Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO690
Course Name	Dissertation Phase 1
Desired Requisites:	Research Methodology, Project management

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	20 hrs/week				
Interaction	-	**Credits: 10**			

Course Objectives

1	To develop the student to apply the knowledge gained to identify problems for research and provide the solutions by self-study and interaction with stakeholders.
2	Share knowledge to tackle real world problems of societal concerns
3	Impart flexibility to the student to have increased control over his/ her learning
4	Enhance a students' learning through increased interaction with peers and colleagues.
5	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	study and survey the existing literature and identify the research problem	Analyze
CO2	design and develop the solution for complex engineering problem	Evaluate
CO3	create new prototypes or models in the specialized field	Create

Course Content

Students are expected to carry out independent research work on the chosen topic. In this semester it is expected that the student has carried out substantial research work including exhaustive literature survey, formulation of the research problem, development/fabrication of experimental set-up (if any/required) and testing, and analysis of initial results thus obtained. In the Dissertation Phase 2, the students would continue their dissertation work. It is expected that the student has completed most of the experimental/computation works and analysed the results obtained as proposed in the synopsis. The work should be completed in all respects till fourth semester. The students are required to submit the dissertation work in the form of report as per the institute rule.

Text Books

1	As per the research topic

References

1	Papers from National and International Journals

Useful Links

1	Introduction to Research- NPTEL Course: Link
2	Overview of Research – Video: Link
3	Project Management- Course: Link

4	Project Management for Managers- Course: Link

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply				
Analyze	15	15	15	**45**
Evaluate	15	15	15	**45**
Create			10	**10**
Total Marks	**30**	**30**	**40**	**100**

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Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO601
Course Name	Legal, Financial Aspects of Industrial Project
Desired Requisites:	None

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

Course Objectives

1	To identify and analyze the relevant legal issues involved in Industrial Project and criminal matters affecting business.
2	To understand theories of value, risk and return, capital investment decisions, wages and working hours, insurance schemes, labour laws
3	To become familiar with intellectual property in cyber space and different cyber laws

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	To understand the terms involved and laws applicable for an Industrial Project.	Understand
CO2	To get acquainted with investments, taxes and employee schemes	Apply
CO3	To be familiar with Cyber laws applicable for cyber crimes	Apply

Module	**Module Contents**	**Hours**
I	**Economic Decision Making** Introduction, Mathematics of Time Value of Money: Compound Interest, Cash Flow Diagram, Uniform Annual Series, Irregular Cash Flows, Cost Comparison: Present Worth Analysis, Annual Cost Analysis, Capitalized Cost Analysis	4
II	**Taxes and Profitability** Taxes, Profitability Of Investments: Rate of Return, Payback Period, Net Present Worth, Internal Rate of Return, Inflation, Sensitivity and Break-Even Analysis, Uncertainty in Economic Analysis	4
III	**Factories Act, 1948:** Health, Safety, Provisions relating to Hazardous Processes, Welfare, Working Hours of Adults, Employment of young persons, Annual Leave with wages. The Employees Provident Fund and Miscellaneous Provisions Act, 1952 (10 of 1952). Employees Provident Fund Schemes, Central Board, Employees' Pension Scheme, Employees Deposit Linked Insurance Scheme, Contributions.	4
IV	**Constitution and Labour Laws:** labour laws, Equality before law and its application in Labour Laws, Equal pay for equal work; and Article-16 and reservation policies, Articles 19, 21, 23 and 24 and its implications.	4
V	**Intellectual Property in Cyber Space** Computer Software and Copyright Law, Software Licences, Computer Databases and the law, Domain Names and the law, Trademark issues in cyberspace	4

VI	**Cyber Crimes and Cyber Laws** Cyber Crimes, Malware, Computer Source Code, Digital Signature, Information Technology Laws, IT ACT & how to prevent yourself from being a victim of Cyber Crime	5

Text Books	
1	P.L. Mehta, *Managerial Economics Analysis, Problems and cases*, S. Chand & Co. Ltd., 2001
2	Dieter G.E., *Engineering Design*, McGraw-Hill Education 5th edition, 2012.
3	N. Godbole, S. Belapure, *Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley India Pvt. Ltd.

