B. Tech SEM-1

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

AY 2022-23

Course Information

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

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

Course Objectives

1	To introduce basic concepts, principles and techniques of data mining
2	To make students to develop skills to use and implement data mining tools
3	To handle and propose solution to real world problem.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Summarize the basic concepts, techniques and algorithms of Data Mining	II	Understanding
CO2	Apply skills of using data mining techniques for solving real life problems	III	Applying
CO3	Recognise real world problems for independent study and research	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction : Basic Concepts in Data Mining** Data mining background, classification of Data Mining, Data Mining Techniques. Data Pre-processing, Applications	4
II	**Data Mining Primitives** Data Mining Primitives, Architecture of Data Mining, Knowledge representation, Data generalization & summarization.	4
III	**Association Rule mining,** Frequent item set generation,, Association Rule generation, correlation analysis, constraint based Association mining.	5
IV	**Classification & Prediction** Issues, Decision Tree, Bayesian classifier, Back propagation, Classification methods, Prediction, ensemble classification	5
V	**Cluster analysis** similarity metrics, Clustering methods, (partitioning based, hierarchical based, density based, grid based),	4
VI	**Introduction to Mining Complex Data sets** Mining spatial data, temporal data, Mining time series, mining text datasets, web mining	4

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/

CO-PO Mapping

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

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

Assessment

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

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AY 2022-23

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	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hrs/week	30	20	50	100
	-	**Credits: 3**			

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Generalize information security aspects and outline CIA requirements	II	Understanding
CO2	Practice various encryption algorithms by examining crypt-complexity	III	Applying
CO3	Compare access control mechanisms and authentication services resolving the security issues	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Security Overview:** Services, Mechanism and Attacks, The OSI Security Architecture, Classical Encryption Techniques, Substitution Techniques, Transposition Techniques, Steganography	4
II	**Block Cipher:** Block Cipher Design Principles, Modes of Data Transfer, Symmetric Cipher Model, Data Encryption Standard, Security of 2DES, 3DES & AES	4
III	**Public Key Encryption:** Principles of Public-Key Cryptosystem, RSA Algorithm, Distribution of Public Keys, Diffie-Hellman Key Exchange	5
IV	**Authentication Functions and Services:** Hash Functions, Message Authentication Codes, Digital Signatures Kerberos, X.509 Certificates	4
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	4
VI	**Perimeter Security:** Intruders, Intruder Detection, Password Management, Malwares Firewall Configurations, Trusted Systems, Honeypots	5

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: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.														

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	4IT451
Course Name	Data Mining Lab
Desired Requisites:	Basic computer programming, Statistics

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

Course Objectives

1	To demonstrate basic concepts of data processing
2	To introduce data mining algorithm
3	To apply data mining algorithms for real world problem

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Summarize data processing tools	III	Applying
CO2	Implement data mining algorithms	IV	Analysing
CO3	Evaluate feasibility of data mining algorithm to various data types	V	Evaluating

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
3	

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	

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

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

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Course Information

Programme	B.Tech. (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)**			
Practical	2 Hrs/week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	1 Hr	30	30	40	100
		Credits: 2			

Course Objectives

1	To configure the open source software
2	To contribute or develop software in open source environment
3	To use FOSS for software engineering

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Exercise the FOSS tools in software development	III	Applying
CO2	Analyze the economics of FOSS	IV	Analysing
CO3	Create new FOSS or Contribute to existing FOSS	VI	Creating

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
3	

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, and preferably to only one PO.

Assessment

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

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30

Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

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

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	1 Hrs/week	15	15	20	50
		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,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Engage the programme for welfare of society and environment	III	Applying
CO2	Appraise pragmatic skills for national and international competitions	IV	Analysing
CO3	Recommend and propose engineering solution for industry and community	V	Evaluating

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, and preferably to only one PO.														

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

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Course Information

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

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

Course Objectives

1	To help students to identify real life needs and discuss project requirements.
2	To give technical solutions through latest design & development tools.
3	To direct students 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,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Integrate project at each stage of the software development life cycle	III	Applying
CO2	Recommend project plans that address real-world challenges	V	Evaluating
CO3	Develop successful software projects that support program's strategic goals and satisfies the customer needs	VI	Creating

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, and preferably to only one PO.

Assessment

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

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

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

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AY 2022-23

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Open Elective - 5: Data Visualization and Interpretation
Desired Requisites:	Programming Fundamentals

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

Course Objectives

1	To explain the concept supervised and unsupervised machine learning techniques.
2	To introduce various machine learning algorithms.
3	To discuss problem solving approaches using appropriate machine learning techniques.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Summaries various machine learning algorithms with data for Regression and Classification.	II	Understanding
CO2	Apply appropriate learning algorithm for particular problems.	III	Applying
CO3	Structuring Machine Learning algorithms with performance parameters.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction:** Introduction to Data Science, Overview of the Data Science process, Introduction to Data Science technologies, Introduction to Machine Learning, Regressions, Classification, Clustering, Recommendation systems	7
II	**Working with Data:** Variables , Vectors, Matrices, lists & Data frames , Logical vectored operators Image data type, Image representation, categorical data using Factors in R.	6
III	**Data/Image Visualization:** 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.	7
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()	7
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-datascience#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		
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CO1	3		1										2		
CO2		2													
CO3	2		1											1	

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
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MSE shall be typically on modules 1 to 3.
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ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

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

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

Course Objectives

1	To introduce fundamentals of virtualization
2	To impart various service and deployment model in cloud computing
3	To acquaint the significance of virtualization in data center

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Comprehend the fundamentals of cloud computation	II	Understanding
CO2	Choose virtualization techniques to deploy the service on cloud infrastructure	III	Applying
CO3	Analyze service models for data center applications	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction to Cloud Computing** Virtualization and Cloud Computing, Cloud Reference Model: IAAS, PAAS, SAAS, Cloud Deployment Model: Public Cloud, Private Cloud and Hybrid Cloud, Cloud Platforms in Industry	7
II	**Virtualization** Hosted and Bare-Meta, Server Virtualization, Desktop Virtualization, Application Virtualization, Storage Virtualization	6
III	**Network Functions** Public Cloud Networking: Route53, Content Delivery Networks, Resilience Infrastructure, Virtual Network Functions: Cloud Firewall, DNS, Load Balancers, Intrusion Detection Systems	6
IV	**Virtual Private Clouds (VPC)** VPC fundamentals, Public and Private Subnets, Security Groups, Network Access Control List, Network Address Translation.	7
V	**Cloud Management** Service Management in Cloud Computing, Data Management in Cloud Computing, Resource Management in Cloud	7
VI	**Advances in Cloud Computing** cloud security, Microservices: Containers, Kubernetes, Resource Management in Microservices	6

