heaps	7
IV	**Tree Data Structure Applications:** Multiway Trees, Lexicographical Search Trees: Tries, External Searching: B & B+ Trees, Redblack trees, Tree Structured Programs: Look –Ahead in Games.	7
V	**Hashing:** Basic Hash Tables and Collision Resolution, Universal Families of Hash Functions, Perfect Hash Functions, Hash Trees, Extendible Hashing, Membership Testers and Bloom Filters.	6
VI	**Selected Problems:** Graph Problems – Network flows: Max flow – mincut theorem, Probabilistic methods – Markov's inequality, Dynamic Graph Problems.	7

Text Books

1	Robert Kruse, C L Tando, Bruce Leung, "*Data Structure and Program Design in C*", Pearson, 2nd, 2007

References	
1	https://onlinecourses.swayam2.ac.in/cec21_cs02/

Useful Links	
1	http://www.dave-reed.com/csc427.F04/
2	http://www.cse.unt.edu/~rada/CSCE3110/

CO-PO Mapping

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

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

Assessment

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

Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Final Year, B.Tech Sem VIII				
Course Code					
Course Name	Professional Elective 4 :Soft Computing				
Desired Requisites:	Artificial Intelligence, Programming Languages and tool like Matlab/Scilab				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3hr/Week	**T1**	**T2**	**ESE**	**Total**
Tutorial	--	20	20	60	100
Practical	--				
Interaction	--	**Credits: 3**			

Course Objectives	
1	To introduce various component of soft computing
2	To impart soft computing concepts to solve engineering and optimization problems.
3	To elaborate swarm intelligence methods

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Classify hard and soft computing concepts	Apply
CO2	Compare the working of swarm intelligence methods	Analyze
CO3	Justify the soft computing technique for given problem	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction** History, Scope of Soft Computing, components of Soft Computing- Neural Networks, Application scope of ANN, Fuzzy Logic, Genetic algorithm, Swarm Intelligence, Hybrid System, Hard vs. Soft Computing.	**5**
II	**Artificial neural network (ANN)** Fundamental Concept, Evolution of Neural network, Basic models of ANN, important terminologies of ANN, Mc-Culloch Pitts Neuron, Linear separability, AND,OR, EXOR problem solving by ANN, Supervised Learning, Unsupervised Learning, Application to ANN to real world problem.	**7**
III	**Genetic algorithms (GA)** Introduction, basic operators and Terminologies in GA, Genetic operators – Selection, cross-over, reproduction and mutation – fitness function, traditional vs. Genetic algorithm, simple genetic algorithm, general genetic algorithm, the schema theorem, classification of GA, Genetic programming. Application to GA to real world problem.	**7**
IV	**Introduction to classical set and fuzzy sets** Introduction, Classical set (crisp set) Fuzzy sets and their properties, Fuzzy models, Membership function, Defuzzification. Application to Fuzzy logic to real world problem.	**6**
V	**Swarm intelligence (SI)** Ant colony optimization (ACO). Swarm as a multi-agent system, Distributed coordination and group communication, Particle Swarm Optimization (PSO), Differential Evolution (DE), Harmony search (HS), Bacteria Foraging Optimization (BFO), Artificial Bee Colony algorithm (ABC), Biogeography-Based Optimization (BBO), Gravitational Search Algorithm (GSA), Grenade Explosion Method (GEM) Teaching Learning Based Optimization Algorithm (TLBO).	**8**

VI	**Applications of soft computing** Hybrid System, Applications in image processing, optimization of TSP using GA/ANN, GA based Internet search technique, soft computing based hybrid fuzzy controller, Application of soft computing in multiple disciplines. Top research article in soft computing from high reputed journals.	**6**

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

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

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_cs17/preview
2	http://www.soft-computing.de/linkC.html

CO-PO Mapping

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

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

Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli
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AY 2021-22

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective 4: Deep Learning
Desired Requisites:	Computer Programming, Data Structures, Computer Algorithms

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 paradigm shift technique, deep learning into students
2	To elaborate the deep learning methods in real world applications
3	To explain deep learning concepts

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Compare the deep learning models	Analyze
CO2	Identify the optimization techniques in deep learning	Analyze
CO3	Implement deep learning techniques for natural language processing and computer vision.	Apply

Module	**Module Contents**	**Hours**
I	**Fundamentals of Neural Networks:** McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward Neural Networks, Representation Power of Feedforward Neural Networks. Backpropagation algorithm.	7
II	**Optimizations in Gradient Descent:** Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Bais correction in Adam.	6
III	**Regularization:** Regularization: Bias Variance Trade off, L2 regularization, Early stopping, Data-set augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout. Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization.	7
IV	**Deep Learning for word encoding-Natural Language Processing:** Eigen values and eigen vectors, Basis, Principal Component Analysis and its interpretations, Singular Value Decomposition, Learning Vectorial Representations Of Words: One hot representation of words, SVD for learning word representation.	7
V	**Convolutional Neural Networks for Computer Vision:** Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks	6
VI	**Recurrent Neural Networks**: Recurrent Neural Network, Back Propagation through time(BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTM.	7

Text Books	
1	Aurelien Geron , " *Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems*",Second Edition, O'Reilly,2019
2	Eugene Charniak, *"Introduction to Deep Learning"*, The MIT Press Cambridge, 1st Edition, 2019
References	
1	Ian Goodfellow, Yoshua Bengio and Aoron Courville "*Deep Learning*", The MIT Press Cambridge, Massachusetts London, England, 2017
Useful Links	
1	https://www.classcentral.com/course/swayam-deep-learning-iitropar-43579

CO-PO Mapping

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

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

Assessment

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

Bloom's Taxonomy Level	T1	T2	ESE	Total
Remember	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Understand	5	5	10	**20**
Apply	10	5	15	**30**
Analyze	5	5	15	**25**
Evaluate		5	15	**20**
Create			5	**5**
Total	**20**	**20**	**60**	**100**