References	
1	Peterson and Lewis: Managerial Economics, 4th Ed., Prentice Hall , 2004
2	R. Drefuss, J. Pila; The Oxford Handbook of Intellectual Property Law, Oxford University Press, 2018.
3	Adv. P. Mali, Cyber Law & Cyber Crimes Simplified, Cyber Infomedia, 2017.

Useful Links	
1	Video on 'Intellectual Property Rights in Cyber Space': Link
2	Video on Cybersquatting and Internet Domain Names in 2016- by WIPO: Link
3	Video on Cyber Laws in India - I: Link
4	Video on Cyber Crimes - Cyber Law: Link

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

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

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

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AY 2021-22

Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO602
Course Name	Industry Orientation Course
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	60	100
Practical	-				
Interaction	1 Hr/Week	**Credits: 1**			

Course Objectives	
1	To provide a hands-on experience of software for needed for Industry

Course Outcomes (CO) with Bloom's Taxonomy Level At the end of the course, students will be able to,		
CO1	Efficient use of the software.	Apply
CO2	Develop the solution for engineering problems using the software.	Evaluate
CO3		

Course Content

This course is based on computers as a tool to design and analyse the system. In the modern-day work environment, the Engineer should be able to simulate and solve complex problems on computers. The Engineers must be highly computer literate. The engineer with strong fundamentals in Engineering and computer software proficiency is highly in demand from industry. Employability of the student can be enhanced by providing software training of the software's in Computer engineering problems

Text Books	
1	Suitable books based on the software selected.

References	
1	Suitable books based on the contents of software selected

Useful Links	
1	As per the need of the software training

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

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

Assessment Plan based on Bloom's Taxonomy Level (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15	15	15	**45**
Analyze				
Evaluate	15	15	25	**55**
Create				
Total Marks	**30**	**30**	**40**	**100**

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AY 2021-22

Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO611
Course Name	Elective-5 Deep Learning
Desired Requisites:	Working knowledge of Linear Algebra, Statistics and Probability Theory

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

Course Objectives

1	To explain the fundamentals of neural networks, recurrent neural networks (RNN), long short term memory cells and convolutional neural networks (CNN).
2	To demonstrate various learning models for practical application.
3	To discuss optimization approach and distribution techniques for Deep Learnin model
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Illustrate fundamentals of deep learning using foundation of mathematics terminology	Understanding
CO2	Compare various deep learning models by hyper tuning various parameters	Analyze
CO3	Demonstrate various case studies of deep learning.	Apply
CO4	Design and deploy deep learning models on various frameworks and platform.	Create

Module	**Module Contents**	**Hours**
I	**Introduction to Deep Learning** Neural network fundamentals: General Introduction to Deep Learning, Perceptron algorithm, Back propagation and Multi-layer Networks. Image fundamentals: Pixels, Image coordinate, scaling and aspect ratios	5
II	**Parameterized Learning and Optimization Methods** parameterized Learning: Introduction to linear classification, Four components of parameterized learning, role of loss function. Optimization Methods: Optimization Methods: Gradient descent, stochastic gradient descent (SGD) and extensions to SGD, regularization	5
III	**Convolutional Neural Networks (CNN)** Understanding Convolutions: Convolutions versus Cross-correlation, The "Big Matrix" and "Tiny Matrix" Analogy, Kernels, A Hand Computation Example of Convolution The Role of Convolutions in Deep Learning. CNN Building blocks: Layer Types, Convolutional Layers, Activation Layers, Pooling Layers, Fully-connected Layers, Batch Normalization, Dropout, ShallowNEt, LeNet, MiniVGGNET	4
IV	**Deep learning-based object detection** Fundamentals of Object detection, Family of R-CNN, Single shot	4

	detectors (SSD), You only look once (YOLO)	
V	**Sequence Models** Recurrent Neural Networks, Vanishing gradients, Gated Recurrent Units (GRU), Long-short-term-memories (LSTMs)	4
VI	**Optimization techniques & Distributed Training for DL model** Fundamentals of optimization techniques, Optimize TensorFlow Models For Deployment with TensorRT, Custom and Distributed Training.	4

