VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Department of Electronics and Computer Science

Syllabus (Autonomy Scheme)

Sem-VII and Sem-VIII

w.e.f. A.Y. 2025-26

Semester VII Teaching Scheme								
Course Code	Course Name	Teaching Scheme (Contact hours)			Credits Assigned			
		TH	PR	TUT	TH	PR	TUT	TOTAL
ECC 701	VLSI Design	3	-	-	3	-	-	3
ECC 702	Internet of Things	3	-	-	3	-	-	3
ECC DO701	Department Level Optional Course - III	3	-	-	3	-	-	3
ECC DO702	Department Level Optional Course – IV	3	-	-	3	-	-	3
ECC IO701	Institute Level Optional Course – I	3	-	-	3	-	-	3
ECL701	VLSI Design Lab	-	2			1		1
ECL702	Internet of Things Lab	-	2	-	-	1	-	1
ECL703	Department Level Optional Course - III Lab	-	2	-	-	1	-	1
ECP701	Major Project – I	-	6	-	-	3	-	3
Total Credits								21

Semester VII Marking Scheme							
Course Type	Course Name	TH	MT	CA	TW	PR/ OR	Total
ECC 701	VLSI Design	60	20	20	-	-	100
ECC 702	Internet of Things	60	20	20	-	-	100
ECC DO701	Department Level Optional Course – III	60	20	20	-	-	100
ECC DO702	Department Level Optional Course – IV	60	20	20	-	-	100
ECC IO701	Institute Level Optional Course- I	60	20	20	-	-	100
ECL701	VLSI Design Lab	-	-	-	25	25	50
ECL702	Internet of Things Lab	-	-	-	25	25	50
ECL703	Department Level Optional Course - III Lab	-	-	-	25	25	50
ECP701	Major Project – I	-	-	-	50	-	50
Total Marks							700

Department Level Optional Courses:

Department Level Optional Course-III (DO701)	Department Level Optional Course -IV (DO702)
1. Deep Learning	1. Cloud Computing
2. Image Processing	2. Mobile Communication
3. Big Data Analytics	3. Cyber Security
4. Advanced Database Management Systems	4. Blockchain Technology

Institute Level Optional Courses: - I

ILO7011	Product Life Cycle Management
ILO7012	Reliability Engineering
ILO7013	Management Information System
ILO7014	Design of Experiments
ILO7015	Operations Research
ILO7016	Cyber Security and Laws
ILO7017	Disaster Management and Mitigation Measures
ILO7018	Energy Audit and Management
ILO7019	Development Engineering

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Semester VII
Syllabus

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
ECC 701	VLSI Design	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECC 701	VLSI Design	20	20	60	---	---	100

Course Prerequisite:

- Electronic Devices (ECC 302)
- Electronic Circuits (ECC402)
- Digital Electronics (ECC 303)

Course Objectives:

1	To understand VLSI Design flow and technology trends.
2	To realise MOS based circuits using different design styles.
3	To study semiconductor memories using MOS logic.
4	To study adder, multiplier and shifter circuits for realizing data path design.
5	Understand the Backend flow of the IC Fabrication.

Course Outcomes:

After successful completion of the course students will be able to:

1	Demonstrate a clear understanding of VLSI Design flow, technology trends, scaling and MOSFET models.
2	Design and analyse MOS based inverters.
3	Realise MOS based circuits using different design styles.
4	Realise various combinational and sequential circuits using CMOS logic.
5	Demonstrate understanding of memory architectures and their working principles.
6	Design and evaluate high-speed arithmetic circuits.

Module	Contents	Hrs
1	**VLSI Design flow and Technology Trends**	**05**
1.1	VLSI Design Flow: Full custom and Semicustom IC design flow	
1.2	Scaling: Types of scaling.	
1.3	Technology Comparison: Comparison of BJT and MOS technologies, MOSFET Capacitor, MOSFET characteristics.	
2	**MOSFET Inverters**	**08**
2.1	Introduction to MOS inverters: Active and passive load nMOS inverters, CMOS inverter and their comparison	
2.2	Circuit Analysis of MOS Inverters Static Analysis of Resistive nMOS and CMOS Inverters: Calculation of critical voltages and noise margins	
2.3	Design of symmetric CMOS inverter.	
2.4	Analysis of CMOS inverter: Calculation of rise time, fall time and propagation delay.	
3	**MOS Circuit Design Styles**	**07**
3.1	Static CMOS.	
3.2	Pseudo NMOS design styles.	
3.3	Pass transistor, Transmission gate.	
3.4	Dynamic: C^2MOS.	
4	**Combinational and Sequential Circuit Realization**	**07**
4.1	Analysis and design of 2-I/P NAND, 2-I/P NOR and complex Boolean function realization using equivalent CMOS inverter for simultaneous switching, Complex Boolean function realization using various design styles and Basic gates and MUX realization using pass transistor and transmission gate logic.	
4.2	SR Latch, JK FF, D FF, 1 Bit Shift Register realization using CMOS logic.	
5	**Semiconductor Memories**	**06**
5.1	SRAM: 6T SRAM operation, design strategy, read/write circuits, sense amplifier	
5.2	DRAM: 1TDRAM, operation modes, leakage currents, refresh operation, physical design	
5.3	ROM Array: NAND and NOR based ROM array	
5.4	Flash memory: F-N tunnelling	
6	**Data Path Design**	**06**
6.1	Adder: CLA adder, MODL, Manchester carry chain, High-speed adders: carry skip, carry select and carry save.	
6.2	Multipliers and shifter: Array multiplier and barrel shifter.	
Total		**39**