Text Books

1	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, *"Mastering cloud computing"*, Mc Graw Hill Education, 3rd Edition, 2011
2	Thomas Erl, Zaigham Mahmood and Ricardo Puttini, *"Cloud Computing: Concepts, Technology & Architecture"*, Pearson, 1st Edition, 2010

References	
1	Richardo Puttini, Thomas Erl, and Zaigham Mahmood, *"Cloud Computing: Concepts, Technology & Architecture"*, Pearson Prentice Hall, 2nd edition, 2013
2	Srinivasan, J. Suresh, *"Cloud Computing: A practical approach for learning and implementation"*, Pearson, 2nd Edition, 2012
Useful Links	
1	Module: I, II, IV, V, VI https://nptel.ac.in/content/syllabus_pdf/106105167.pdf
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	3
CO1	1		2										2		
CO2			3												
CO3	2													3	
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.															

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

Walchand College of Engineering, Sangli
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AY 2022-23

Course Information

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

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

Course Objectives

1	To introduce basic concepts in systems programming.
2	To study the structure and design of assemblers, linkers and loaders.
3	To explain the concepts and theory behind the implementation of high level prog languages.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Apply the knowledge about execution process of HLL programs.	III	Applying
CO2	Analyse the working of scanners and parsers.	IV	Analysing
CO3	Evaluate various system software's.	V	Evaluating

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,	7
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	6
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	1	1	2									1		
CO2		2			2								2	
CO3	1	2			1									

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

Assessment

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

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AY 2022-23

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Professional Elective – 3: Mobile Ad-hoc Networks & Sensors
Desired Requisites:	Computer Networks, Wireless Network

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

Course Objectives

1	To discuss different wireless technologies.
2	To introduce various protocols used in Adhoc and Sensor Networks.
3	To design sensor network scenario

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Illustrate different wireless network issues through ad-hoc concepts.	III	Applying
CO2	Integrate MAC and network layer protocols for ad-hoc and sensor network applications	IV	Analysing
CO3	Recommend different protocol of MANS	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction Mobile Adhoc Networks(MANETs):** Introduction: Wireless Ad Hoc Networks, Self-organizing Behaviour of Wireless Ad Hoc Networks Cooperation in Mobile Ad Hoc Networks, MAC Protocols in MANETs	6
II	**Routing in MANETs:** Routing in MANETs,Multicasting in MANETs, Mobility Models for MANETs,Transport Protocols for MANETs	7
III	**Wireless Sensor Networks:** Opportunistic Mobile Networks, UAV Networks, Introduction: Wireless Sensor Networks	6
IV	**Wireless Sensor Network Management:** WSN Coverage & Placement, Topology Management in Wireless Sensor Network Mobile Wireless Sensor Networks, Medium Access Control in Wireless Networks	7
V	**Routing in WSN:** Routing in Wireless Sensor Networks, Congestion and Flow Control	7
VI	**Challenges in 5G:** Underwater Sensor Networks, Underwater Sensor Networks, Security of Wireless Sensor Networks, Hardware Design of Sensor Node, Real Life Deployment of WSN	6

Text Books	
1	C.K Toh*, "Ad hoc Mobile Wireless Networks Protocols and Systems",* Pearson Education, 1st Edition, 2002
2	KazemSoharby, Daniel Minoli,, TaiebZnati,"Wireless Sensor Networks, Technology, Protocols and applications",Wiley,1st edition, 2007
References	
1	Xiang-Yang Li, "Wireless Ad Hoc and Sensor Networks", Cambridge University press, 1st edition, 2008
Useful Links	
1	Module I, II, III, IV, V, VI https://nptel.ac.in/courses/106/105/106105160/

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

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

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AY 2022-23

Course Information

Programme	B.Tech. (Information Techology)
Class, Semester	Final Year B. Tech., Sem VII (seven)
Course Code	
Course Name	Professional Elective - 3: Basics of Visual Computing
Desired Requisites:	Computer Graphics

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

Course Objectives

1	To introduce theory of data structure and levels for representation
2	To discuss the principles of Animation and how to apply it
3	To provide comprehensive introduction to computer modelling, animation and rendering

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Distinguish the levels of image data representation	II	Understanding
CO2	Interpret the effects of rendering	III	Applying
CO3	Justify the use of OpenGL for object visualization and manipulation	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Image Processing & Modelling –** Level of image data representation, Traditional & hierarchical data structure Image Enhancement in spatial domain, 3-D Modelling, Basic 3-D Programming principles	5
II	**Graphics Programming** Introduction to OpenGL, Primitives and attributes, Viewing, control functions, sample program in OpenGL	8
III	**2D Transformation** Basic Transformations, Homogeneous representation of 2d transformation, Shear Transformation, window to viewport Transformations	6
IV	**3D Transformation** Translation, scaling, Rotation o 3D objects, composition of 3D transformations, OpenGL Transformation Matrix, Alpha blending, Modelling a coloured cube.	8
V	**Lighting and surfacing –** Light and matter, the phone lighting model; computation of vectors; polygon shading; Approximation of sphere by recursive subdivision; Light sources in OpenGL; Specification of material in OpenGL	6
VI	**Visible Surface Determination** Zbuffer algorithm, Visible surface Ray Tracing, Area subdivision techniques, scan line algorithm	6

Text Books

1	Edward Angel, "*Interactive Computer Graphics: A Top-Down Approach with OpenGL"*, 4th edition Addison-Wesley, 2005
2	Meenakshi Raikar, "Computer Graphics with OpenGL", CENAGE, 2019.