Text Books	
1	Ian Goodfellow, Yoshua Bengio and Aaron Courville Deep Learning, MIT Press, 2016
2	Aurelien Geron, " Hands-On Machine Learning with Scikit-Learn & TensorFlow", O'REILLY, Dec 2017
References	
1	Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2	Pattern Recognition and Machine Learning, Christopher Bishop, 2007
3	Prof. Mitesh M. Khapra, "Deep Learning", course on NPTEL, July 2018
4	Andrew Ng, "Deep Learning Specialization", Coursera online course
Useful Links	
1	https://nptel.ac.in/courses/106/106/106106184/
2	https://www.coursera.org/specializations/deep-learning

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

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

Assessment (for Theory Course)

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

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	5	10	25
3	Apply	5	7	10	22
4	Analyze	5	8	20	33
5	Evaluate				
6	Create			20	20
Total		**20**	**20**	**60**	**100**

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Course Information	
Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO612
Course Name	Elective 5 - Network Security
Desired Requisites:	Computer Networks, Web Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**Test1**	**Test2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives	
1	To learn the basics of security and various types of security issues
2	To study different cryptography techniques available and various security attacks.
3	Explore network security and how they are implemented in real world.
4	To get an insight of various issues of Web security and biometric authentication

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	To have an understanding of basics of security and issues related to it.	Understanding
CO2	Understanding and applying biometric techniques available and also understanding how they are used in today's world	Apply
CO3	To learn and apply mechanisms for transport and network security.	Apply
CO4	To learn security issues in web and how to tackle them and analyse them	Analyse

Module	**Module Contents**	**Hours**
I	**Data Security:** Review of cryptography. Examples RSA, DES	3
II	Authentication, non-repudiation and message integrity. Digital signatures and Certificates. Protocols using cryptography (example Kerberos). Attacks on Protocols. **SSO/ LDAP, Oauth.**	5
III	**Network security & Transport Security:** **Network security:** Firewalls, Proxy-Servers, Network intrusion detection. **Transport security:** Mechanisms of TLS, SSL, IPSec.	4
IV	**Web security:** SQL injection, XSS, etc. Software security and buffer overflow. Malware types and case studies. Access Control, firewalls and host/network intrusion detection. Email Security	6
V	**Other Topics Part 1:** Biometric authentication, Secure E-Commerce (ex. SET), Smart Cards, Security in Wireless Communication. Cyber security laws (IT laws 2000)	5
VI	**Other Topics Part 2:** Recent trends in IOT security, IDS and Biometric. Case study for intrusion detection EAACK, Blockchain basic introduction.	3

Text Books	
1	

2	
3	
4	
References	
1	W. R. Cheswick and S. M. Bellovin. Firewalls and Internet Security. Addison Wesley, 1994.
2	W. Stallings. Cryptography and Network Security. Prentice Hall, 1999.
3	B. Schneier. Applied Cryptography. Wiley, 1999.
4	
Useful Links	
1	
2	
3	
4	

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

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

Assessment Plan based on Bloom's Taxonomy Level (Marks)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	5	5	15	**25**
3	Apply	15	10	30	**55**
4	Analyze		5	15	**20**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO613
Course Name	Elective 5 - High Performance Computing
Desired Requisites:	Data structures, Basic Programming knowledge

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

Course Objectives	
1	To provide an introduction to the arithmetic and software tools and techniques needed to implement effective, high performance programs on modern parallel computing systems.
2	To be introduced with current trends in parallel computer architectures and programming models(i.e. languages and libraries) for shared memory, manycore/multicore architecture.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	explain principles of parallel algorithm design, analytical modelling of parallel programs, programming models for shared and distributed memory systems, parallel computer architectures, along with numerical and non-numerical algorithms for parallel systems	Apply
CO2	demonstrate understanding of learned concepts of parallel algorithm design, performance evaluation, communication operators by writing algorithms and programs exploiting parallel architecture	Apply
CO3	analyze the efficiency of parallel algorithms designed for matrix, graph and sorting operations	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction to Parallel Computing**: Implicit Parallelism, Limitations of Memory, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques.	5
II	**Principals of Parallel Algorithm Design**: Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models **Basic Communication Operations**: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather	5
III	**Analytical Modeling**: Performance Metrics for parallel systems. The effect of Granularity and Data Mapping on Performance. The Scalability of parallel systems, Iso efficiency metric of scalability, sources of parallel overhead, Minimum execution time and minimum cost-optimal execution time.	4