Textbooks:	
1	CMOS Digital Integrated Circuits Analysis and Design, Sung-Mo Kang and Yusuf Leblebici, Tata McGraw Hill, Revised 4thEdition.
2	Introduction to VLSI Circuits and Systems, John P. Uyemura, Wiley India Pvt. Ltd.
3	Sorab K. Gandhi, "VLSI Fabrication Principles", Wiley, Student Edition.
Reference books:	
1	Digital Integrated Circuits: A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan Borivoje Nikolic, Pearson Education, 2nd Edition.
2	Basic VLSI Design, Douglas A Pucknell, Kamran Eshraghian, Prentice Hall of India Private Ltd.
3	Logical Effort: Designing Fast CMOS Circuits, Ivan Sutherlan and Bob Sproull
4	Basics of CMOS Cell Design, Etienne Sicard and Sonia Delmas Bendhia, Tata McGraw Hill
5	CMOS VLSI Design: A Circuits and Systems Perspective, Neil H. E. Weste, David Harris and Ayan Banerjee, Pearson Education
6	Analysis and Design of Digital Integrated Circuits, David Hodges, Horace Jackson, Resve Saleh, McGraw-Hill, Inc.
7	Advanced Semiconductor Memories: Architectures, Designs, and Applications, Ashok K. Sharma, Wiley Publication

Internal Assessment:	
1	Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2	Mid Term test is to be conducted when approx. 50% syllabus is completed.
3	Duration of the midterm test shall be one hour.

Continuous Assessment:
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon pertaining to the course.	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	05 marks
8	Multiple Choice Questions (Quiz)	05 marks
9	Literature review of papers/journals.	05 marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks.
2	Question paper will have a total of five questions.
3	All questions have equal weightage and carry 20 marks each.
4	Any three questions out of five needs to be solved.

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
ECC 702	Internet of Things	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECC 702	Internet of Things	20	20	60	---	---	100

Course Prerequisite:	
1	Computer Networks
2	Embedded Systems
3	Web Technologies
Course Objectives:	
1	To understand the basic building blocks of IoT
2	To understand various IoT protocols.
3	To introduce data handling in IoT.
4	To understand the Design Methodology in IoT through case studies.
Course Outcomes: After successful completion of the course students will be able to:	
1	Understand concepts, functional blocks and communication methodology relevant to IoT.
2	Identify various components of IoT
3	Compare various communication protocols for IoT.
4	Understand various methods for data handling in IoT-based systems.
5	Design basic applications based on IoT using specific components.
6	Introduce various security issues in IoT

DIGITAL SIGNAL PROCESSING (THEORY)

Module	Contents	Hrs
1	**Introduction to IoT**	**06**
1.1	Definition and Characteristics of IoT	
1.2	IoT Protocols	
1.3	IoT Functional Blocks	
1.4	IoT Communication Models	
1.5	IoT Communication APIs :- REST and WebSockets	
1.6	IoT Enabling Technologies	
1.7	Introduction to M2M and Difference between IoT and M2M	
2	**Components (Things) in IoT**	**06**
2.1	Sensor Technology, Examples of Sensors	
2.2	Actuators	
2.3	Applications of RFID and WSN in IoT	
3	**Data Handling in IoT**	**08**
3.1	Data Acquiring and Storage, Organizing the Data, Transactions and Business Processes, Analytics	
3.2	Data Collection, Storage and Computing Using Cloud Platform, Introduction to Cloud Computing, Virtualization, Cloud Models Cloud Services IoT Cloud-based Data Collection, Storage, Computing using Xively.	
4	**Design Principles for Web Connectivity**	**08**
4.1	Web Communication Protocols for connected devices:- CoRE Environment, CoAP, LWM2M, MQTT, XMPP, HTTP, SOAP Protocols	
4.2	LPWAN Fundamentals: LORA and NBIoT	
5	**IoT Design Methodology**	**06**
5.1	Defining Specifications About: - Purpose & requirements, process, domain model, information model, service, IoT level, Functional view, Operational view, Device and Component Integration: - Case Studies of Home automation, Weather Monitoring.	
5.2	IoT Levels and Deployment Templates.	
6	IoT Security and Vulnerabilities Solutions	**05**
6.1	Iot Security Tomography and Layered Attacker Model.	
6.2	Identity Management, Establishment, Access Control and Secure Message Communication.	
6.3	Security Protocols	
Total		**39**

Textbooks:	
1	Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach, Universities Press.
2	Raj Kamal, " Internet of Things: Architecture and Design Principles", McGraw Hill Education ,First edition
3	David Hanes ,Gonzalo salgueiro"IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, Kindle 2017 Edition
4	Andrew Minteer ,"Analytics for the Internet of Things(IoT)", Kindle Edition
Reference Books:	
1	Adrian McEwen, Hakim Cassimally, : Designing the Internet of Things", Paperback, First Edition.
2	Yashavant Kanetkar, Shrirang Korde: Paperback "21 Internet of Things (IOT) Experiments", BPB Publications

Internal Assessment:	
1	Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2	Mid Term test is to be conducted when approx. 50% syllabus is completed.
3	Duration of the midterm test shall be one hour.