References	
1	F. S. Hill Jr. and S. M. Kelley , *"Computer Graphics using OpenGL (3/e)",* Pearson, 2007
2	ShalliniGovil-Pai, *"Principles of computer Graphics"* , Springer, first edition, 2005
3	Rechard Wright & Sweet, *"OpenGLSuperBible",* QUE, 2nd Edition, 2000
Useful Links	
1	https://www.coursera.org/learn/computer-vision-basics#syllabus
2	https://www.classcentral.com/course/udacity-introduction-to-computer-vision-1022
3	https://www.classcentral.com/course/introduction-computer-vision-watson-open-13849

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: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

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

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AY 2022-23

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII
Course Code	
Course Name	Professional Elective - 3: Digital Image Processing
Desired Requisites:	

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

Course Objectives

1	To explain image fundamentals and mathematical transforms for image processing
2	To describe and explain image enhancement techniques
3	To elaborate image processing applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Discuss fundamental concepts of a digital image processing system	II	Understanding
CO2	Interpret image segmentation and representation techniques	III	Applying
CO3	Analyze images in the frequency domain using various transforms	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction and Pixel Relationship** Need for Image Processing ,Some Applications of Image Processing-Fundamental steps in DIP, Components of digital image processing, sampling, quantization, Pixel Relationships in images, Distance measurements, Data structure for image representation	7
II	**Image Operations and Interpolations** Arithmetic operations, Logical operations, Geometrical operations , Image interpolation techniques	7
III	**Image Transformation** Need of transformation, DFT and properties, convolution Theorem, DCT	6
IV	**Image Enhancement** Point operations ,Spatial filtering techniques, Frequency domain filtering	6
V	**Image Segmentation** Classification of Image segmentation, Edge detection, Thresholding techniques, Region growing techniques	7
VI	**Image Morphology** Mathematical Morphology, structuring elements, Dilation, erosion, opening, closing operations, properties of morphological operations.	6

Text Books

1	S.Shridhar, *"Digital Image Processing",* Oxford Unversity Press,2nd Edition,2016.
2	Millan sonka,Vaclav Hiavac, Roger Boyle, *"Image Processing Analysis and Machine Vision",* CL Engineering,3rd Edition,2013.

References

1	S. Jayraman, S Esakkiarajan , Veerakumar, *"Digital image processing",* MGH,1st Edition,2017.
2	Rafel C. Gonzalez, Richard E. Woods, *"Digital Image Processing",* 3rd Edition, Pearson Education, 2008

Useful Links	
1	Module I,II,III https://nptel.ac.in/courses/117/105/117105079/
2	Module IV,V https://nptel.ac.in/courses/106/105/106105223/
3	Module VI Vlabs,iitb.ac.in

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli
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AY 2022-23

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year, Sem-VIII
Course Code	
Course Name	Humanities-3:Project Management
Desired Requisites:	

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

Course Objectives

1	To understand the fundamental concepts of project management and planning
2	To understand the processes in the knowledge areas and inter dependencies between them
3	To use hands on different tools to ensure the smooth planning and execution

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand the concepts of Project Management for planning to execution of projects	II	Understanding
CO2	Identify the resources needed for each stage, including involved stakeholders and tools	III	Applying
CO3	Plan and manage the scope, cost, timing, and quality of the project	III	Applying

Module	**Module Contents**	**Hours**
I	**Introduction to Software Project Management** Project, project management(PM), role of project manager, project management profession, system view of PM, organization, stakeholders, project phases and lifecycle, context of IT projects, process groups, mapping process groups to knowledge areas	3
II	**Project Integration and Scope Management** Strategic planning and project selection, preliminary scope statements, project management plans, project execution, monitoring and controlling project work, integrated change control, closing project, software assistance scope planning and scope management plan, scope definition and project scope statement, creating the work breakdown structure, scope verification and control, software assistance	2
III	**Project Time and Cost Management** Importance of project schedules, activity - definition, sequencing, resource estimating, duration estimating; schedule development and control, software assistance Importance, basic principles, cost estimating, budgeting and control, software assistance	2
IV	**Project Quality and Human Resource Management** Quality planning, assurance and control tools and techniques, modern quality management and improving IT project quality, software assistance, keys to managing people, human resource planning, acquiring, developing and managing project team	2

V	**Project Communication and Risk Management** Communication planning, information distribution, performance reporting, managing stakeholders, risk management planning, sources of risk, risk identification, qualitative and quantitative risk analysis, risk response planning, risk monitoring and control	2
VI	**Project Procurement Management** planning purchases and acquisitions, planning contracting, requesting seller responses, selecting sellers, administering the contract, closing the contract Tools used – JIRA, Agile Methodology, Network diagrams, GitHub, GitLab	2

List of Experiments / Lab Activities

1. Surveying of common project management tools and techniques and preparing a report on it
2. Developing the project charter for the project topic
3. Collecting functional and behavioural requirements using different techniques
4. Developing project schedule using network model diagram
5. Developing entire schedule of project by estimating activity resources and estimated time
6. Preparing the cost estimate by using different cost estimation techniques
7. Developing the project quality document
8. Developing communication management plan for the project
9. Identifying the risk involved in the project and preparing a risk portfolio document
10. Developing the SOW for the procurement of the project

Text Books

1	Project Management - Mantel Jr., Meredith, Shafer, Sutton with Gopalan (Wiley India Edition)
2	Effective Project Management: Traditional, Agile, Extreme – Robert K Wyosaki (Seventh Edition) Wiley India

References

1	Project Management (4th Edition) – Kathy Schwalbe, (Cengage Learning – India Edition)

Useful Links

1	https://www.coursera.org/specializations/engineering-project-management#courses
2	https://onlinecourses.nptel.ac.in/noc22_mg60/preview?user_email=mullatahseen@gmail.com
3	https://onlinecourses.nptel.ac.in/noc22_cs107/preview
4	

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, and preferably to only one PO.

Assessment

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

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30

LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

B. Tech SEM-2

Walchand College of Engineering, Sangli
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AY 2022-23

Course Information

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

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	3 Hrs/week	30	30	40	100
		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,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Demonstrate use of automation testing tools	III	Applying
CO2	Implement project management techniques like planning, risk analysis, scheduling.	III	Applying
CO3	Evaluate software development life cycle using Agile tools and DevOps.	V	Evaluating

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, Test Driven Development	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, JIRA Tool, Scum	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, and preferably to only one PO.