IV	**Parallel Programming**: OpenMP, MPI, CUDA/OpenCL, Chapel, etc. Thread basics ,Work Sharing constructs, Scheduling, Reduction, Mutual Exclusion Synchronization & Barriers, The MPI Programming Model, MPI Basics, Global Operations , Asynchronous Communication, Modularity, Other MPI Features Basic of GPGPU, CUDA Programming model, CUDA memory type Performance Issues	5
V	**Dense Matrix Algorithms**: Matrix-Vector Multiplication, Matrix-Matrix Multiplication **Sorting**: Issues, Sorting Networks, Bubble Sort and its Variants, Quicksort	5
VI	**Graph Algorithms**: Definitions and Representation, Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths	4

Text Books	
1	Grama Ananth, Gupta Anshul, George Karypis, and Vipin Kumar, Introduction to Parallel Computing, Addison Wesley (2nd ed.),.
2	Buyya Raijkumar, High Performance Cluster Computing : Programming and Applications, Volume 2, Printice Hall PTR Upper Saddle River, New Jersey
3	Cook shane, CUDA Programming: A Developer's Guide to Parallel Computing with GPUs

References	
1	Michael J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill.
2	
3	

Useful Links	
1	High Performance Computing, Charles Severance, 1998. Link
2	Marc Snir, Steve Otto, Steven Huss-Lederman, David Walker, and Jack Dongarra, MPI: The Complete Reference, 1996. Link
3	Ian Foster, Designing and Building Parallel Programs, 1995. Link
4	

CO-PO Mapping

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

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

Assessment

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

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

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				

2	Understand				
3	Apply	10	10	40	**60**
4	Analyze	10	10	20	**40**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO651
Course Name	A B Elective Lab 2: Deep Learning Lab
Desired Requisites:	Basics of programming language C, python

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

Course Objectives

1	To execute base neural networks, recurrent neural networks (RNN), long short term memory cells and convolutional neural networks (CNN) models.
2	To demonstrate various learning models for practical application.
3	To test optimization approach and distribution techniques for Deep Learning model on various platform
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Perform experimentation of various deep learning models using various platforms	Apply
CO2	Compare various deep learning models by hyper tuning various parameters	Analyze
CO3	Demonstrate various case studies of deep learning by hypertuning parameters.	Apply
CO4	Design and deploy deep learning models on various frameworks and platform.	Create

Mini Project Guidelines

Course Contents:

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

Text Books

1	Ian Goodfellow, Yoshua Bengio and Aaron Courville Deep Learning, MIT Press, 2016
2	Aurelien Geron, " Hands-On Machine Learning with Scikit-Learn & TensorFlow", O'REILLY, Dec 2017

References	
1	Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2	Pattern Recognition and Machine Learning, Christopher Bishop, 2007
3	Prof. Mitesh M. Khapra, “Deep Learning”, course on NPTEL, July 2018
4	Andrew Ng, “Deep Learning Specialization”, Coursera online course
Useful Links	
1	https://nptel.ac.in/courses/106/106/106106184/
2	https://www.coursera.org/specializations/deep-learning

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

Assessment

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

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

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom’s Taxonomy Level (Marks)				
Bloom’s Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	15	45
Analyze	10	15	15	40
Evaluate				
Create		5	10	15
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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Course Information

Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO652
Course Name	A B Elective Lab 2: Network Security Lab
Desired Requisites:	Computer Networks, Web Programming

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

Course Objectives

1	To learn the basics of security and various types of security issues
2	To study different cryptography techniques available and various security attacks.
3	Explore network security and how they are implemented in real world.
4	To get an insight of various issues of Web security and biometric authentication