Continuous Assessment:
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon pertaining to the course.	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	05 marks
8	Multiple Choice Questions (Quiz)	05 marks
9	Literature review of papers/journals.	05 marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks.
2	Question paper will have a total of five questions.
3	All questions have equal weightage and carry 20 marks each.
4	Any three questions out of five needs to be solved.

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
ECC DO7011	Department Level Optional Course - III (Deep Learning)	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECC DO7011	Department Level Optional Course - III (Deep Learning)	20	20	60	---	---	100

Course Prerequisite:	
1	Basic Mathematics, Linear Algebra, Machine Learning
Course Objectives:	
1	To develop mathematical concepts required for Deep Learning algorithms
2	To gain an in-depth understanding of training Deep Neural Networks.
3	To acquire knowledge of advanced concepts of Convolution Neural Networks, Autoencoders and Recurrent Neural Networks
4	To get familiarised with the recent trends in Deep Learning.
Course Outcomes: After successful completion of the course students will be able to:	
1	Understand the basic knowledge of Neural Networks.
2	Explain the process of training, optimization and Regularization of Deep Neural Networks
3	Design supervised models for DNN.
4	Design unsupervised model for DNN.
5	Select suitable DNN model for a given application.
6	Recent trends and applications of Neural networ

Module	Contents	Hrs
1	**Introduction**	**05**
1.1	Biological neuron, Mc-Culloch Pitts Neuron, Perceptron, Perceptron Learning, Delta learning, Multilayer Perceptron: Linearly separable, linearly non-separable classes.	
1.2	Deep Networks: Fundamentals, Brief History, Three Classes of Deep Learning Basic Terminologies of Deep Learning	
2	**Training, Optimization and Regularization of Deep Neural Network**	**06**
2.1	**Training Feedforward DNN** Multi Layered Feed Forward Neural Network, Learning Factors, Activation functions: Tanh, Logistic, Linear, Softmax, ReLU, Leaky ReLU, Loss functions: Squared Error loss, Cross Entropy, Choosing output function and loss function 6	
2.2	**Optimization** Learning with backpropagation, Learning Parameters: Gradient Descent (GD), Stochastic and Mini Batch GD, Momentum Based GD, Nesterov Accelerated GD, AdaGrad, Adam, RMSProp	
2.3	**Regularization** Overview of Overfitting, Types of biases, Bias Variance Tradeoff Regularization Methods: L1, L2 regularization, Parameter sharing, Dropout, Weight Decay, Batch normalization, Early stopping, Data Augmentation, Adding noise to input and output	
3	**Convolutional Neural Networks (CNN): Supervised Learning**	**08**
3.1	Convolution Operation, Motivation, Basic structure of a convolutional neural network: Padding, strides, pooling, fully connected layers, interleaving between layers .	
3.2	Training a convolutional network: Backpropagation through convolution, Backpropagation as convolution with inverted filter, Convolution/backpropagation as matrix multiplication	
3.3	Modern Deep Learning Architectures: LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet	
4	**Recurrent Neural Networks (RNN)**	**07**
4.1	Sequence Learning Problem, Unfolding Computational graphs, Recurrent Neural Network, Bidirectional RNN, Back propagation Through Time (BTT), Vanishing and Exploding Gradients, Truncated BTT	
4.2	Long Short Term Memory: Selective Read, Selective write, Selective Forget, Gated Recurrent Unit	

5	**Autoencoders: Unsupervised Learning**	**07**
5.1	Introduction, Linear Autoencoder, Undercomplete Autoencoder, Overcomplete Autoencoders, Regularization in Autoencoder	
5.2	Denoising Autoencoders, Sparse Autoencoders, Contractive Autoencoders	
6	**Recent Trends and Applications**	**06**
6.1	Generative Adversarial Network (GAN): Architecture	
6.2	Applications: Image Compression, Brain Tumour Detection, Fraud Detection, Expression identification	
Total		**39**

Textbooks:	
1	Ian Goodfellow and Yoshua Bengio and Aaron Courville. Deep Learning. An MIT Press book. 2016.
2	Li Deng and Dong Yu, "Deep Learning Methods and Applications", now publishers Inc (30 June 2014)
3	Satish Kumar "Neural Networks A Classroom Approach" Tata McGraw-Hill.
4	J M Zurada "Introduction to Artificial Neural Systems", Jaico Publishing House
5	M. J. Kochenderfer, Tim A. Wheeler. "Algorithms for Optimization", MIt Press.
Reference Books:	
1	Jon Krohn, Grant Beyleveld, Aglae Bassens, "Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence", Pearson Education.
2	Buduma, N. and Locascio, N., "Fundamentals of deep learning: Designing next-generation machine intelligence algorithms" 2017. O'Reilly Media, Inc."
3	François Chollet, "Deep Learning with Python", Manning Publications, 2018.
4	Douwe Osinga. "Deep Learning Cookbook", O'REILLY, SPD Publishers, Delhi.
5	Simon Haykin, Neural Network- A Comprehensive Foundation- Prentice Hall International, Inc.