Assessment

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

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

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

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2022-23					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Final Year B. Tech., Sem VIII				
Course Code					
Course Name	Project – II				
Desired Requisites:	Project – I				
Teaching Scheme		**Examination Scheme (Marks)**			
Practical	12 Hrs/Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
	-	**Credits: 6**			

Course Objectives	
1	To help students to identify real life needs and discuss project requirements.
2	To give technical solutions through latest design & development tools.
3	To direct students 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,

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Integrate project at each stage of the software development life cycle	III	Applying
CO2	Recommend project plans that address real-world challenges	V	Evaluating
CO3	Develop successful software projects that support program's strategic goals and satisfies the customer needs	VI	Creating

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)
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, and preferably to only one PO.

Assessment

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

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year, Sem-VIII
Course Code	
Course Name	Professional Elective – 4: Information Storage Management
Desired Requisites:	Computer networks, Operating System

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

Course Objectives

1	To introduce Storage technologies
2	To acquaint with Storage system architectures
3	To categorize backup and recovery technologies

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Comprehend the logical and physical components of a storage infrastructure	II	Understanding
CO2	Choose various storage networking technologies for data centre	III	Applying
CO3	Distinguish between backup and recovery technologies	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction to information storage and Data center** Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle, Storage System Environment: Components of a Storage System Environment.	6
II	**Data Protection: RAID, Intelligent Storage System** Storage components ,Data organization: File vs. Block, Object; Data store; Searchable models ,Storage Devices (including fixed content storage devices) File Systems Volume Managers RAID systems Caches, Prefetching	7
III	**Direct-Attached Storage, SCSI, SAN, NAS** Fibre Channel , IP-based Storage (iSCSI, FCIP, etc.),Examples NAS,NFS,CIFS, DAFS	6
IV	**Network components** Connectivity: switches, directors, highly available systems Fibre Channel,1GE/10GE, Metro-Ethernet, Aggregation , Infiniband	6
V	**Business Continuity Backup and Recovery** Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets,	7
VI	**Large Storage Systems** Google FS/BigTable, Cloud/Web-based systems (Amazon S3) FS+DB convergence ,,Programming models: Hadoop**,** ,	7

Text Books	
1	Somasundaram Gnanasundaram, Alok Shrivastava, *"Information Storage and Management"*, EMC Education Services (Wiley India), 2nd Edition, 2012.
2	Ulf Troppen, Rainer Erkens, Wolfgang Müller,, *"Storage Networks Explained"*, (Wiley India). 2nd Edition, 2016.
References	
1	Robert Spalding, "*Storage Networks: The complete Reference*", McGraw Hill Education Indian edition 2017.
2	Tom Clark, *"Designing Storage Area Networks, A Practical Reference for Implementing Fibre Chanel and IP SANs",* AddisonWesley Professional; 2nd edition 2010.
Useful Links	
1	Modules II,III,IV and VI https://nptel.ac.in/courses/106/108/106108058/

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

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective-4:Parallel Algorithm
Desired Requisites:	Operating System

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

Course Objectives

1	To introduce the current trends in parallel computer architectures and programming model.
2	To acquaint with parallel program design methodologies.
3	To devise various parallel algorithms for matrices and graphs

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain different parallel architectures and design methodologies	II	Understanding
CO2	Select appropriate Strategy to optimize real world problem	IV	Analysing
CO3	Study the parallel algorithms for matrices, graphs, sorting algorithm etc	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Basic Parallel Algorithm** Introduction to Parallel Computing, Parallelism on the JVM, Running Computations in Parallel, Monte Carlo Method to Estimate Pi, First-Class Tasks	7
II	**Basic Task in Parallel Algorithms** Parallel Sorting, Data Operations and Parallel Mapping, Parallel Fold (Reduce) Operation Associativity, Parallel Scan (Prefix Sum) Operation	6
III	**Data-Parallelism** Data-Parallel Programming, Data-Parallel Operations, Scala Parallel Collections Splitters and Combiners	7
IV	**Data Structures for Parallel Computing** Implementing Combiners, Parallel Two-phase Construction, Conc-tree Data Structure, Amortized, Constant-time Append Operation, Conc-Tree Combiners	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

References	
1	Horrowitz, SahniRajasekaran, *"Computer Algorithms"*, Computer Science, W. H. Freeman and company Press, New York, 1997
Useful Links	
1	Module I, II, III, IV https://www.coursera.org/learn/parprog1?ranMID=40328&ranEAID=*GqSdLGGurk&ranSiteID=.GqSdLGGurk-ntwHfWI_xX32aIgZXdr9Ug&siteID=.GqSdLGGurk-ntwHfWI_xX32aIgZXdr9Ug&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=*GqSdLGGurk#syllabus

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: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective - 4: Software Defined Network
Desired Requisites:	Computer Networks, Cloud Computing

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

Course Objectives

1	To provide fundamental knowledge of Software Defined Network.
2	To acquaint SDN operation in Data center
3	To appraise 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,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Comprehend the concept of abstracting and centralizing the control plane in SDN	II	Understanding
CO2	Analyze the implications of shifting from traditional network architectures to SDN	IV	Analysing
CO3	Evaluate the network virtualization functions	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to SDN:** Basic Packet Switching Terminology, The Modern Data Center, Architecture of SDN, SDN Switch, Central Control, Active Networks, The Road to SDN	7
II	**Control and Data Plane:** Control/Data Separation, Opportunities in Various Domains, Challenges in Separating the Data and Control Planes, Routing Control Platform, The 4D Network Architecture	7
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** SDN Use Cases in the Data Centre, Open SDN versus Overlays in the Data Centre	7
V	**Virtualization in Data Centre** Network Functions Virtualization, Micro service based deployment, Virtualization techniques in Data Centre, micro services and orchestration of applications	7
VI	**Application of SDN** SDN for Campus network, Data centre based applications, SDN in Public, Private and Hybrid Cloud	4

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	Module I, II, III, V, VI https://www.coursera.org/learn/sdn#about
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	3
CO1	1		2										2		
CO2			3												
CO3	2													3	
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.															