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	To have an understanding of basics of security and issues related to it.	Understanding
CO2	Understanding and applying biometric techniques available and also understanding how they are used in today's world	Apply
CO3	To learn and apply mechanisms for transport and network security.	Apply
CO4	To learn security issues in web and how to tackle them and analyse them	Analyse

Mini Project Guidelines

Course Contents:

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

Text Books

1	
2	

References

1	W. R. Cheswick and S. M. Bellovin. Firewalls and Internet Security. Addison Wesley, 1994.

2	W. Stallings. Cryptography and Network Security. Prentice Hall, 1999.
3	B. Schneier. Applied Cryptography. Wiley, 1999.

Useful Links	
1	
2	
3	

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

Assessment

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

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

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom's Taxonomy Level (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand	10	5	5	20
Apply	20	15	10	45
Analyze		10	25	35
Evaluate				
Create				
Total	**30**	**30**	**40**	**100**

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Course Information	
Programme	M. Tech. (Computer Science & Engineering)
Class, Semester	Second Year M. Tech., Sem I
Course Code	5CO653
Course Name	A B Elective Lab-2 High Performance Computing Lab
Desired Requisites:	Data structures, Basic Programming knowledge

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

Course Objectives	
1	To provide an introduction to the arithmetic and software tools and techniques needed to implement effective, high-performance programs on modern parallel computing systems.
2	To be introduced with current trends in parallel computer architectures and programming models(i.e languages and libraries) for shared memory, manycore/multicore architecture
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	apply shared memory, Distributed memory parallel programming concepts while designing parallel algorithm.	Apply
CO2	implement parallel programs for large-scale parallel systems, shared address space platforms, and heterogeneous platforms	Apply
CO3	analyse the efficiency of parallel algorithms designed for matrix, graph and sorting operations	Analyze

Mini Project Guidelines

Course Contents:

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

Text Books	
1	Grama Ananth, Gupta Anshul, George Karypis, and Vipin Kumar, Introduction to Parallel Computing (2nd Ed.).
2	Buyya Rajkumar, High Performance Cluster Computing: Programming and Applications, Volume 2

3	Cook Shane, CUDA Programming: A Developer's Guide to Parallel Computing with GPUs
References	
1	Michael J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill.
2	
Useful Links	
1	Victor Eijkhout, Introduction to High-Performance Scientific Computing, 2011. Link
2	High Performance Computing, Charles Severance, 1998. Link
3	Marc Snir, Steve Otto, Steven Huss-Lederman, David Walker, and Jack Dongarra, MPI: The Complete Reference, 1996. Link
4	Ian Foster, Designing and Building Parallel Programs, 1995. Link

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

Assessment Plan based on Bloom's Taxonomy Level (Marks)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand				
Apply	20	10	30	60
Analyze	10	20	10	40
Evaluate				
Create				
Total	**30**	**30**	**40**	**100**

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Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem II
Course Code	5CO691
Course Name	Dissertation Phase 2
Desired Requisites:	Research Methodology, Project management

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	24 hrs/week				
Interaction	-	**Credits: 10**			

Course Objectives

1	To develop the student to apply the knowledge gained to identify problems for research and provide the solutions by self-study and interaction with stakeholders.
2	Share knowledge to tackle real world problems of societal concerns
3	Impart flexibility to the student to have increased control over his/ her learning
4	Enhance a students' learning through increased interaction with peers and colleagues.
5	Promote students to publish high quality research papers

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	study and survey the existing literature and identify the research problem	Analyze
CO2	design and develop the solution for complex engineering problem	Evaluate
CO3	create new prototypes or models in the specialized field	Create

Course Content

Students are expected to carry out independent research work on the chosen topic. In this semester it is expected that the student has carried out substantial research work including exhaustive literature survey, formulation of the research problem, development/fabrication of experimental set-up (if any/required) and testing, and analysis of initial results thus obtained. In the Dissertation Phase 2, the students would continue their dissertation work. It is expected that the student has completed most of the experimental/computation works and analysed the results obtained as proposed in the synopsis. The work should be completed in all respects fourth semester. The students are required to submit the dissertation work in the form of report as per the institute rule.

