University of Mumbai

No. AAMS_UGS/ICC/2022-23/187

CIRCULAR:-

Attention of the Principals of the Affiliated Colleges and Directors of the Recognized Institutions in Faculty of Science & Technology is invited to this office circular No. AAMS_UGS/ICC/2022-23/167 dated 17th November, 2022 relating to the Ordinance 5134 relating to M.E. Degree Course has been by adding new branch for (Information Security).

You are hereby informed that the recommendations made by the Ad-hoc Board of Studies in **Information Technology** at its meeting held on 27th May, 2022 and subsequently passed in the Faculty and then by the Board of Deans at its meeting held on 5th July, 2022 **vide** item No. 6.28 have been accepted by the Academic Council at its meeting held on 11th July, 2022 **vide** item No. 6.28 (R) and that in accordance therewith, to revise the syllabus of **M.E. (Information Security) (Sem.- I to IV) (CBCS)** (REV- 2022 Scheme), has been brought into force with effect from the academic year 2022-23. (The circular is available on the University's website www.mu.ac.in).

MUMBAI – 400 032
7th December, 2022

(Prof. Sunil Bhirud)
I/c Registrar

To
The Principals of the Affiliated Colleges and Directors of the Recognized Institutions in Faculty of Science & Technology.

A.C/6.28(R)/11/07/2022

Copy forwarded with Compliments for information to :-

1) The Dean, Faculty of Science & Technology,
2) The Chairman, Ad-hoc Board of Studies in Information Technology,
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Director, Department of Information & Communication Technology,
6) The Co-ordinator, MKCL.

Copy to :-
1. The Deputy Registrar, Academic Authorities Meetings and Services (AAMS),
2. The Deputy Registrar, College Affiliations & Development Department (CAD),
3. The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),
4. The Deputy Registrar, Research Administration & Promotion Cell (RAPC),
5. The Deputy Registrar, Executive Authorities Section (EA),
6. The Deputy Registrar, PRO, Fort, (Publication Section),
7. The Deputy Registrar, (Special Cell),
8. The Deputy Registrar, Fort/ Vidyanagari Administration Department (FAD) (VAD), Record Section,
9. The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanagari,

They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above circular and that on separate Action Taken Report will be sent in this connection.

1. P.A to Hon'ble Vice-Chancellor,
2. P.A Pro-Vice-Chancellor,
3. P.A to Registrar,
4. All Deans of all Faculties,
5. P.A to Finance & Account Officers, (F.& A.O),
6. P.A to Director, Board of Examinations and Evaluation,
7. P.A to Director, Innovation, Incubation and Linkages,
8. P.A to Director, Board of Lifelong Learning and Extension (BLLE),
9. The Director, Dept. of Information and Communication Technology (DICT) (CCF & UCC), Vidyanagari,
10. The Director of Board of Student Development,
11. The Director, Department of Students Walfare (DSD),
12. All Deputy Registrar, Examination House,
13. The Deputy Registrars, Finance & Accounts Section,
14. The Assistant Registrar, Administrative sub-Campus Thane,
15. The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,
16. The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,
17. The Assistant Registrar, Constituent Colleges Unit,
18. BUCTU,
19. The Receptionist,
20. The Telephone Operator,
21. The Secretary MUASA

for information.

University of Mumbai

Revised Syllabus for

M.E. (Information Security)

(Sem. - I to IV)

(Choice Based Credit System)

(With effect from the academic year 2022-23)

University of Mumbai

Syllabus for Approval

O: _____	Title of Course	M.E. (Information Security)
O: _____	Eligibility	Passed B.E./B.Tech and as per the Ordinance 0.5134
R: _____	Standards of Passing	45%
No. of years/Semesters:		4 semesters
Level:		P.G. / U.G./ Diploma / Certificate
Pattern:		Yearly / Semester
Status:		New / Revised
To be implemented from Academic Year :		With effect from Academic Year : 2022-23
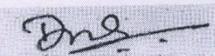
Dr. Deven Shah
Chairman,
Ad-hoc Board of
Studies in Information
Technology
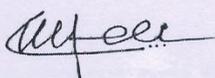
Dr. Suresh K. Ukarande
Associate Dean,
Faculty of Science and
Technology
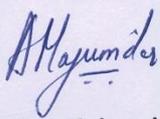
Dr Anuradha Majumdar
Dean,
Faculty of Science and
Technology

Semester I

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MEISC101	IT Infrastructure Design	3	--	--	3	--	--	3
MEISC102	Cryptography and PKI	3		--	3		--	3
MEISCPE103	Program Elective 1	3	--	--	3	--	--	3
MEISCPE104	Program Elective 2	3	--	--	3	--	--	3
IE101X	Institute Elective 1	3	--	--	3	--	--	3
MEISL101	Program Lab-I	--	2	--	--	1	--	1
MEISL102	Skill Based Lab-I	--	4$	--	--	2	--	2
Total		**15**	**06**	**--**	**15**	**03**	**--**	**18**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract / Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
MEISC101	IT Infrastructure Design	20	20	20	80	3	--	--	100
MEISC102	Cryptography and PKI	20	20	20	80	3	--	--	100
MEISCPE103	Program Elective 1	20	20	20	80	3	--	--	100
MEISCPE104	Program Elective 2	20	20	20	80	3	--	--	100
IE101X	Institute Elective 1	20	20	20	80	3	--	--	100
MEISL101	Program Lab-I	--	--	--	--	--	25	25	50
MEISL102	Skill Based Lab-I	--	--	--	--	--	50	50	100
Total		**--**	**--**	**100**	**400**	**--**	**75**	**75**	**650**

Program Elective 1	MEISCPE1031	GPU Architecture and programming
	MEISCPE1032	Fundamental of statistic of AI
	MEISCPE1033	Advanced Web Technologies
	MEISCPE1034	IT security Laws and compliance

Program Elective 2	MEISCPE1041	Quantum computing
	MEISCPE1042	IoT and security
	MEISCPE1043	Clould Computing security
	MEISCPE1044	Machine Learning

Institute Elective 1	IE1011	Product Lifecycle Management
	IE1012	Reliability Engineering
	IE1013	Management Information System
	IE1014	Design of Experiments
	IE1015	Operation Research
	IE1016	Cyber Security and Laws
	IE1017	Disaster Management and Mitigation Measures
	IE1018	Energy Audit and Management
	IE1019	Development Engineering

Semester II

Course Code	Course Name	Teaching Scheme(Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MEISC201	Information Security	3	--	--	3	--	--	3
MEISC202	Block chain Technology	3		--	3		--	3
MEISCPE203	Program Elective 3	3	--	--	3	--	--	3
MEISCPE204	Program Elective 4	3	--	--	3	--	--	3
IE201X	Institute Elective 2	3	--	--	3	--	--	3
MEISL201	Program Lab-II	--	2	--	--	1	--	1
MEISL202	Skill Based Lab-II	--	4$	--	--	2	--	2
Total		15	06	--	15	03	--	18