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VII (seven)
Course Code	
Course Name	Professional Elective 4:Adavanved Deep Learning
Desired Requisites:	Machine Learning

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

Course Objectives

1	To Introduce major deep learning algorithms
2	to solve real world problems using deep learning
3	To explain the advanced algorithms for Natural Language Processing and Computer Vision

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.	II	Understanding
CO2	Utilize appropriate learning algorithm for Encoder Decoder model.	III	Applying
CO3	Implement deep learning algorithms and solve real-world problems.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Deep Learning Introduction** Partial) History of Deep Learning, Deep Learning Success Stories, 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	6
II	**FeedForward Neural Networks** FeedForward Neural Networks, BackpropagationGradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam.	6
III	**Autoencoders** Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization	7
IV	**Regularization in Training of DL** Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout	6

V	**Convolutional Neural Networks** Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks	7
VI	**Deep Learning for Computer Vision:** Recap of Convolutional Neural Networks. Object Localization, Object Detection using Convolutional Implementation of Sliding Windows, Bounding Box Predictions, Intersection Over Union, Non-max Suppression, Anchor Boxes, YOLO Algorithm, and Region Proposal Networks.	7

Text Books	
1	Ian Goodfellow, Yoshua Bengio and Aoron Courville *"Deep Learning"*, The MIT Press Cambridge, Massachusetts London, England, 2017,ISBN: 9780262035613

References	
1	Module I II III IV Prof.Mitesh M. Khapra, *"Deep Learning",* course on NPTEL, July 2019
2	Andrew Ng, "Deep Learning Specialization", Coursera online course

Useful Links	
1	https://www.deeplearningbook.org/
2	https://onlinecourses.nptel.ac.in/noc19_cs85/

CO-PO Mapping

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

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

Assessment

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective 4:Augumented Reality and Virtual Reality
Desired Requisites:	Machine Learning

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

Course Objectives

1	To Introduce geometric modelling and Virtual environment
2	To solve real world problems in AR VR
3	To explain various types of Hardware and software in virtual Reality systems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand fundamental computer vision, computer graphics and human-computer interaction techniques related to VR/AR	II	Understanding
CO2	Relate and differentiate VR/AR technology	IV	Analysing
CO3	Implement Virtual/Augmented Reality applications	III	Applying

Module	**Module Contents**	**Hours**
I	**Introduction to Virtual Reality:** Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.	5
II	**Computer Graphics And Geometric Modelling:** Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Colour theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms. Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.	6
III	**Virtual Environment:** Input: Tracker, Sensor, Digital Gloves, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc. Output: Visual /Auditory / Haptic Devices. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems. Animating the Virtual Environmen	7

IV	**Augmented Reality:** Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.	7
V	**Development Tools and Frameworks:** Human factors: Introduction, the eye, the ear, the somatic senses. Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML	7
VI	**AR / VR Applications:** Introduction, Engineering, Entertainment, Science, Training.	7

Text Books	
1	Grigore C. Burdea, Philippe Coiffet , Virtual Reality Technology, Wiley 2016
2	Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

References	
1	Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
2	John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.

Useful Links	
1	https://nptel.ac.in/courses/106106138
2	https://gamedevacademy.org/category/vr-ar-tutorials/

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		1										
CO3			2												3

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

Assessment

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year, B. Tech. , Sem-VIII
Course Code	
Course Name	Professional Elective -5: Geographical Information System
Desired Requisites:	-

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

Course Objectives

1	To make students able to describe, GIS.
2	To introduce GIS data structures, data capture, storage, analysis and the use.
3	To impart typical uses of GIS in business, government, and resource management

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Distinguish spatial and non-spatial characteristics of GIS data	II	Understanding
CO2	Examine the data quality issues and performance for GIS data	III	Applying
CO3	Design a GIS application for real time system	VI	Creating

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to GIS** Introduction to GIS, components of GIS, Real World to Digital World through GIS, GIS data and structures, representing the Real World.	7
II	**Module 2: Georeferencing and Map Projections** Georeferencing, Relative and Discrete Referencing, levation models, Coordinate Systems, Maps and Numbering, Map Projections.	6
III	**Module 3: Data Quality and Measures** Positional Accuracy and Source of Errors, Classification Accuracy and Pixel Errors, Spatial Data Editing and Transformations, data model and comparisons.	6
IV	**Module 4: Remote Sensing and GPS and Database systems:** Introduction to Remote Sensing, RS-working, satellites, and GPS, GPS: Working and Signals , GPS errors Introduction to database, Database Management System - Introduction, DBMS models, Normalization forms, Creating and Maintaining a database, Spatial Database systems.	7
V	**Module 5: Spatial Query and analysis** Spatial Query - Introduction, Spatial analysis, Raster and vector data analysis, Overlay operations, Basic spatial analysis, advanced spatial analysis.	6
VI	**Module 6: GIS Data Standard and Infrastructure** Open Source GIS Softwares- Introduction, PROS & CONS of open source, GIS Data Standards, Open Geospatial Consortium (OGC), National Spatial Data Infrastructure (NSDI), Introduction to Web GIS and Geoserver.	7

Text Books

1	Ian HeyWood, Sarah Cornelius and Steve Carver, "*An Introduction to Geographical Information Systems",* Pearson Education, 2nd Edition, 2006
2	Kang-tsung Chang , "*Introduction to Geographic Information Systems*", Tata McGrawHill, 4th Edition, 2007
References	
1	Peter A. Burrough, Rachael A. McDonnell and Christopher D. Lloyd "*Principles of Geographical Information System*", Oxford University Press, 2016
2	Keith C. Clarke, Bradley O. Parks, and Michael P. Crane, "*Geographical Information Systems and Environmental Modeling*", Prentice-Hall India, 2001
3	Michael N. Demers , "*Fundamentals of Geographic Information Systems*", 4th Edition, Wiley Publication 2008,
4	Chor Pang Lo , "*Concepts and Techniques of Geographic Information Systems*", Pearson Prentice Hall, 2007
Useful Links	
1	https://nptel.ac.in/courses/107/105/107105088/
2	https://nptel.ac.in/courses/105/107/105107206/
3	https://nptel.ac.in/courses/105/107/105107155/
4	

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

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

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 -5: Decision Support System
Desired Requisites:	--

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

Course Objectives

1	To describe the decision making process
2	To introduce various use cases in decision making process
3	To provide prototype development in decision support system