Text Books

1	As per the research topic

References

1	Papers from National and International Journals

Useful Links

1	Introduction to Research- NPTEL Course: Link
2	Overview of Research – Video: Link
3	Project Management- Course: Link

4	Project Management for Managers- Course: Link

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply				
Analyze	15	15	15	**45**
Evaluate	15	15	15	**45**
Create			10	**10**
Total Marks	**30**	**30**	**40**	**100**

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Course Information	
Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem II
Course Code	5CO671
Course Name	Techno-Socio Activity
Desired Requisites:	

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

Course Objectives	
1	To record student performance in co-curricular and extracurricular activities over four years will be considered.
2	To encourage the students to participate in activities that help develop leadership skills, team integrity, coordination skills, Time management, Communications skills, Interviewing skills etc.
3	To highlight the importance of social responsibility. Become members of technical organizations.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Demonstrate paper writing and presentation skills by publishing papers in conference/journals	Apply
CO2	Participate in solving real world problems or competitions related to social and environmental upliftment.	Analyze

Course Contents

The guide will be mentoring a given student batch for the duration of two years. The students shall submit

Text Books

1	Not applicable

References

1	Not applicable

Useful Links

1	Not applicable

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

CO1		2				
CO2					3	

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

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.

IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

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

Week 1 indicates the starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

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

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

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Course Information

Programme	M.Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem II
Course Code	
Course Name	Elective 6- Human Computer Interaction and Interface Design
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	Students must be able to understand and make use of : The human components functions.
2	The Computer components functions.
3	The Interaction between the human and computer components.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Illustrate concepts of HCI and UI.	Apply
CO2	Analyse and design problem solving methods in HCI.	Analyze
CO3	Appraise applicability of HCI designs in solving engineering problems.	Evaluate
CO4	Build and demonstrate typical HCI and UI system.	Create

Module	**Module Contents**	**Hours**
I	**Introduction** Course objective and overview, Historical evolution of the field, The Human, The Computer, The Interaction.	7
II	**Design processes** Interaction Design basics, Concept of usability – definition and elaboration, HCI in the Software Process, Design Rules.	7
III	**Implementation and Evaluation** Implementation Support, Evaluation Techniques, Universal Design, Use Support.	6
IV	**Models** Cognitive Models, Socio – Organizational Issues and Stakeholders Requirements, Communication and Collaboration models.	6
V	**Theories** Task Analysis Dialog notations and Design Models of the system, Modelling Rich Interactions.	6
VI	**Virtual Reality** Introduction to Virtual Reality, Representing the Virtual World, Introduction to Augmented Reality.	7

Text Books

1	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition Pearson Education
2	B. Shneiderman, Designing the User Interface, Addison Wesley 2000 (Indian Reprint)
References	
1	Preece J, Rogers Y, Sharp H, Baniyon D, Holland S and Carey T, “Human Computer Interaction”, Addison-Wesley, 1994
2	
Useful Links	
1	https://www.tutorialspoint.com/human_computer_interface/human_computer_interface_introduction
2	https://www.interaction-design.org/literature/topics/human-computer-interaction
3	https://nptel.ac.in/courses/106/103/106103115/
4	

CO-PO Mapping

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

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

Assessment (for Theory Course)

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

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

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

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Course Information

Programme	M. Tech. (Computer Science and Engineering)
Class, Semester	Second Year M. Tech., Sem II
Course Code	5CO622
Course Name	Elective 6- Cyber Forensics
Desired Requisites:	Cryptography and Security, Computer Networks