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract / Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
MEISC201	Information Security	20	20	20	80	3	--	--	100
MEISC202	Block chain Technology	20	20	20	80	3	--	--	100
MEISCPE203	Program Elective 3	20	20	20	80	3	--	--	100
MEISCPE204	Program Elective 4	20	20	20	80	3	--	--	100
IE201X	Institute Elective 2	20	20	20	80	3	--	--	100
MEISL201	Program Lab-II	--	--	--	--	--	25	25	50
MEISL202	Skill Based Lab-II	--	--	--	--	--	50	50	100
Total		--	--	100	400	--	75	75	650

$ indicates work load of Learner (Not Faculty), for Skill Based Lab

Note 1: Skill Based Lab- I and II shall include activity / project based learning like
1) Mini project in engineering domains related to the specialization or interdisciplinary domains
2) Product Design
3) Application Software Development
4) Idea proposal and validation

Program Elective 3	MEISCPE2031	Application and Web Security
	MEISCPE2032	Machine Learning for Security
	MEISCPE2033	Investigating Crypto currency
	MEISCPE2034	Design Thinking

Program Elective 4	MEISCPE2041	Devops and Devsecops
	MEISCPE2042	IT Security Strategic Planning, Policy & leadership
	MEISCPE2043	Hacker Technique, Exploits and Incident handling
	MEISCPE2044	Advanced Computer Forensic Analysis

Institute Elective 2	IE2011	Project Management
	IE2012	Finance Management
	IE2013	Entrepreneurship Development and Management
	IE2014	Human Resource Management
	IE2015	Professional Ethics and CSR
	IE2016	Research Methodology
	IE2017	IPR and Patenting
	IE2018	Digital Business Management
	IE2019	Environmental Management

Semester III

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MEISMP301	Major Project: Dissertation -I	--	20	--	--	10	--	10
Total		**00**	**20**	**--**	**00**	**10**	**--**	**10**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract/ Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
MEISMP301	Major Project: Dissertation -I	--	--	--	--	--	100	--	100
Total		**--**	**--**	**--**	**--**	**--**	**100**	**--**	**100**

Online Credit Courses

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MEISOCC301	Online Credit Course - I	--	--	--	--	--	--	3
MEISOCC301	Online Credit Course - II	--	--	--	--	--	--	3
Total		**--**	**--**	**--**	**00**	**00**	**00**	**06**

Note 2: It is mandatory to complete the Online Credit Courses (OCC) available on NPTEL / Swayam /MOOC or similar platform approved by university. The learner shall opt for one course each from OCC- I and OCC-II. These two courses shall be completed in any semester I or II or III, but not later end of the Semester III. The credits earned with OCC- I and OCC-II shall be accounted in the third semester grade-sheet. The learner shall be allowed to take up these courses from his or her institute or organisation/ industry where his / her major project is carried out. The students shall complete the courses and shall qualify the exam conducted by the respective authorities/ instructor from the platform. The fees for any such courses and the corresponding examination shall be borne by the learner. University shall make a provision that credit earned with OCC-I and OCC-II shall be accounted in the third semester grade-sheet with actual names of the courses.

Online Credit Course – I
The learner shall opt for the course in the domain of Research Methodology **or** Research & Publication Ethics or IPR. The opted course shall be of 3 credits of equivalent number of weeks.

Online Credit Course –II
The learner shall opt for the course recommended by Faculty Advisor/ Project Supervisor from the institute. The opted course shall be of 3 credits of equivalent number of weeks.

Semester IV

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MEISMP401	Major Project : Dissertation -II	--	32	--	--	16	--	16
Total		**--**	**32**	**--**	**--**	**16**	**--**	**16**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract/ Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
MEISMP401	Major Project : Dissertation -II	--	--	--	--	--	100	100	200
Total		**--**	**--**	**--**	**--**	**--**	**100**	**100**	**200**

Total Credits: 68

Note 3: The Dissertation submission shall not be permitted till the learner completes all the credit requirements of ME course.

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISC101	IT Infrastructure Design	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme								
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISC101	IT Infrastructure Design	20	20	20	80	--	--	--	100

Course Objectives: Students shall be able to:
1. Be familiarized with the methodologies and approaches of the network design for an Enterprise network.
2. Explain Ethernet design rules, server farm design and DMZ design
3. Describe the data center design considerations and Telecommunications Infrastructure Standard for data centers.
4. Study the components of Enterprise Wireless LAN Architecture.
5. Understand and apply the concepts of need for storage Network, Data Protection and RAID.
6. Understand SDN and Open Flow switch and controllers.

Course Outcomes: Students will be able to
1. Analyse customer requirements and apply a methodology to Network Design. (BT Level 4)
2. Describe Ethernet Design Rules of server farm design and DMZ design. (BT Level 2)
3. Design and analyse Basic Campus and Data Centre Network. (BT Level 6)
4. Design and apply the concepts of Enterprise Wireless LAN. (BT Level 6)

5. Explain the concepts of SAN and its applications. (BT Level 2)
6. Describe OpenFlow controllers and switches in SDN. (BT Level 2)

Prerequisite: Basic knowledge of Networking techniques.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic knowledge of Networking techniques, Networking Topology, OSI Layer, Internetworking Devices, IP addressing.	02	--
I	Enterprise Network Design	Network Design Methodology: Cisco Architectures for the Enterprise; Cisco Design Lifecycle- Plan, Build, Manage; Prepare, Plan, Design, Implement, Operate, and Optimize Phases; Identifying Customer Design Requirements, Characterizing the Existing Network, Designing the Network Topology and Solutions; Network Design Models: Hierarchical Network models, Cisco Enterprise Architecture model- Enterprise Campus Module, Enterprise Edge Area Module, Service Provider Edge Module, Remote Modules; High Availability Network Services: Workstation to Router redundancy and LAN High Availability protocols, Route and Server Redundancy, Load Balancing, link Media Redundancy. **Self-learning Topics**: Overview of Analysis, Architecture, and Design Processes, Architectural models, Juniper Networks, Network Management Protocols and Features.	08	CO1
II	Enterprise LAN Design	Ethernet Design Rules: 100 Mbps Fast Ethernet Design rules, Gigabit Ethernet Design Rules, 10 Gigabit Ethernet Design rules, 10GE Media types, Campus LAN Design and Best Practices, STP Design Considerations, Cisco STP Toolkit, Server Farm Module, Campus LAN QoS considerations. Multicast Traffic considerations. **Self-learning Topics**: DMZ, Understanding Working of Repeater, hub, Bridge, routers, Layer2/3 Switch.	06	CO2
III	Data Center Design	Enterprise DC architecture, data center foundation components, data center topology components, Network programmability, challenges in DC, Enterprise data center infrastructure, Virtualization Overview, Virtualization Technologies, Data Center Interconnect (DCI), Load balancing in the DC; Architecture Considerations, Service Layers	08	CO1, CO3