Online References:

Sr. No.	Website Links
1	https://nptel.ac.https://deeplearning.cs.cmu.edu/S21/index.html
2	http://www.cse.iitm.ac.in/~miteshk/CS6910.html
3	https://nptel.ac.in/courses/106/106/106106184/

4	https://www.deeplearningbook.org/
5	http://introtodeeplearning.com/
6	http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php

Internal Assessment:	
1	Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2	Mid Term test is to be conducted when approx. 50% syllabus is completed.
3	Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon pertaining to the course.	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	05 marks
8	Multiple Choice Questions (Quiz)	05 marks
9	Literature review of papers/journals.	05 marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks.
2	Question paper will have a total of five questions.
3	All questions have equal weightage and carry 20 marks each.
4	Any three questions out of five needs to be solved.

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
ECCDO 7021	Cloud Computing	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECCDO 7021	Cloud Computing	20	20	60	---	---	100

Course Prerequisite: Computer networks, Basics of operating system (O.S.)	
Course Objectives:	
1	To provide an overview of cloud computing fundamentals.
2	To make students familiar with the key concepts of virtualization.
3	To explore various cloud computing services.
4	To create an open-source cloud.
5	To identify risks and provide cloud security.
6	To analyze several cloud applications and recent trends in cloud computing.
Course Outcomes: After successful completion of the course students will be able to:	
1	Define cloud computing and understand different cloud services and deployment models.
2	Implement different types of virtualizations.
3	Use several cloud computing services.
4	Design of open-source cloud.
5	Identification of threats and cloud-based risks for cloud security.
6	Understand cloud applications and recent trends.

Module	Contents	Hrs
1	**Introduction to Cloud Computing**	**06**
1.1	**Pre-requisites:** Basics of operating system (O.S.), ISO-OSI model and its layers	
1.2	Definition Of Cloud Computing and cloud data centre, NIST model and cloud cube model, and characteristics of cloud computing.	
1.3	Cloud deployment models (private, public, hybrid, and community) and service models (SaaS, PaaS, and IaaS).	
1.4	Impact of cloud computing on business,key drivers for cloud computing.	
1.5	Advantages and disadvantages of cloud computing.	
	Self-learning topics: Comparison between cloud service providers with traditional IT service providers.	
2	**Virtualization**	**08**
2.1	Introduction and benefits of virtualization, implementation levels of virtualization, VMM.	
2.2	Virtualization at O.S.level, middleware support for virtualization, virtualization structure/tools and mechanisms, hypervisor and xen architecture, binary translation with full virtualization, para virtualization with compiler support.	
2.3	CPU virtualization, memory virtualization and I/O virtualization, virtualization in multicore processors,demonstration of virtualization using type II hypervisor.	
	Self-learning topics: Comparison between virtualization and containerization (docker).	
3	**Cloud Computing Services**	**05**
3.1	Exploring different cloud computingservices: Software-as-a-Service (SaaS) (e.g., Dropbox, Google Workspace, Salesforce, etc.), Platform-as-a-Service(PaaS) (e.g., AWS Elastic Beanstalk, Windows Azure, Heroku, Google App Engine, etc.), Infrastructure-as-a-Service (IaaS) (e.g., DigitalOcean, AWS, Microsoft Azure, Google Compute Engine (GCE), etc.).	
3.2	Anything-as-a-Service or Everything-as-a-Service (XaaS), Security-as-a-Service, Identity Management-as-a-Service, and Database-as-a-Service.	
3.3	Storage-as-a-Service, Collaboration-as-a-Service, Compliance-as-a-Service,Monitoring-as-a-Service, Communication-as-a-Service, Network-as-a- Service Disaster Recovery-as-a-Service, Analytics-as-a-Service, and Backup-as-a- Service	
	Self-learning topics: Explore any 10 services offered by AWS/Microsoft Azure.	
4	**Open-Source Cloud Implementation of OpenStack and Eucalyptus**	**10**

4.1	OpenStack Cloud Architecture, Features of OpenStack, Components of OpenStack, Mode of Operations of OpenStack	
4.2	Eucalyptus Architecture, Features of Eucalyptus, Components of Eucalyptus, Mode of Operations of Eucalyptus	
4.3	Installation and configuration process of OpenStack and Eucalyptus	
	Self-learning topics: Explorer Open source cloud and edge computing platform for an enterprise: OpenNebula.	
5	**Cloud Security**	**07**
5.1	Security overview, cloud security challenges and risks, SaaS security, cloud computing security architecture, architectural considerations.	
5.2	General issues in securing cloud, securing data, application, and virtual machine security.	
5.3	AAA model, automatic security establishing trusted cloud computing, secure execution environments and communications, access control, disaster recovery in clouds.	
	Self-learning topics: Cloud security in AWS/Microsoft Azure/Google Cloud Platform.	
6	**Cloud Applications and Recent Trends**	**06**
6.1	**Scientific Applications:** **Healthcare:** ECG analysis in cloud **IoT-enabled Cloud Applications:** Smart Agriculture	
6.2	**Business and Consumer Applications:** CRM and ERP, Productivity, networking, media applications, multiplayer online gaming.	
6.3	**Recent Trends:** Mobile cloud computing, autonomic cloud computing, multimedia cloud, energy aware cloud computing.	
	Self-learning topics: Jungle computing, Fog computing, Quantum computing	
Total		**39**

Textbooks:	
1	Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education
2	Cloud Computing and Services by Arup Vithal, Bhushan Jadhav, StarEdu Solutions, SYBGEN Learning India Pvt. Ltd.
3	Cloud Computing: A Practical Approach forLearning and Implementation by A. Srinivasan, J.Suresh, Pearson.
4	Cloud Security: A Comprehensive Guide to Secure Cloud Computing by Ronald L. Krutz,Russell Dean Vines, Wiley & Sons.
5	Cloud Computing Bible by Barrie Sosinsky, Wiley Publishing.