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Identify decision support tools that can aid decision making	II	Understanding
CO2	Apply system development methodology for a decision support system	III	Applying
CO3	Develop a functional prototype of a decision support system	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction Decision Support Systems** Introduction to decision support systems, Components of a decision support systems, Models in decision support systems	6
II	**Models in Decision Support Systems:** Structured , Semi - Structured and Unstructured problems , Purpose of classification of models, Solution Techniques - Optimization : Linear Programming, Decision Support Systems for Forecasting	7
III	**Decision Making:** Decision Making for Warehouse Location , Centre of gravity ; Ardalan heuristic and transportation cost models Estimation of space requirement in a warehouse and economic order quantity (EOQ)	6
IV	**Decision Making for Warehouse:** Space calculation in a warehouse : Space calculation for racks, Order Picking ; Material handling equipment's, Material Safety and Safety Equipment's, Automated storage & replenishment systems (AS / RS)	7
V	**Decision Support Systems for Marketing:** Decision Support Systems for Product Pricing Model Pricing : Model Selection Using Cross – Validation, Taxation and the Distribution Network	7
VI	**Market Risk Analysis with :** Transshipment, Flexibility and Six Sigma, Flexibility and Total Cost of the Network, Risk Analysis for the Distribution Network, Echelons in the Network	6

Text Books

1	Efraim Turban, Jay E. Aronson, Ting-Peng Liang, & Ramesh Sharda , *"Decision Support Systems and Intelligent Systems"*, 8th Edition, Prentice Hall, 2006; ISBN 0-13-198660-0
References	
1	Alex Tapscott, *"Blockchain Revolution",* Microsoft Publication, 1st Edition, 2016
Useful Links	
1	Module I, II, III, IV, V, VI https://nptel.ac.in/courses/110/105/110105147/

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

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

Walchand College of Engineering, Sangli
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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective 5 Information and Network Security
Desired Requisites:	

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

Course Objectives

1	To understand the digital forensics techniques for forensic examination
2	To introduce the acquisition, identification and analysis of data.
3	To provide insights in computer forensic and crimes

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Apply forensic analysis tools to recover important evidence to identify computer crime	III	Applying
CO2	Analyze various crimes in hardware and software systems	IV	Analysing
CO3	Investigate the next-generation computer crimes	VI	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction Digital Forensic** Introduction to Digital Forensics, Methods of storing data, Understanding file system, Definition and types of computer crimes, Distinction between computer crimes and conventional crimes.	6
II	**Network security:** Basic Concepts of Network security, Encryption and decryption methods, Encryption Algorithm	7
III	**Computer Crimes:** Types of computer crimes, Computer virus, and computer worm, Trojan horse, trap door, super zapping, logic bombs, Social media crimes, intellectual property crimes, cyber pornography & cyber terrorism, hate speech and cyber security	6
IV	**Computer Forensic and Tools:** Seizure of suspected computer, Preparation required prior to seizure, Legal and privacy issues in computer forensics, Open and Proprietary tools for Digital Forensics	7
V	**Disk Forensics:** Digital Forensics-Memory & Network forensics, Computer forensic investigation Restoration of deleted files, Password cracking, Email tracking	7

VI	**Mobile phone Forensics:** Digital Forensics and Mobile phone, Relevant law to combat computer crime –Information Technology Act, New challenges of computer forensic	6

Text Books	
1	Warren G. Kruse II and Jay G. Heiser, *"Computer Forensics: Incident Response Essentials",* Addison Wesley, 2002
2	Nelson, B, Phillips, A, Enfinger, F, Stuart, C., *"Guide to Computer Forensics and Investigations*", 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5
References	
1	Vacca, J, "*Computer Forensics, Computer Crime Scene Investigation"*, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389
Useful Links	
1	Module I, II, III, IV, V, VI https://onlinecourses.swayam2.ac.in/cec20_lb06/preview

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli
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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year, B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective -5: Social Network Analytics
Desired Requisites:	Data Structures

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

Course Objectives

1	To introduce the concept of semantic web and applications
2	To explain human behaviour in social web and related communities
3	To express visualization of social networks

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Analyse human behaviour in social web and related communities	IV	Analysing
CO2	Evaluate relationships between social networks	V	Evaluating
CO3	Examine semantic web related applications	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction :** Introduction to Semantic Web: Limitations of current Web Development of Semantic Web, Emergence of the Social Web, Social Network analysis: Development of Social Network Analysis, Key concepts and measures in network analysis.	6
II	**Web Data Semantics and Knowledge Representation** Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks, Applications of Social Network Analysis. Ontology and their role in the Semantic Web: Ontology-based knowledge Representation, Ontology languages for the Semantic Web: Resource Description Framework , Web Ontology Language	7
III	**Modeling And Aggregating** State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.	6
IV	**Issues Extraction And Mining Communities** Extracting evolution of Web Community from a Series of Web Archive. Detecting communities in social networks. Definition of community. Evaluating communities. Methods for community detection and mining.	6
V	**Predicting Human Behavior And Privacy Issues** Understanding and predicting human behavior for social communities, User data management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment.	7

VI	**Visualization And Applications Of Social Networks** Graph theory, Centrality, Clustering, Node-Edge Diagrams, Matrix representation, Visualizing online social networks, Visualizing social networks with matrix-based representations, Matrix and Node-Link Diagrams	7

Text Books	
1	Peter Mika, "*Social Networks and the Semantic Web*", First Edition, Springer 2007.
2	Borko Furht, "*Handbook of Social Network Technologies and Applications*", 1st Edition, Springer, 2010.
References	
1	Guandong Xu ,Yanchun Zhang and Lin Li, "*Web Mining and Social Networking – Techniques and applications*", First Edition Springer, 2011.
2	Charu C. Aggarwal, "*Social Network Data Analytics*", Springer; 2011
Useful Links	
1	https://nptel.ac.in/courses/106/106/106106169/
2	https://blog.hootsuite.com/social-media-analytics/
3	https://towardsdatascience.com/how-to-get-started-with-social-network-analysis-6d527685d374

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2022-23					
Course Information					
Programme	B.Tech. (Information Technology)				
Class, Semester	Final Year B. Tech., Sem VIII				
Course Code					
Course Name	Professional Elective - 5: Computer Graphics and Multimedia Techniques				
Desired Requisites:	Data Structures, Computer Programming				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
	-	**Credits: 3**			

Course Objectives	
1	To introduce basics of computer graphics
2	To describe object transformation algorithms and its modelling
3	To impart key concepts of digital multimedia handling and storage devices

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Expain context of the computer graphics towards object representation	II	Understanding
CO2	Implement geometric transformations and object modelling	III	Applying
CO3	Evaluate digital multimedia handling techniques and its storages	V	Evaluating