		Model of Cloud computing; Cloud Reference Architecture Framework, Cloud Data Center Building Blocks. Cloud Data Center Technology Architecture Trust in Cloud Data Center, Compliance and SLA; Data Center Security, Data Center Tiers. **Self-learning Topics:** Case study on Data Center Top-of-Rack Architecture Design, NSI/NECA/ BICSI-002 Data Center Design and Implementation Best Practices.		
IV	Enterprise Wireless LAN Architecture	Wireless LAN Technologies, Cisco Unified Wireless Network, WLAN Authentication, WLAN Controller Components, Roaming and Mobility Groups, WLAN Design- Controller Redundancy design. **Self-learning Topics:** Narrow Band, Spread Spectrum, FHSS, DSSS.	05	CO1,CO4
V	SAN	Need for storage Network, Data Protection and RAID, Storage Network Architecture and IP storage, Storage Network Backup and Recovery, Storage and Network in Storage Network, Software for Storage Network, Adopting and Managing SAN. **Self-learning Topics:** Case study on SAN and RAID	04	CO1, CO5
VI	Software Defined Network	Understanding SDN and Open Flow : SDN – Network Virtualization Techniques, SDN Building Blocks, Open Flow messages – Controller to Switch, Symmetric and Asynchronous messages, Implementing Open Flow Switch, OpenFlow controllers , PoX and NoX, NetApp Development on top of SDN, Open Flow in Cloud Computing. **Self-learning Topics:** Case study on how SDN changed Traditional Enterprise network Design	06	CO1, CO3, CO6

Text Books:

1. CCDA 200-310 Official Cert Guide by Anthony Bruno and Steve Jordan, Cisco Press, 2016.
2. Cisco Cloud Computing - Data Center Strategy, Architecture, and Solutions by Kapil Bakshi - Cisco Systems White paper, 2009.
3. Software Defined Networking with Open Flow : PACKT Publishing Siamak Azodolmolky, 2013.
4. Storage Area Network Essentials: A Complete Guide to Understanding and Implementing SANs by Richard Barker, Paul Massiglia, Wiley India, 2002.
5. Cisco SD-WAN Design Guide, April 2022.

Reference Books:

1. Network Analysis, Architecture, and Design 3rd Edition, Morgan Kaufman, James D,2007.
2. Storage Networks explained by Ulf Troppen, Wiley publication,2009.
3. Data Center Top-of-Rack Architecture Design, *White paper*. Cisco Systems. April 18, 2011. Retrieved July 10, 2013.
4. Cisco Data Center Infrastructure 2.5 Design Guide, 2013.
5. Enterprise Network Design, Neeraj Khairwal, Trupti Lotlikar, Staredu solutions,2019.

6. Storage Network Management and Retrieval by Dr. Vaishali Khairnar, Nilima Dongre, Wiley India, 2015.

Online References:

S.No	Website/Reference link
1.	https://en.wikipedia.org/wiki/TIA-942
2.	https://ciscodatacenter.files.wordpress.com/2009/07/data-center-top-of-rack-architecture-design.pdf
3	https://www.bicsi.org/docs/default-source/publications/002-2019-preview.pdf
4.	https://www.cisco.com/c/en_in/solutions/data-center-virtualization/what-is-a-data-center.html
5.	https://nptel.ac.in/courses/106105183
6..	https://www.juniper.net/documentation/en_US/release-independent/junos/topics/concept/m7i-pfe-architecture.html

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination.

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISC102	Cryptography and PKI	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme								
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISC102	Cryptography and PKI	20	20	20	80	--	--	--	100

Course Objectives:

1. Provide knowledge of Cryptography.

2. Provide Knowledge of Symmetric key Algorithms.

3. Provide knowledge of Asymmetric key algorithms

4. Give insight on Message Authentication and Hash Functions.

5. Understand the concepts of Digital Signatures and Public Key Infrastructure.

6. Provide knowledge of techniques used for secure computation

Course Outcomes:

Students will try to

1. Apply the knowledge & concepts of Cryptography for secure communications. (BT Level 3)

2. Understand and Implement Symmetric Algorithms. (BT Level 2)

3. Understand Implement Asymmetric Algorithms. (BT Level 2)

4. Develop Message Authentication and Hash Functions. (BT Level 6)

5. Apply the Identify the concepts of Digital Signatures and Public Key Infrastructure.(BT Level 3)

6. Analyze and Explain algorithms used for Secure Computation(BT Level 4)

Prerequisite: Computer Networks OSI layers

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Computer Networks OSI layers	02	_
I	Cryptography	**Cryptography:** Concepts and Techniques: Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Key Range and Key Size, Possible Types of Attacks Stegnography in Mulimedia, Stegnography in Networks **Self-learning Topics:** Security Trends, Model for Network Security.	06	CO1
II	Symmetric Key Algorithms	**Symmetric Key Algorithms:** DES,3DES, AES, Confidentiality using Symmetric encryption. Blowfish algorithm **Self-learning Topics:** Block ciphers : IDEA, RC4, RC5	05	CO2
III	Number Theory & Asymmetric Key Algorithms	**Public- Key Cryptography and RSA:** Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, Modular Functions, Principles of Public-Key Cryptosystems, RSA, ElGamal cryptosystem, Key Management, Diffie-Helman Key Exchange, Elliptic Curve Cryptography. **Self-learning Topics:** Random Number Generation algorithm for prime numbers.	09	CO3
IV	Message Authentication and Hash Functions	**Message Authentication and Hash Functions:** Authentication Requirements, Authentication Functions, MAC, Hash Functions, Security of Hash Functions and MACs, SHA-512, HMAC, CMAC **Self-learning Topics:** MD5 Algorithm	06	CO4
V	Digital Signatures and Public Key Infrastructure	**Digital Signatures and Public Key Infrastructure (PKI):** Digital Signatures, DSS, Authentication Protocols: Kerberos, Digital Certificates, Private Key Management, PKI Trust Models, Public Key Cryptography Standards, Revocation, Directories and PKI **Self-learning Topics:** Authentication Applications:	05	CO5

VI	Secure Computations	**Principal of Secure computation:** Homomorphic algorithms, Charactristics, Limitations, Fully homomorphic, computational Model-addition, subtraction, multiplication, Division **Self-learning Topics:** Half homomorphic encryption	06	CO6

Text Books:

1. Information Security Principal and Practice: Mark stamp, Wiley, 2018
2. Cryptography and security, wiley, Shyamala, harini,2011
3. Stallings, W., "Cryptography and Network Security", Fourth Edition, Pearson, 2017
4. Introduction to Cryptography with coding Theory, Pearson,WadenTrappe,2020
5. Forouzan B., "Cryptography and Network Security", Second Edition, Tata McGraw Hill, 2015

Reference Books:

1. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, 2010
2. Charlie Kaufman, Radia Perlman and mike speciner "Network security, private communication in a public world", Second Edition, Pearson, 2016
3. Xun and Paulet, Russell and Bertino, Elisa, "Homomorphic Encryption and Applications", Springer Publishing Company,2014
4. Chatterjee, Ayantika, and Khin Mi Mi Aung. 2019. Fully homomorphic encryption in real world applications. Singapore : Springer, 2019.