Reference Books:	
1	Cloud Computing Black Book by Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Deven Shah, Dreamtech Press.
2	Amazon Web Services in Action by Michael Wittig, Andreas Wittig, Manning Publisher.
3	To the cloud: cloud powering an Enterprise, Arora Pankaj, Tata Mc Graw Hill Education.
4	Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Kai Hwang, Morgan Kaufmann.

Online References:

Sr. No.	Website Links
1	NPTEL:https://onlinecourses.nptel.ac.in/noc22_cs20/preview
2	OpenStack Installation Guide: https://docs.openstack.org/install-guide/
3	EucalyptusInstallation:https://docs.eucalyptuscloud.org/eucalyptus/4.4.4/install-guide-4.4.4.pdf
4	AWS Management Console: https://aws.amazon.com/console/
5	https://ndl.iitkgp.ac.in NOC: Cloud Computing https://rb.gy/wyjtjx
6	https://ndl.iitkgp.ac.in NOC :Cloud Computing and Distributed Computing – Virtualization https://rb.gy/uuyzq3

Internal Assessment:	
1	Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2	Mid Term test is to be conducted when approx. 50% syllabus is completed.
3	Duration of the midterm test shall be one hour.

Continuous Assessment:
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon pertaining to the course.	10 marks

3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	05 marks
8	Multiple Choice Questions (Quiz)	05 marks
9	Literature review of papers/journals.	05 marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks.
2	Question paper will have a total of five questions.
3	All questions have equal weightage and carry 20 marks each.
4	Any three questions out of five needs to be solved.

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
ECC DO7023	Cyber Security	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECC DO7023	Cyber Security	20	20	60	---	---	100

Course Prerequisite: Computer Networks	
Course Objectives:	
1	To understand the need for Cyber Security Awareness.
2	To understand the flow and methodology of an attack
3	To learn and explore various static and web vulnerability analysis tools.
4	To understand the various IPR, privacy and security compliances.
Course Outcomes: After successful completion of the course students will be able to:	
1	Understand the need of Cyber Security and its aspects.
2	Illustrate the various tools and techniques used by attackers to launch their attacks.
3	Identify cyber attacks and its countermeasures.
4	Identify various web application and Network vulnerability scanning techniques and defence methodologies.
5	Describe the various Privacy and standard compliances with the help of real world application.

Module	Contents	Hrs
1	**Introduction to Cyberspace**	**10**
1.1	**Prerequisite:** Computer Networks **Cyber Crime:** Cybercrime definition, Types of Cybercrime. Classifications of cybercrime, Cyber Hygiene, Types of Hackers - Hackers and Crackers - Cyber-Attacks and Vulnerabilities - Malware threats - Sniffing - Gaining Access - Escalating Privileges - Executing Applications - Hiding Files - Covering Tracks - Worms - Trojans - Viruses - Backdoors	
1.2	**Cyber Attacks:**Cyber-attack Lifecycle, social engineering, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Attacks on Wireless and mobile Networks.	
2	**Cyber-crime Attacks and Techniques**	**08**
2.1	**Attacks Techniques:** Password Cracking, Keyloggers and Spywares Steganography, Identity Theft (ID Theft), Banner Grabbing Techniques, ransom wares, Crypto wares	
2.2	Network information gathering, vulnerability scanning, Virtual Private Networks (VPN), Open Port Identification, Social engineering, Types of social engineering, How cyber-criminal works? Prevention from being victim of social engineering.	
3	**Cyber Attacks and Preventions**	**06**
3.1	Attacks on WIFI and prevention, traditional techniques, theft of internet hours, Wi-Fi measures	
3.2	Attacks on Mobile phone and prevention, mobile phone theft, mobile virus, Mishing, vishing, smishing, hacking Bluetooth	
4	**Web and Network Security**	**08**
4.1	Web Security: WASP, Web Security Considerations, Management, Cookies, Privacy on Web, Web Browser Attacks, Web Bugs, Clickjacking, Session Hijacking and Management, Phishing and Pharming Techniques, Web Service Security	
4.2	Network security: Syn-DOS:,DDOS, defences against Denial-of-Service Attacks. Virtual Private Networks (VPN)	
5	**Cyber Laws**	**04**
5.1	**Information Security Privacy and Standard Compliances (WR)** HIPPA, FISMA, PCI DSS, GDPR, Intellectual Property Aspect of Cyber Law, Creative Commons Library, Data Protection Laws in India.	
6	**Cyber Security Initiatives- (case studies)**	**03**

6.1	Online Banking, Mobile Banking Security, Security of Debit and Credit Card, UPI Security	
6.2	Role of AI/ML in Cyber Security	
Total		**39**