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To understand underlying principles and many of the techniques associated with the digital forensic practices and cyber crime
2	To explore practical knowledge about ethical hacking Methodology.
3	To learn the importance of evidence handling and storage for various devices
4	To develop an excellent understanding of current cyber security issues (Computer Security Incident) and analysed the ways that exploits in securities.
5	To investigate attacks, IDS, technical exploits and router attacks and "Trap and Trace" computer networks.
6	To apply digital forensic knowledge to use computer forensic tools and investigation report writing.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Define the concept of ethical hacking and its associated applications in Information Communication Technology (ICT) world, Underline the need of digital forensic and role of digital evidences.	Apply
CO2	Explain the methodology of incident response and various security issues in ICT world, and identify digital forensic tools for data collection.	Apply
CO3	Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications /devices like Windows/Linux/Unix system	Evaluate
CO4	Apply the knowledge of IDS to secure network and performing router and network analysis, List the method to generate legal evidence and supporting investigation reports and will also be able to use various digital forensic tools.	Create

Module	**Module Contents**	**Hours**
I	**Introduction:** Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential- Device handling: seizure issues, device identification, networked devices and contamination. Introduction to Cyber Security.	6
II	**Digital forensics examination principles:** Overview of Types of computer forensics i.e., Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations)	6

	Previewing, imaging, continuity, hashing and evidence locations- Seven element security model- developmental model of digital systems audit and logs- Evidence interpretation: Data content and context.	
III	**Live Data collection and investigating windows environment:** windows Registry analysis, Gathering Tools to create a response toolkit (Built in tools like netstat, cmd.exe, nbtstat, arp, md5sum, regdmp etc and tools available as freeware like Fport, Pslist etc), Obtaining volatile Data (tools like coffee, Helix can be used) Computer forensics in windows environment, Log analysis and event viewer, File auditing, identifying rogue machines, hidden files and unauthorized access points	7
IV	**Live Data collection and investigating Unix/Linux environment:** /Proc file system overview, Gathering Tools to create a response toolkit (Built in tools like losetup, Vnode, netstat, df, md5sum, strace etc and tools available as freeware like Encase, Carbonite etc). Handling Investigations in Unix/Linux Environment: Log Analysis (Network, host, user logging details), Recording incident time/date stamps, Identifying rogue processes, unauthorized access points, unauthorized user/group accounts.	7
V	**Network Forensics:** Technical Exploits and Password Cracking, Introduction to Intrusion Detection systems, Types of IDS Understanding Network intrusion and attacks, Analyzing Network Traffic, Collecting Network based evidence, Evidence Handling. Investigating Routers, Handling Router Table Manipulation Incidents, Using Routers as Response Tools.	6
VI	**Forensic Investigation Report and Forensic Tools:** Report: Goals of Report, Layout of an Investigative Report, Guidelines for Writing a Report, sample for writing a forensic report. Computer Forensic Tools: need and types of computer forensic tools, task performed by computer forensic tools. Study of open-source Tools like SFIT, Autopsy etc. to acquire, search, analyze and store digital evidence	8

Text Books	
1	Jason Luttgens, Matthew Pepe, Kevin Mandia, “Incident Response and computer forensics”,3rd Edition Tata McGraw Hill, 2014.
2	Nilakshi Jain, Dhananjay Kalbande, “Digital Forensic: The fascinating world of Digital Evidences” Wiley India Pvt Ltd 2017
3	Cory Altheide, Harlan Carvey “Digital forensics with open source tools “Syngress Publishing, Inc. 2011.
4	Chris McNab, Network Security Assessment, By O’Reily.

References	
1	Incident Response & Computer Forensics. Mandia, k, Prosise, c, Pepe, m. 2nd edition. TataMcGraw Hill, 2003.
2	Guide to Computer Forensics and Investigations, 2nd edition, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning
3	Digital Evidence and Computer Crime, 2nd Edition, Eoghan Casey, academic Press File System Forensic Analysis by Brian Carrier, addition Wesley
4	Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, syngress Publication
5	EnCE: The Official EnCase Certified Examiner Study Guide, 2nd Edition, Steve Bunting, sybex Publication

Useful Links	
1	Information Security and Cyber Forensics: Link

2	Digital Forensics: Link
3	Swayam-digital-forensic: Link
4	

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

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

Assessment Plan based on Bloom's Taxonomy Level (Marks)					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	5	5	10	**20**
3	Apply	15	10	25	**50**
4	Analyze		5	20	**25**
5	Evaluate			5	**05**
6	Create				
Total		**20**	**20**	**60**	**100**