Online References:

S.No	Website/Reference link
1.	https://eprint.iacr.org/2015/1192.pdf
2.	https://link.springer.com/book/10.1007/978-3-319-12229-8
3.	https://onlinecourses.nptel.ac.in/noc20_cs02/preview
4.	https://www.coursera.org/lecture/security-privacy-big-data-protection/homomorphic-encryption-H8Une
5.	https://shaih.github.io/pubs/he-chapter.pdf

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination.

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE1031	GPU Architecture and programming	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE1031	GPU Architecture and programming	20	20	20	80	-	-	-	100

Course Objectives: Students will be able to:

1. To understand the basics of GPU architectures

2. To explore parallel development environment on CUDA

3. To investigate GPU programing models

4. To study limitations and challenges of GPU programming

5. To study OpenCL basics.

6. To write programs for massively parallel processors

Course Outcomes: Students will be able to:

1. Understand different parallel processing approaches and GPU computing architecture - (BT-L2)

2. Understand CUDA architectural details   - (BT-L2)

3. Explore basic GPU programming constructs - (BT-L3)

4. Understand the issues in mapping algorithms for GPUs   - (BT-L2)

5. Develop basic applications using OpenCL   - (BT-L4)

6. Design and Develop GPU based solutions to solve computationally intensive problems in various fields

    - (BT-L6)

Prerequisite:
   1. Computer Organization and Architecture

   2. Operating System

   3. Distributed Computing

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Introduction to distributed system, characteristics, Introduction to Parallel processing	2	CO1
I	Introduction	Parallel Architecture, Parallel Platforms, Performance measures GPU Architecture: Evolution of GPU Architectures, Typical GPU architecture, CPU-GPU interaction, Address Spaces, Software Architecture	4	CO1
II	CUDA: GPU Parallel Development Environment	Compute Unified Device Architecture (CUDA) Architecture, CUDA programming model, execution model Thread organization: Concept of threads, Blocks, grid, thread index generation, warp Scheduling - Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory	**6**	CO2
III	CUDA Algorithms and Programming	GPU primitives: scan (exclusive or inclusive), scatter, gather, reduce CUDA structure, API and library (CUDPP, CUBLAS, FFT etc. Using CUDA- Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions	**6**	CO3
IV	CUDA: Programming Issues Common Problems	CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues	**7**	CO4
V	OpenCL Basics	OpenCL Standard Kernels – Host Device Interaction – Execution Environment Memory Model Basic OpenCL Examples	**7**	CO5
VI	Algorithms on GPU	Vector dot product, Matrix multiplication Graph algorithms, dense linear algebra, etc. using GPU GPU Analytics Parallelization in Quantum Computing, Parallel quantum computation basic	**7**	CO6
Self-Learning (optional)		**NPTEL Course on GPU Architectures and Programming (https://onlinecourses.nptel.ac.in/noc20_cs41/preview)**		

Useful Links:	**http://www.nvidia.com/object/cuda_home_new.html** **http://www.openCL.org** **CUDA: docs.nvidia.com/cuda** **https://cuda-tutorial.readthedocs.io/en/latest/** **https://people.csail.mit.edu/nhm/pqc.pdf**

Text Books:
1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Introduction to Parallel Computing," Addison-Welsey, © 2003.

2. Shane Cook, CUDA Programming: A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing), First Edition, Morgan Kaufmann, 2012.

3. David R. Kaeli, Perhaad Mistry, Dana Schaa, Dong Ping Nicholas Wilt, CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison- Wesley, 2013.

References:
1. Jason Sanders, Edward Kandrot, CUDA by Example: An Introduction to General Purpose GPU Programming‖, Addison - Wesley, 2010.

2. David Kirk, Wen-meiHwu, "CUDA: Programming Massively Parallel Processors: A Hands-On Approach. © ELSEVIER Inc.

3. Nicholas Wilt, CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison -Wesley, 2013.

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

Subject Code	Subject Name	Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
MEISCPE1032	Fundamental of Statistics for AI	03	-	-	03	-	-	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem.				
		Test1	Test 2	Avg. of 2					

				Tests	Exam				
MEISCPE1032	Fundamental of Statistics for AI	20	20	20	80	03	-	-	100

Course Objectives:
1. Understand statistical foundations.
2. Explore data types and operations to be performed.
3. Preprocess the data using various EDA techniques.
4. Analyze data using various sampling and distribution techniques
5. Use various statistical testing methods.
6. Evaluate the model using different performance parameters.

Course Outcomes:
Students will be able to
1. Understand the importance and concepts of linear algebra, statistics, and probability [BT level 1].
2. Understand the types of data and operations performed on them[BT level 2].
3. Apply various exploratory data analysis techniques [BT level 3].
4. Apply the knowledge of sampling and distribution techniques to explore its significance [BT level 3].
5. Apply the knowledge of testing to outline the conditions for a particular test [BT level 3].
6. Analyze and evaluate the different performance parameters [BT level 3].

Prerequisite: Fundamentals of Probability and Statistics.
DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Pre-requisite	Fundamentals of Probability and Statistics.	2	
1	The role of Statistics in Engineering	The engineering method and Statistical thinking, Collecting Engineering Data, Observational Study, Mechanistic and empirical models. Self Learning topic : Case study from different Industry and Sectors where role of statistics is prominent	2	CO1
2	Linear Algebra in Probability and Statistics	Mean Variance and probability; Covariance Matrices and Joint Probability; Multivariate Gaussian and Weighted Least Squares. Self Learning topics: Case studies on measure of central values and Probabilities for any given problem statement.	6	CO2
3	Exploratory Data Analysis	Elements of structured data; Estimates of location; Estimates of variability; Expectations and moments; Exploring the data distribution; Exploring binary and Categorical data; Covariance and correlation. Self Learning topics: Case study on EDA for any given problem statement.	8	CO3

4	Data and Sampling Distributions	Random sampling and sample bias; Selection bias; Central limit theorem; Standard error; Bootstrap; Confidence intervals; Normal distribution; Long-tailed distributions; Student's t-distribution; Binomial distribution; Poisson distributions; Exponential distribution; Weibull distribution. Self Learning: Case study on sampling for any given problem statement.	8	CO4
5	Statistics and Significance Testing	Hypothesis testing; A/B testing; Chi-square test; confidence intervals; p-values; ANOVA; t-test; Confidence (statistical) intervals; Degrees of free, White-noise process. Self Learning: Case study on different testing using different samples for any given problem statement.	7	CO5
6	Evaluation and Optimization	Mathematics in algorithmic performance evaluation: Confusion matrix; Precision; Recall; Specificity; ROC Curve; Optimization: Global and local optima; Unconstrained and constrained optimization;Introduction to least squares optimization. Self Learning: Case study on doing performance evaluation and improving performance for any given problem statement.	6	CO6

Text Books:
1. Applied Statistics and Probability for Engineers, 6ed, ISV by Douglas C. Montgomer,2016
2. G. Strang, Introduction to Linear Algebra, 5th edition, Wellesley-Cambridge Press, USA,2016.
3. P. Bruce and A. Bruce, Practical Statistics for Data Scientists: 50 Essential Concepts, O'Reilly,2017.
4. C. O'Neil and R. Schutt, Doing Data Science, O'Reilly,2013.