Textbooks:	
1	Nina Godbole,Sunit Belapure, "Cyber Security-Understanding Cyber Crimes,Computer Forensics and Legal Perspective",Wiley-India,2011.
2	The Complete Cyber Security Course -Volume 1- Nathan House
3	Network Security Bible, Eric Cole, Second Edition, Wiley

Reference Books:	
1	The Information technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
2	James Graham,Richard Howard ,Ryan Olson. " Cyber Security Essentials,CRC Press,2018 print.
3	Build your own Security Lab, Michael Gregg, Wiley India
4	Computer Security, Dieter Gollman, Third Edition, Wiley

Online References:

Sr. No.	Website Links
1	Virtual Penetration Testing Labs- https://pentesterlab.com
2	OWASP- https://owasp.org/
3	DVWA- https://dvwa.co.uk
4	FISMA - https://csrc.nist.gov/projects/risk-management/fisma-background
5	PCI DSS ttps://www.itgovernance.eu/blog/en/a-guide-to-the-4-pci-dss-compliance-levels
6	GDPR -https://gdpr.eu/what-is-gdpr/

Internal Assessment:	
1	Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2	Mid Term test is to be conducted when approx. 50% syllabus is completed.
3	Duration of the midterm test shall be one hour.

Continuous Assessment:
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon pertaining to the course.	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	05 marks
8	Multiple Choice Questions (Quiz)	05 marks
9	Literature review of papers/journals.	05 marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks.
2	Question paper will have a total of five questions.
3	All questions have equal weightage and carry 20 marks each.
4	Any three questions out of five needs to be solved.

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
ECL701	VLSI Design Lab	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECL701	VLSI Design Lab	---	---	---	25	25	50

Lab Outcomes: After successful completion of the lab course students will be able to:	
1	Demonstrate transfer, dynamic characteristics of various digital circuits.
2	Understand the circuit design using various simulation tools
3	Demonstrate layouts for various circuits and doing simulations.
4	Understand the variation in the behaviour after extraction.

Suggested Experiments: Students are required to complete at least 10 experiments.	
Sr.No.	**Name of the Experiments**
1	Plot Transfer and output characteristics of NMOS and PMOS
2	Design CMOS inverter. Carry out static as well as transient simulation with different aspect ratio of pull up and pull-down devices
3	Comparative analysis of the NMOS Inverter with different types of loads.
4	Find the equivalent CMOS inverter for the given 2-input NAND and NOR gates
5	Implement the given equation using various logic design style
6	Implementation of any Flip- Flop using various logic design styles
7	Simulate Minimum Sized CMOS INVERTER circuit to calculate τPHL and τPLH
8	Design and Simulate 4:1 multiplexer using NMOS pass transistor
9	Design and simulate 4-bit adder/subtractor
10	Design CMOS transmission gate and perform all the analysis to verify its Characteristics.
11	Design and Simulate 4-bit multiplier
12	Simulate and carry out comparative analysis for 6T SRAM cell with a) β= 1.5 and α=1, and b) β= 1 and α=1
13	Draw the CMOS schematic and Layout of the inverter circuit, simulate layout
14	Extraction of CMOS layout and simulation of the extracted Inverter

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term-Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
ECL 702	Internet of Things Lab	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECL 702	Internet of Things Lab	---	---	---	25	25	50

Lab Outcomes: After successful completion of the lab course students will be able to:	
1	Interface various sensors to any IoT device and push data onto cloud.
2	Remotely control various devices using Blynk App and Node-red environment.
3	Implement IoT protocols to control devices remotely.
4	Implement services like Google Assistance, Adafruit I/O, IFTTT, Firebase etc in IoT.
5	Configure AWS Cloud and its Application in IoT

Suggested Experiments: Students are required to complete at least 10 experiments.	
Sr.No.	**Name of the Experiments**
1	Interfacing Various Sensors like LDR, ultrasonic, DHT etc (data collection) and pushing data on to Thingspeak Cloud.
2	Controlling IoT devices/sensors remotely using Node-red and rpi.
3	Application of MQTT in node red
4	Control a LED Remotely & Monitor Temperature values with a Raspberry Pi using Node-RED
5	Controlling IoT devices using Blynk App.
6	Temperature and Humidity monitor using Blynk
7	ESP8266 Voice Control with Google Assistant and Adafruit IO and IFTTT.
8	Implementing Publish-Subscribe model using MQTT protocol and DHT11 sensor
9	Google Firebase: - controlling LED using Android App
10	Publishing sensor data from ESP32 to AWS IoT Cloud.
11	Device controlling over cloud on android mobile app :- Monitoring sensor and different data on mobile phone
12	Creating an emergency push button to upload status on Facebook
13	To send Push notification to IoT device (R-pi to smart phone)
14	Google Assistant Controlled Switch Using NodeMCU
15	AWS and SNS service

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term-Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
ECL 7031	Department Level Optional Course - III Lab (Deep Learning)	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ECL 7031	Department Level Optional Course - III Lab (Deep Learning)	---	---	---	25	25	50

Lab Outcomes: After successful completion of the lab course students will be able to:	
1	Implement basic neural network models to learn logic functions.
2	Design and train feed-forward neural networks using various learning algorithms.
3	Build and train deep learning models such as Auto-encoders, CNNs, RNN, LSTM etc.