Module	Module Contents	Hours
I	**Introduction to Computer Graphics:** Graphics i/p & o/p Devices, Display Adapters, Vector & Raster Scan Displays Scan Conversion Techniques- Real Time, RLE, Frame Buffers Visualization of Basic Mathematical Objects- Point, Line, Circle – DDA & Bresenham's Techniques	6
II	**Geometric Transformations:** Object Representations & Transformations- 2D & 3D Affine Transformations- Translation, Scaling, Rotation, Reflection, Shearing; Multiple Transformations Plane Geometric Projections- Parallel and Perspective Viewing	8
III	**Polygon Filling:** Polygon Listing & Filling Criteria- Ordered Edge List Representations Polygon Filling Algorithms- Edge Fill, Fence Fill, Edge Flag and Seed Fill Algorithms Antialising- Polygon Interiors, Simple Area Antialising Halftoning- Patterning, Thresholding & Error Distribution, Ordered Dither	6
IV	**Clipping and Hidden line Elimination:** Window & Viewport Transformation, Window Clipping –Line Subdivision, Midpoint Subdivision Visibility & Hidden Surface Removal -Z Buffer Algorithm, Warnock Algorithm	6

V	**Plane & Space Curves:** Curve Representation & Visualization- Non-Parametric and Parametric Curves, Interpolation, Cubic Spline, Parabolic Blended Curves, Bezier Curves and B-Spline Curves	7
VI	**Multimedia Elements:** Multimedia Components, Types of Media Files, Compression Techniques, Media Editing & Recording Software, Portable Storage Devices Principles of Animation, Animation Software CASE study	6

Text Books	
1	David F. Rogers, J Alan, Adams, *"Mathematical Elements for Computer Graphics",* TMGH, 2nd Edition, Reprint 2015
2	Tay Vaughan, *"Multimedia Making it Work",* TMGH, 8th Edition, 2010

References	
1	Steve Marschner, Peter Shirley, *"Fundamentals of Computer Graphics",* CRC Press, 5th Edition, 2016
2	Zhigang Xiang, *"Schaum's Outline of Computer Graphics",* McGraw-Hill Education, 2nd Edition, Reprint 2020

Useful Links	
1	https://nptel.ac.in/courses/106/106/106106090/
2	https://www.tutorialspoint.com/computer_graphics/index.htm
3	https://www.javatpoint.com/computer-graphics-tutorial

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	2									1	
CO3		2										1		3

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

Assessment

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

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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 - 6: Advanced Distributed Computing
Desired Requisites:	Data Mining

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

Course Objectives

1	To impart the fundamental concepts of Distributed Computing
2	To introduce Data flow Synchronization and Pipelining
3	To explain Client-Server Programming

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Realize the Advancement in Distributed Computing	II	Understanding
CO2	Study the various approach to implement distributed environment for computation	IV	Analysing
CO3	Evaluate the reliability and performance various algorithms of distributed system	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Distributed Systems:** Task Creation and Termination (Async, Finish), Tasks in Java's Fork/Join Framework, Computation Graphs, Work, Span, Multiprocessor Scheduling	6
II	**Distributed System with Parallelism:** Parallel Speedup , Amdahl's Law,Reciprocal ArraySum using Async-Finish, ReciprocalArraySum using RecursiveAction's in Java's Fork/Join Framework	7
III	**Functional Parallelism:** Futures: Tasks with Return Value, Futures in Java's Fork/Join Framework, Memoization, Java Streams, Data Races and Determinism	6
IV	**Data flow Synchronization and Pipelining:** Split-phase Barriers with Java Phasers, Point-to-Point Sychronization with Phasers, One-Dimensional Iterative Averaging with Phasers, Pipeline Parallelism, Data Flow Parallelism	7
V	**Distributed Map Reduce:** Introduction to Map-Reduce, Hadoop Framework, Spark Framework, TF-IDF Example, Page Rank Example, Demonstration: Page Rank Algorithm in Spark	7
VI	**Client-Server Programming:** Introduction to Sockets, Serialization/Deserialization, Remote Method Invocation, Multicast Sockets, Publish-Subscribe Mode, Demonstration: File Server using Sockets	6

Text Books	
1	Prajapati Vignesh, *"Big Data Analytics with R and Hadoop"*, Packt Publishing, 1st Edition, 2013
2	Minelli Michael, Chambers Michehe, *"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business"*, Ambiga Dhiraj, Wiely CIO Series, 1st Edition, 2013
References	
1	Franks Bill, *"Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics"*, Wiley and SAS Business Series,1st Edition , 2012
Useful Links	
1	Module I, II, III, IV, V, VI https://nptel.ac.in/courses/106/104/106104189/

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

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

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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 6: Advanced Database Engineering
Desired Requisites:	Database Engineering

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

Course Objectives

1	To introduce parallel and distributed databases architectures.
2	To deliver application oriented appropriate database system.
3	To develop design and implementation skills for database systems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Differentiate parallel and distributed database architectures.	II	Understanding
CO2	Selection of appropriate database system for an application.	III	Applying
CO3	Build a database for an application	VI	Creating

Module	**Module Contents**	**Hours**
I	Parallel and Distributed Databases: Architectures for parallel database, Parallel query Evaluation, Parallelizing individual operation, Parallel Query Optimization, Distributed DBMS, Architecture, Storing data in distributed DBMS, Distributed Catalog Management, Distributed query processing, Updating distributed data, Distributed concurrence control, Distributed recovery.	8
II	Data Warehousing and Data Mining: Introduction to decision support, OLAP, Implementation Techniques for OLAP, Data Warehousing, Views and decision support, view materialization. Data Mining: Introduction, Counting Co-occurrences, Mining for rules, Tree structured rules, Clustering, Similarity search over sequences.	7
III	Object Database Systems: Structured data types, Operations, inheritance, Objects, OID and Reference types, design for ORDBMS, Comparing RDBMS with OODBMS and ORDBMS.	5
IV	Web Databases: Database, information retrieval. Indexing for text search. Web search engines, web search architecture, Inverted indexes the IR way, Inverted indexes for web search engines, web crawling, web search statistics. Data model for XML. XML Quires	7
V	Spatial Database: Types of Spatial Data, Spatial Queries, Application, spatial Indexes, space filling Curves, Grid files, R trees.	6

VI	Deductive Database: Recursive Queries, datalog programs, least model semantics, fixpoint operator, Recursive Queries with Negation, stratification, evaluation of Recursive Queries.	6