Reference Books:
1. W. Hines, D. Montgomery, D. Goldman, C. Borror, Probability and Statistics in Engineering, 6ed, ISV, Wiley India Pvt. Ltd, 2016.
2. A. Agresti, C. Franklin, B. Klingenberg, Statistics: The Art and Science of Learning from Data, Global Edition, Pearson,2017.

Online References:

S.No	Website/Reference link
1.	NPTEL :: Special Series - ACM Summer School In Data Science,2018 - Goa
2.	Mathematics for Data Science	Coursera
3.	NPTEL :: Mathematics - NOC:Constrained and unconstrained optimization
4.	https://ieeexplore.ieee.org/document/9077835

5.	https://www.coursera.org/lecture/machine-learning-with-python/evaluation-metrics-in-classification-5iCQt

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE 1033	Advanced Web Technology	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks							
		Internal assessment			End Sem. Exam	Term Work	Practical	Oral	Total
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE1 033	Advanced Web Technology	20	20	20	80	--	--	--	100

Course Objectives:
1. To apply HTML 5 and CSS to design web application
2. To apply the concepts of Angular JS to develop dynamic web applications
3. To develop SOAP/REST-based web services
4. To design and develop Rich Internet Applications.
5. To explain various techniques of web analytics
6. To explain advanced concepts of Web 3.0 and Semantic web

Course Outcomes:
Students will be able to
1. Design website using HTML, CSS and scripting languages (BT Level 6)
2. Design dynamic web apps using AngularJS framework (BT Level 6)
3. Develop web services using REST and SOAP protocols (BT Level 6)
4. Design Rich Internet Application (RIA) (BT Level 6)
5. Apply web analytics to websites (BT Level 3)
6. Define and explain web 3.0 and the semantic web (BT Level 2)

Prerequisite- Computer Networks

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	**Introduction to web technologies**: Web system architecture- 1,2,3 and n tier architecture, W3C.	02	
I	Web Technology Basics	**Basic HTML**: Anchors, images, lists, tables. **HTML 5:** Fundamental Syntax and Semantics, Progressive Markup and Techniques, Forms, Native Audio and Video. **CSS**: Syntax of CSS,Exploring CSS Selectors, Inserting CSS in an HTMLDocument, Selectors, Typography and color **TypeScript**: Environment Setup, TypeScript Types, variables and operators, Decision Making and loops, TypeScript Functions, TypeScript Classes and Objects, TypeScript Modules Self-study Topics:-Publishing of Web Site. Function of Web Server, Formatting and Fonts,	7	CO1
II	Introduction to AngularJS	Overview of AngularJS, Need of AngularJS in real web sites, AngularJS modules, AngularJS built-in directives, AngularJS custom directives, AngularJS expressions, Angular JS Data Binding, AngularJS filters, AngularJS controllers, AngularJS scope, AngularJS dependency injection, Angular JS Services, Form Validation, Routing using ng-Route, ng-Repeat, ng-style, ng-view, Built-in Helper Functions, Using Angular JS with Typescript **Self-learning Topics:** MVC model, DOM model, Javascript functions and Error Handling	6	CO2

III	Web Services	**Web Services:** Web services, Evolution and differences with distributed computing, XML, WSDL, SOAP, UDDI, Transactions, REST-ful web services, Resource-Oriented Architecture, Comparison of REST, SOA, SOAP. **Self-study Topics:-**Business Process Execution Language for Web Services.	6	CO3
IV	Rich Internet Application (RIA)	Introduction to Ajax: Ajax Design Basics, JavaScript, Blogs, Wikis, RSS feeds Working with JavaScript Object Notation (JSON): Create Data in JSON Format, JSON parser, Implement JSON on the server Side, Implementing Security and Accessibility in AJAX Applications: Secure AJAX Applications, Accessible Rich Internet Applications, Developing RIA using AJAX techniques: CSS, HTML,DOM, XMLHTTPRequest, JavaScript, PHP, AJAX as RESTClient **Self-study Topics –** Open Source Frameworks and CMS for RIA: Django, Drupal, Joomla introduction and comparison.	6	CO4
V	Web Analytics 2.0	Introduction to Web Analytics 2.0 1: State of the Analytics Union, State of the Industry, Rethinking Web Analytics: Meet Web Analytics 2.0, Optimal Strategy for Choosing Your Web Analytics Soul Mate. The Awesome World of Clickstream Analysis: Metrics. **Self-study Topics** -The Key to Glory: Measuring Success. Failing Faster: Unleashing the Power of Testing and Experimentation.	6	CO5
VI	Web 3.0 and Semantic Web	**Web 3.0 and Semantic Web**: Challenges, Components, Semantic Web Stack: RDF, RDF Schema (RDFS), Simple Knowledge Organization System (SKOS), SPARQL as RDF query language, N-Triples as a format for storing and transmitting data, Turtle (Terse RDF Triple Language), **Self-study Topics** -Web Ontology Language (OWL) a family of knowledge representation languages, Rule Interchange Format (RIF), a framework of web rule language dialects supporting rule interchange on the Web.	6	CO6

Text Books:

1. INC, Kogent Learning Solutions. "HTML 5 Black Book." (2011).

2. Cherny, Boris. Programming TypeScript: making your JavaScript applications scale. O'Reilly Media, 2019.

3. Dayley, Brad, Brendan Dayley, and Caleb Dayley. Node. js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications. Addison-Wesley Professional, 2017.

4. O'reilly, Tim. "What is Web 2.0: Design patterns and business models for the next generation of software." Communications & strategies 1 (2007): 17.

5. Davies, John, Rudi Studer, and Paul Warren, eds. Semantic Web technologies: trends and research in ontology-based systems. John Wiley & Sons, 2006.

6. Kaushik, Avinash. Web analytics 2.0: The art of online accountability and science of customer centricity. John Wiley & Sons, 2009.

Reference Books:

1. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.