Suggested Experiments: Students are required to complete at least 10 experiments.	
Sr. No.	**Name of the Experiment**
1	**Based on Module 1 (Any two) using Virtual Lab**
	Implement Mc-Culloch Pitts model for binary logic functions.
	Implement Perceptron algorithm to simulate any logic gate.
	Implement Multilayer Perceptron algorithm to simulate XOR gate.
	To explore python libraries for deep learning e.g. Theano, TensorFlow etc.
2	**Module 2 (Any Two)**
	Apply any of the following learning algorithms to learn the parameters of the supervised single layer feed-forward neural network. a. Stochastic Gradient Descent b. Mini Batch Gradient Descent c. Momentum GD d. Nestorev GD e. Adagrad GD Adam Learning GD
3	**Module 3 (Any One)**
	Implement a back-propagation algorithm to train a DNN with at least 2 hidden layers.
	Design and implement a fully connected deep neural network with at least 2 hidden layers for a classification application. Use appropriate Learning Algorithm, output function and loss function
4	**Module 4 (Any One)**
	Design and implement a CNN model for digit recognition application.
	Design and implement a CNN model for image classification.
5	**Module 5 (Any One)**
	Design the architecture and implement the auto-encoder model for Image Compression.
	Design the architecture and implement the auto-encoder model for Image denoising.
6	**Module 6 (Any One)**
	Design and implement LSTM for Text / Image / Audio / Video / etc.
	Design and implement GRU for Text / Image / Audio / Video / etc.
	Design and implement RNN for Text / Image / Audio / Video / etc.

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Online References:

Sr. No.	Website Links
1	https://nptel.ac.https://deeplearning.cs.cmu.edu/S21/index.html
2	http://www.cse.iitm.ac.in/~miteshk/CS6910.html
3	https://nptel.ac.in/courses/106/106/106106184/
4	https://www.deeplearningbook.org/
5	http://introtodeeplearning.com/
6	http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php

Term-Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
ISP701	Major Project – I	---	6#	---	---	03	---	03

Course Code	Course Name	Examination Scheme						
		Theory			Term Work	Practical	Oral	Total
		Internal Assessment		End Sem Exam				
		Mid-Term Test	Continuous Assessment					
ISP701	Major Project – I	---	---	---	50	---	50	100

 # indicate workload of learner not faculty

Course Objectives:	
1	To acquaint with the process of identifying the needs and converting it into the problem.
2	To familiarize the process of solving the problem in a group.
3	To acquaint with the process of applying basic engineering fundamentals to attempt solutions to the problems.
4	To inculcate the process of self-learning and research.
Course Outcomes: After successful completion of the course students will be able to:	
1	Identify problems based on societal /research needs.
2	Apply knowledge and skill to solve societal problems in a group.
3	Develop interpersonal skills to work as member of a group or leader.
4	Draw the proper inferences from available results through theoretical/experimental/simulations.
5	Analyze the impact of solutions in societal and environmental context for sustainable development.
6	Use standard norms of engineering practices.
7	Excel in written and oral communication.
8	Demonstrate capabilities of self-learning in a group, which leads to life-long learning.
9	Demonstrate project management principles during project work

Guidelines for Major Project	
1	Students should form groups with minimum 2(two) and not more than 4 (four)
2	Students should do survey and identify needs, which shall be converted into problem statement for major project in consultation with faculty supervisor/head of department/internal committee of faculties.
3	Students shall submit implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of major project.

Log book	
1	A log book to be prepared by each group, wherein group can record weekly work progress, guide/supervisor can verify and record notes/comments.
2	Faculty supervisor may give inputs to students during major project activity; however, focus shall be on self-learning.
3	Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.
4	Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
5	The solution to be validated with proper justification and report to be compiled in standard format of University of Mumbai.
6	With the focus on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the major Projects.

Guidelines for Assessment of Major Project:

Term Work

1	The review/ progress monitoring committee shall be constituted by head of departments. The progress of major project to be evaluated on continuous basis, minimum two reviews in the semester.
2	In continuous assessment focus shall also be on each individual student, assessment based on individual's contribution in group activity, their understanding and response to questions.

Distribution of Term work marks for both semesters shall be as below;

1	In VII semester entire theoretical solution shall be ready, including components/system selection and cost analysis.
2	Two reviews will be conducted based on the presentation given by the student group.
3	First shall be for finalization of problem
4	Second shall be on finalization of proposed solution of problem.

Assessment criteria of Major Project - I.

Major Project - I shall be assessed based on following criteria:

1	Quality of survey/ need identification.
2	Clarity of Problem definition based on need.
3	Innovativeness in solutions
4	Feasibility of proposed problem solutions and selection of best solution
5	Cost effectiveness
6	Societal impact
7	Innovativeness

Guidelines for Assessment of Major Project Practical/Oral Examination:

Report should be prepared as per the guidelines issued by the University of Mumbai.

Major Project shall be assessed through a presentation and demonstration of working model by the student project group to a panel of Internal and External Examiners preferably from industry or research organizations, having experience of more than five years approved by head of the Institute.

Students shall be motivated to publish a paper based on the work in Conferences/students competitions.