Text Books	
1	Raghu Ramakrishnan, Johannes Gehrke, *"Database Management Systems"*, 3rd Edition, McGraw-Hill Higher Education, 2014
References	
1	Carlos Coronel, Steven Morris, *"Database Systems: Design, Implementation, & Management"*, 13th Edition, Cengage Learning, 2018.
2	Shio Kumar Singh, *"Database Systems: Concepts, Design and Applications"*, 2nd Edition, Pearson Education India, 2011
Useful Links	
1	https://nptel.ac.in/courses/106/104/106104021/
2	https://nptel.ac.in/courses/106/106/106106093/

CO-PO Mapping

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

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

Assessment

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

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective 6: Transacting Blockchain
Desired Requisites:	Cryptography and Network Security

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

Course Objectives

1	To discuss basics of cryptography
2	To introduce blockchain and transactions
3	To provide insights in algorithms of mining and hashing in blockchain technologies

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Comprehend cryptographic algorithms on data block	II	Understanding
CO2	Illustrate different hashing and mining algorithms	III	Applying
CO3	Compare different Blockchain distribution system	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction Blockchain Technology** Introduction to Blockchain Architecture, Conceptualization, Basic Crypto Primitives,	6
II	**Crypto Systems:** Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles	7
III	**Bitcoin:** Bitcoin Blockchain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc, Downside of Bitcoin – mining	6
IV	**Coins in Blockchain:** Alternative coins – Bitcoin Blockchain Ethereum and Smart contracts, The real need for mining – consensus – Byzantine Generals Problem	7
V	**Blockchain and Distributed Network:** Distributed coordination problem, permissioned blockchain, Introduction to Hyperledger	7
VI	**Blockchain use case:** Permissioned Blockchain use cases – Hyperledger, Corda, Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems, and others	6

Text Books

1	Daniel Drescher*, "Blockchain Basics",* Apress Publications", 1st Edition,2017
2	Melanie Swa, *"Blockchain"*,O'ReillyPublications, 1st Edition, 2015

References

1	Alex Tapscott, *"Blockchain Revolution",* Microsoft Publication, 1st Edition, 2016

Useful Links	
1	Module I, II, III, IV, V, VI https://onlinecourses.nptel.ac.in/noc20_cs01/preview

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

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

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

AY 2022-23

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Final Year B. Tech., Sem VIII
Course Code	
Course Name	Professional Elective - 6: Big Data Analytics
Desired Requisites:	Data Mining

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

Course Objectives

1	To elaborate the fundamental concepts of big data analytics
2	To analyze the big data using various techniques
3	To represent big data using visualization tools

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Elaborate the fundamentals of various big data analytics techniques	III	Applying
CO2	Study the various approach to implement distributed environment	IV	Analysing
CO3	Evaluate the performance of algorithms on advanced distributed system	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Big Data:** Big Data and its Importance, Four V's of Big Data, Drivers for Big Data – Introduction to Big Data Analytics, Big Data Analytics applications.	6
II	**Big Data Technologies:** Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, Cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics	7
III	**Processing Big Data:** Detecting Patterns in Complex Data with Clustering and Link Analysis, Identifying previously unknown groupings within a data set, Segmenting the customer market with the K–Means algorithm, Defining similarity with appropriate distance measures, Constructing tree–like clusters with hierarchical clustering, Clustering text documents and tweets to aid understanding	6
IV	**Hadoop Mapreduce:** Introduction to Map-Reduce, Hadoop Framework, Spark Framework	7
V	**Distributed Map Reduce:** TF-IDF Example, Page Rank Example, Demonstration: Page Rank Algorithm in Spark	7
VI	**Analytic Tools:** PIG overview, SQL vs. PIG, PIG Latin, User Defined Functions, Data Processing Operators, Overview of Hive, Hive QL, Tables, Querying Data	6

Text Books

1	Prajapati Vignesh, *"Big Data Analytics with R and Hadoop"*, Packt Publishing, 1st Edition, 2013

2	Minelli Michael, Chambers Michehe, *"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business"*, Ambiga Dhiraj, Wiely CIO Series, 1st Edition, 2013
References	
1	Franks Bill, *"Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics"*, Wiley and SAS Business Series,1st Edition , 2012
Useful Links	
1	Module I, II, III, IV, V, VI https://nptel.ac.in/courses/106/104/106104189/

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

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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 – 6: Software Reliability and Fault Detection
Desired Requisites:	Software Engineering

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

Course Objectives

1	To introduce fundamentals of virtualization
2	To impart various types of virtualization
3	To acquaint the significance of virtualization in data center

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Grasp scientific concepts of Software Reliability	II	Understanding
CO2	Apply Software Reliability Growth Models in Software Development	III	Applying
CO3	Resolve the Software system fault tolerance	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Basic of Software Testing:** Software Testing, Testing types, Flow graph, Cyclomatic complexity, Graph Matrices, Debugging & Test Case Strategies	7
II	**Software Quality:** Software Quality Assurance, Software Reuse, Documentation Requirements, Standards, Software Configuration Management, Version Control, Baselines	7
III	**Software Reliability:** Software Reliability, Software Reliability Issues, Statistical Testing and Software Quality Management, ISO 9000, Case Tools, Characteristics of Case Tools	7
IV	**User Interface and Design**: Concept of user Interface and Design, Types of user Interface, Component Based GUI Development	7
V	**Software Fault Detection:** Basic terminology of Fault tolerant, Fault detection using fault tree, Fault tolerant in SRE, Techniques for Fault tolerant: Recovery blocks, N- version programming	5
VI	**Software Fault Analysis:** Fault tree modeling, Fault tree analysis, Analysis of fault tolerant software system, Quantitative analysis of fault tolerant system	6

Text Books

1	Jalote Pankaj, *"An Integrated Approach to Software Engineering",* Narosa Publication, 3rd Edition, 2010.
2	Sommerville, *"Software Engineering"*, Pearson Education India, New Delhi,2nd Edition, 2006

References

1	Musa John D., *"Software Reliability Engineering"*, Tata McGraw Hill, 2nd Edition, 1999

2	Lyu, *"Software Reliability Engineering"*, IEEE Computer Society Press, 1st Edition, 1996

Useful Links	
1	Module I, II, III, IV, V https://onlinecourses.nptel.ac.in/noc21_cs15/preview

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		
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CO3	2				2									1	

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