2. Barker, Deane. Web content management: Systems, features, and best practices. " O'Reilly Media, Inc.", 2016.

3. John Domingue, Dieter Fensel, Handbook of Semantic Web Technologies, Springer Reference

4. Liyang Yu, a Developer's Guide to the Semantic Web, Second Edition, Springer

Online References:

S.No	Website/Reference link
1.	www.jena.apache.org/tutorials/rdf_api.html.
2.	https://www.tutorialspoint.com/web_development_tutorials.html
4.	https://nptel.ac.in/
5.	https://www.coursera.org

List of Experiments: based on Laboratory Practical's/ Case studies
1. Design a secure and dynamic website with features like login for users, Session management, and Encryption.
2. A mini project based on REST API and web analytics 2.0
3. Apache Jena based RDF and SPRQL based Tutorials

Assessment:

Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE1034	IT Security Laws and Compliance	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE1034	IT Security Laws and Compliance	20	20	20	80	--	--	--	100

Course Objectives:
1. To understand the basic concepts of security. And laws related to it.
2. To study the Fundamentals of IT Security Law and Policy.
3. To study E-Records, E-Discovery and Business Law
4. To study and understand Contracting for Data Security and Other Technology
5. To study and understand the Law of IT Compliance
6. To understand and apply Law to Emerging Dangers

Course Outcomes:
1. To understand the Security Laws. –(BT-L2)
2. To understand the Fundamentals of IT Security Law and Policy. (BT-L2)
3. To understand E-Records, E-Discovery and Business Law (BT-L2)
4. To understand Contracting for Data Security and Other Technology (BT-L2)
5. To study and understand the Law of IT Compliance (BT-L2)
6. To understand and apply Law to Emerging Dangers (BT-L2)

Prerequisite: Security

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic Concepts of Security.	01	
I	Introduction:	Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types & overview of Cyber Crimes, Cyber Law Issues in E-Business Management Overview of Indian IT Act, Ethical Issues in Intellectual property rights ,Copy	**05**	**CO1**

		Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical hacking. **Self-Learning Topic:** Study of Indian IT Act, Copy Right, Patents.		
II	Fundamentals of IT Security Law and Policy:	Security Policy, Privacy Notice & Privacy Laws, Computer Crime Laws, Intellectual Property, Non-Disclosure Agreements and Terms of Use, Honeypots & Entrapment, Active Defenses, Hacking Back **Self-Learning Topic:** Study of Intellectual Property	**05**	**CO2**
III	E-Records, E-Discovery and Business Law:	Vicarious Liability, E-Discovery, Records Retention, Destruction, Email Retention, Forensics, Privacy Policies, Evidence Law, Signatures **Self-Learning Topic:** Study of Business Laws and discovery of e-records.	**05**	**CO3**
IV	Contracting for Data Security and Other Technology:	Click Through Agreements, Contract Formation, Battle of the Forms, Liability, Breach, Bonds, Assent, Warranty, Remedies, Liens, Ownership Issues, Subpoenas, Documentation, Audits, Exceptions, Maintenance, Termination, Escrow, Investigations, Competition, Disputes, Non-Disclosure **Self-Learning Topic:** Case study on Data Security using Blockchain Technology.	**08**	**CO4**
V	The Law of IT Compliance: How to conduct investigations:	Cooperation with investigations, Numerous Examples of Fraud (Post-Mordems), SOX, Securities Fraud, Federal Sentencing Guidelines, Codes of Ethics, Hotlines, Reporting, Whistleblowing, Employee Monitoring, Entrapment, Raids & Seizures **Self-Learning Topic:**	**08**	**CO5**
VI	Applying Law to Emerging Dangers: Cyber Defense	Sony Root Kit Case Study, Crisis Communications, Choice point Case Study, Relationship with Law Enforcement, TJX Case Study, Publicity, Safely Monitoring Threats w/o Incurring Liability, Factors Mitigating Legal Risk, Public Accountability, Political Diplomacy, Competitive Boundaries **Self-Learning Topic:** Study of Strategic Legal Procedures.	**07**	**CO6**

Text & Reference Books:
1. Sood,"Cyber Laws Simplified", Mc Graw Hill
2. Anthony Reyes, "Cyber Crime Investigations: Bridging the Gaps Between Security
3. Professionals, Law Enforcement, and Prosecutors"
4. Marcia P. Miceli, "Whistle-Blowing in Organizations",

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE10 41	Quantum Computing	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme						
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE 1041	Quantum Computing	20	20	20	80	--	--	--	100

Course Objectives: Students will able to learn
1. To know the fundamentals of Quantum computing and its applications
2. To understand the efficient quantum algorithms for several basic promise problems.
3. To gain knowledge about quantum computers and their principles.
4. To understand the working of various quantum algorithms.
5. To gain knowledge about different quantum error and its correction techniques.
6. To gain knowledge about different quantum cryptographic algorithms.

Course Outcomes: Students will able

	Bloom's Taxonomy Level
1. Basics of Quantum computing and its applications.	L1
2. Solve various problems using quantum algorithms.	L3
3. Methodology for quantum computers and their principles	L2, L3
4. To gain knowledge about different quantum algorithms.	L1, L2
5. Gain knowledge about different quantum error correction techniques.	L1, L2
6. To gain knowledge about different quantum cryptographic algorithms.	L1,L2

Prerequisite: NA

DETAILED SYLLABUS: total six module for each subject and total 36 hours to be distributed among six modules.

Sr. No.	Module	Detailed Content	Hours	CO Mapping
I	**FUNDAMENT ALS OF QUANTUM COMPUTING**	Fundamental Concepts: Introduction and Overview – Global Perspectives – Quantum Bits – Quantum Computation – Quantum Algorithms – Experimental Quantum Information Processing – Quantum Information. Problems on Qubits **Self-learning Topics:** Detail of Quantum computing and its applications https://www.ibm.com/quantum-computing/what-is-quantum-computing/	**4**	**CO1**
II	**QUANTUM COMPUTATIO N**	Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum	**6**	**CO2**

		Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database **Self-learning Topics:** IBM Quantum Composer		
III	**QUANTUM COMPUTERS**	Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance. **Self-learning Topics:** Qiskit	**6**	**CO3**
IV	**QUANTUM INFORMATIONS**	Deutsch's algorithm, BB84 algorithm, B92 algorithm, Three stage quantum cryptography algorithm, compact coding, Fourier sampling, Simon's algorithm, Quantum Fourier transform, Number theoretic preliminaries for factoring, order finding and Hidden subgroup problem Grover search algorithm. **Self-learning Topics:** Oracles, Deustch Jozsa	**8**	**CO4**
V	**QUANTUM ALGORITHMS**	Endpoint Security Bypass; Pivoting and Lateral Movement; Hijacking Attacks; Covering Tracks; Establishing Persistence; Defense Spotlight: Real Intelligence Threat Analytics; Data Collection. **Self-learning Topics:** VQE/QAOA	**8**	**CO5**
VI	**QUANTUM CRYPTOGRAPHY**	Quantum Cryptography-Private Key Cryptography, Privacy Amplification and Information Reconciliation, Quantum Key Distribution, Privacy and Coherent Information, The Security of Quantum Key Distribution. Problems on Quantum error correction and cryptography. **Self-learning Topics:** Attacks on Quantum Cryptography	**7**	**CO6**

Text Books:
1. Chris Bernhardt," Quantum Computing for Everyone", (The MIT Press) Hardcover – Illustrate ,September 2020,
2. Willi-Hans Steeb; "Problems and Solutions in Quantum Computing and Quantum Information", Yorick Hardy Academic Consulting and Editorial Services (ACES) Private Limited, January 2020.
3. M.A. Nielsen and I.Chuang, "Quantum Computation and Quantum Information", Cambridge University Press 2010.