Major Project-I shall be assessed based on following points;

1	Quality of problem and Clarity
2	Innovativeness in solutions
3	Cost effectiveness and Societal impact
4	Full functioning of working model as per stated requirements
5	Effective use of diversified skill-set
6	Effective use of standard engineering practices & norms
7	Contribution of an individual's as a member or Leader
8	Clarity in written and oral communication

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
ILO7013	Management Information System	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ILO7013	Management Information System	20	20	60	---	---	100

Course Objectives:	
1	The course is blend of Management and Technical field.
2	Discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built.
3	Define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage.
4	Identify the basic steps in systems development.
5	Define and analyze various MIS management responsibilities, including planning, budgeting, project management, and personnel management.
6	Discuss critical ethical and social issues in information systems.
Course Outcomes: After successful completion of the course students will be able to:	
1	Explain how information systems Transform Business.
2	Identify the impact information systems have on an organization.
3	Describe IT infrastructure and its components and its current trends.
4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making.
5	Identify the types of systems used for enterprise-wide knowledge management and how they provide value for businesses.

Module	Contents	Hrs
1	Introduction To Information Systems (IS): Computer Based Information Systems, Impact of IT on organizations, Importance of IS to Society. Organizational Strategy, Competitive Advantages and IS.	07
2	Data and Knowledge Management: Database Approach, Big Data, Data warehouse and Data Marts, Knowledge Management. Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Presenting Results	09
3	Ethical issues and Privacy: Information Security. Threat to IS, and Security Controls	06
4	Social Computing (SC): Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E- commerce – B2B B2C. Mobile commerce.	07
5	Computer Networks Wired and Wireless technology, Pervasive computing, Cloud computing model.	05
6	Information System within Organization: Transaction Processing Systems, Functional Area Information System, ERP and ERP support of Business Process. Acquiring Information Systems and Applications: Various System development life cycle models.	10

Reference Books:	
1	Management Information Systems: Kelly Rainer, Brad Prince by Wiley.
2	Management Information Systems: Managing the Digital Firm (10th Edition). K.C. Laudon and J.P. Laudon, Prentice Hall, 2007.
3	Managing Information Systems: Strategy and Organization, D. Boddy, A. Boonstra, Prentice Hall, 2008.

Internal Assessment:	
1	Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2	Mid Term test is to be conducted when approx. 50% syllabus is completed.
3	Duration of the midterm test shall be one hour.

Continuous Assessment:		
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:		
Sr. No	**Rubrics**	**Marks**
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon pertaining to the course.	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	05 marks
8	Multiple Choice Questions (Quiz)	05 marks
9	Literature review of papers/journals.	05 marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks.
2	Question paper will have a total of five questions.
3	All questions have equal weightage and carry 20 marks each.
4	Any three questions out of five needs to be solved.

VIVEKANAND EDUCATION SOCIETY'S

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Computer Science

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
ILO7016	Cyber Security and Laws	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
ILO7016	Cyber Security and Laws	20	20	60	---	---	100

Course Objectives:	
1	To understand and identify different types cyber-crime and cyber law.
2	To recognized Indian IT Act 2008 and its latest amendments.
3	To learn various types of security standards compliances.
Course Outcomes: After successful completion of the course students will be able to:	
1	Understand the concept of cyber-crime and its effect on outside world.
2	Interpret and apply IT law in various legal issues.
3	Distinguish different aspects of cyber law.
4	Apply Information Security Standards compliance during software design and development.

Module	Contents	Hrs
1	**Introduction to Cybercrime:** Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes.	04
2	**Cyber offenses & Cybercrime:** How criminal plan the attacks, Social Engg, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices- Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.	10
3	**Tools and Methods Used in Cyberline:** Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft).	06
4	**The Concept of Cyberspace:** E-Commerce, The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law, The Evidence Aspect in Cyber Law, The Criminal Aspect in Cyber Law, Global Trends in Cyber Law, Legal Framework for Electronic Data Interchange Law Relating to Electronic Banking, The Need for an Indian Cyber Law.	08
5	**Indian IT Act.:** Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments.	08
6	**Information Security Standard compliances** SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI.	06

Reference Books:

1	Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, New Delhi.
2	The Indian Cyber Law by Suresh T. Vishwanathan; Bharat Law House New Delhi.
3	The Information technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
4	Cyber Law & Cyber Crimes By Advocate Prashant Mali; Snow White Publications, Mumbai
5	Nina Godbole, Information Systems Security, Wiley India, New Delhi.
6	Kennetch J. Knapp, Cyber Security &Global Information Assurance Information Science Publishing.

7	Kennetch J. Knapp, Cyber Security &Global Information Assurance Information Science Publishing.
8	Websites for more information is available on: The Information Technology ACT, 2008-TIFR: https://www.tifrh.res.in
9	Website for more information , A Compliance Primer for IT professional: https://www.sans.org/reading room/whitepapers/compliance/compliance-primer-professionals- 33538

Internal Assessment:	
1	Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2	Mid Term test is to be conducted when approx. 50% syllabus is completed.
3	Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon pertaining to the course.	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	05 marks
8	Multiple Choice Questions (Quiz)	05 marks
9	Literature review of papers/journals.	05 marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks.
2	Question paper will have a total of five questions.
3	All questions have equal weightage and carry 20 marks each.
4	Any three questions out of five needs to be solved.