References:
1. Computer Science: An Introduction by N. David Mermin 5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.
2. Parag K. Lala ,Quantum Computing: A Beginner's Introduction Paperback" , McGraw Hill November 2020.
3. V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing company,2007.

4. Nayak, Chetan; Simon, Steven; Stern, Ady; Das Sarma, Sankar, "Nonabelian Anyons and Quantum Computation", 2008.

Web Links: - 1) https://quantum-computing.ibm.com/composer/docs/iqx/guide/
2) https://www.javatpoint.com/what-is-quantum-computing
3) https://pythonprogramming.net/quantum-computer-programming-tutorial/
4) https://onlinecourses.nptel.ac.in/noc19_cy31/preview

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE 1042	IOT and Security	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE1 042	IOT and Security	20	20	20	80	--	--	--	100

Course Objectives:
Students will try to
1. Learn the concepts of IOT.
2. Identify the different technology for IOT.
3. Learn different applications in IOT.
4. Learn different protocols used in IOT.
5. Learn how to analyze the data in IOT.
6. Learn the concepts of Security in IOT.

Course Outcomes:
Students will be able to
1. Describe the concepts of IOT – BT Level 2
2. Apply basic Microcontroller Programming with various sensors - BT Level 3
3. Identify different Technologies required to implement IOT – BT Level 2
4. Analyze and evaluate different Cloud frameworks for IOT – BT Level 4, 5
5. Analyze and evaluate the data received through sensors in IOT - BT Level 4, 5
6. Analyze Security at various levels of IOT – BT Level 4

Prerequisite
Microcontroller, C Programming

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Microcontroller , Programming in C and Python	02	-
I	Introduction to Internet of Things	Definition of Internet of Things (IoT), IoT Paradigm, IoT Architecture – State of the Art, IoT Communication Models, IoT in Global Context, Real world scenarios, Different application Areas **Self-Learning Topic:**New Trends in IOT Applications	04	CO1
II	Open-Source Prototyping Platforms for IoT	Basic Arduino Programming, Arduino – Based Internet Communication, Raspberry PI, Sensors and Actuators and Interfacing, Node MCU ESP 8266 **Self-Learning Topic:**Extended Arduino Libraries	07	CO2
III	IoT Protocol & Technology	RFID , NFC, Wireless Sensor Networks , RTLS , GPS, Composition Models for the Web of Things (WoT), IoTMashups,IoTcommunication Protocols –M2M, Bluetooth, Wifi, ZigBee ; IoT application layer Protocols- MQTT, CoAP	08	CO3

		Self-Learning Topic: WoTresources on the Web, Discovery, Search		
IV	Cloud for IOT	Introduction, Cloud Frameworks for IoT: Things Work, AWS, Microsoft Azure, IBM Cloud, Google cloud, IOT cloud security architecture **Self-Learning Topic:**Cloud of Thingsand Big Data.	06	CO4
V	Data Analytics for IoT and Applications	Introduction, Data analytics and visualization tools:Tableau, Plotly etc. Case Studies and application: Smart Homes, Healthcare, Logistics and Transport, Structural health Monitoring **Self-Learning Topic:**Chef, Chef Case Studies, Puppet, Puppet Case Study	05	CO5
VI	IOT Security	Security Requirements in IOT Architecture: Security at Sensor Layer, Security at Microcontroller layer, Security at Protocol Layer, Security at the Communication Link Layer; Security in Enabled Technology **Self-Learning Topic:**Security and Privacy Issuesin IOT	07	CO6

Text Books:
1. The Internet of Things (MIT Press) by Samuel Greengard.
2. The Internet of Things (Connecting objects to the web) by HakimaChaouchi (Wiley Publications).
3. Internet of Things (A Hands-on-Approach) by ArshdeepBhaga and VijayMadisetti.
4. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations

Reference Books:
1. The Internet of Things Key applications and Protocols, 2nd Edition, (Wiley Publication) by Olivier Hersent, David Boswarthick and Omar Elloumi.
2. IoT –From Research and Innovation to Market development (River Publication) by OvidiuVermesan and Peter Friess.
3. Building Internet of Things with Arduino by CharalamposDoukas.

Online References:

S.No	Website/Reference link
1.	https://www.nabto.com/guide-iot-protocols-standards/
2.	https://www.cloudofthings.com/
3.	https://www.w3.org
4.	https://internetofthingsagenda.techtarget.com/definition/IoT-security-Internet-of-Things-security
1.	https://onlinecourses.nptel.ac.in/noc21_cs17/preview

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical /Oral	Tutorial	Total
MEISCPE1043	Cloud Computing Security	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
MEISCPE1 043	Cloud Computing Security	20	20	20	80	--	--	--	100

Course Objectives:
The students will learn
1 The basics of cloud computing
2 Different Virtualization Concepts
3 The basics of cloud services
4) About cloud and information security
5) The risks and threats which they will encounter in cloud computing
 6 IAM and privacy practices used in cloud computing

Course Outcomes:
1)The student will be in a position to classify and discuss between different cloud computing models –
(BT-L1,L2)
2)The student will be able to select different virtualization techniques as per the needs (BT-L2)
3)The student will be able to use various cloud computing services (BT-L2)
 4) The students will be able recognize the required security type for making the information secured
(BT-L2)
5)The students will be able to judge the risk and threats for their cloud computing applications (BT-L2)
 6) The students will be a position to compare and examine their knowledge of IAM and privacy policies
for cloud computing applications(BT-L2)

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	**Prerequisite**	Concepts of Computer Network and Network security.	02	--
I	**Introduction to Cloud Computing**	NIST Cloud Computing Definition, Need for cloud computing and its components, Cloud types: NIST and Cloud Cube Models, Cloud Deployment Models, Service Models, NIST architecture of cloud computing, Characteristics, Advantages and disadvantages of cloud computing. **Self-Learning Topics:** Study of different cloud computing architectures and platforms	06	CO1 BL:2
II	**Virtualization**	Virtualization, requirement of virtualization, Taxonomy of virtualization. Hypervisor: types, Mechanisms:	06	CO2 BL:2

		Binary translation, Hardware Assisted virtualization, Para virtualization, Full virtualization. Implementation levels of virtualization, Types of virtualizations- Memory, CPU, I/O, OS, Server. **Self-learning Topics:** Comparison of Virtualization technology Examples: KVM, XEN, Vmware, HyperV and QEMU.		
III	**Cloud Computing Services**	SPI Model of Cloud services, Anything as a Service (XaaS): Security as a Service, Identity management as a Service, Database as a Service, Storage as a Service, Collaboration as a Service, Compliance as a Service, Monitoring as a Service, Communication as a Service, Network as a service, Application as a service, Integration as service, Disaster recovery as a service, Analytics as a service and Backup as a service **Self-learning Topics:** Comparison between different cloud services provider and their services.	06	CO3 BL:3
IV	**Basics of Cloud and Information security**	security, its requirement in cloud computing, Different types of security in cloud, Attacks, and Vulnerabilities, Cloud computing security architecture. Information Security: Objectives, AAA model, Cloud security design principles, Secured cloud software requirements and development practices, Physical security of the system, Resource perspective of software security, Goals oriented software security requirements, Monitoring internal and external requirements. **Self-learning Topics:** Assessment of Cloud Security services in different cloud platforms like AWS, GCP and Azure.	6	CO4 Bl:2

V	**Risk, threats and security in Cloud computing**	CIA, Privacy and compliance risk, Cloud service provider risk, Hypervisor risk, Increased denial of service risk, Cloud risk assessment, Risk management framework, Cloud provider and consumers risk, Management process, Understanding threats, Common threats, Infrastructure and host threats, Service providers threats, Generic threats, Threat assessment vulnerabilities, virtual threats, VM security recommendations and VM specific security techniques IasS security, PaaS security, SaaS security, trust boundary, Audit and reporting. **Self learning topics** Identification of risks and threats in public cloud platforms like AWS, GCP and Azure.	6		CO5 BL:4
VI	**IAM and Privacy practices in the Cloud**	IAM :requirements, Challenges, Definition, Architecture and Practice, Relevant IAM Standards and Protocols for Cloud Services. Privacy: Key Privacy Concerns in the Cloud. Legal and Regulatory Implications: Laws and Regulations, Governance, Risk, and Compliance (GRC) **Self-learning Topics:** Assessment of IAM and compliance services in Public cloud platforms like AWS, GCP	7		CO6 BL:4

			and Azure.		

Text Books:

1.   Cloud computing Bible by Barrie Sosinsky

2. Cloud Computing Black book by Kailash jayaswal, jagannath kallakurchi, Donald J Houde, Dr Deven Shah

3) Cloud security: A comprehensive guide to secure cloud computing by ronold L Krutz and Russell Dean Vines, wiley publishing inc

4) Cloud Security and Privacy by Tim Mather, Subra Kumaraswamy, and Shahed Latif, O'Reilly Publication.

Reference Books:

1) Cloud application architectures by George reese

2) Cloud Computing by Shailendra Singh

3) Cloud computing security: foundation and challenges by john R vecca

4) Mastering cloud computing by Rajkumar Bhuyya, Christian Vecchiola, S. thamarai selvi

5) Cloud Computing by Dr Kumar Saurabh

Assessment:

Internal Assessment Test:

   Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

   Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

			Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total

Subject Code	Subject Name								
MEISCPE10 44	Machine Learning(ML)	03	--	--	03	--	--		03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE 1044	Machine Learning (ML)	20	20	20	80	--	--	--	100

Course Objectives: Students will learn
1. To understand the basics of of machine learning
2 To introduce different machine learning algorithms and concepts of computation learning in real world
        problems.
3. To Evaluate clustering and Dimensionality Reduction concepts.
4. To analyze the Ensemble Methods for improving classification
5. To understand the basics of optimization techniques in machine learning algorithms
6. To introduce and understand the concept of artificial neural network and deep learning.

Course Outcomes: Students will be able to :

1) Understand the fundamentals of machine learning and machine learning models.	BTL-2
2) Compare and apply various machine learning algorithms in real world applications.	BTL-3
3) Design and formulate clustering and dimensionality reduction in the paradigm of machine learning.	BTL-6
4) Evaluate Ensemble Methods for improving classification.	BTL-5
5)Apply optimization in formulating objective functions and solving engineering problems.	BTL-3
6) Discuss the basic concepts of Artificial Neural Network and Deep Learning.	BTL-2

Prerequisite: Data Mining, Linear Algebra and Calculus, Probability Basics

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	**Prerequisite**	Data mining, Linear Algebra ,Calculus, Probability Basics	2	-

I	Introduction to Machine Learning	Introduction to machine learning, Types of Machine learning, Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection. **Self-learning Topics:** AI versus machine learning, comparison of different machine learning models	4	CO1
II	**Classification and Regression**	Classification: Support Vector Machine, K-NN, Decision Tree, Random Forest, Bayesian Learning: Bayesian Theorem, Concept learning, Maximum likelihood and least square error hypothesis , maximum likelihood hypothesis for predicting probability, minimum length description, Bayesian optimal classifier, Gibbs Algorithm, Navy Baysian(NB) classifier, Learning to classify text, Bayesian Belief Network(BBN),Linear Discriminant Analysis(LDA),HMM. Regression: Linear Regression, simple and multiple regressions, logistic regression, Ridge-regression, Lasso regression, elastic net regression. **Self-learning Topics**: Implementation of the above algorithms	9	CO2

III	**Clustering and Dimensionality reduction**	Clustering: Types of clustering, Partition based clustering, hierarchical clustering, and Expectation maximization. Dimensionality reduction: subset selection, Principal component analysis (PCA), Feature embedding, Factor analysis, Singular value decomposition (SVD) **Self-learning Topics:** comparison of PCA and SVD	7		CO3
IV	**Ensemble Methods**	Introduction to Ensemble Methods: Bagging, Boosting, XG boost**,** Adaboost , gradient boosting, Improving classification accuracy of Class-Imbalanced Data, Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling, Cross-Validation, Bootstrap, Model Selection Using Statistical Tests of Significance, Comparing Classifiers Based on Cost–Benefit and ROC Curves, Synthetic minority over sampling techniques (SMOTE). **Self-learning Topics:** Hyper parameter tuning	6		CO4
V	**Optimization Techniques**	Introduction, Classification of Optimization Problems: Linear Vs Non-linear programming Problems, Unconstrained Minimization Problems, Derivative Based Methods: Steepest Descent Method, Newton's Method, Derivative Free Methods: Random Search Method, Downhill Simplex Method; Derivative-Based Vs Derivative- Free Optimization. **Self-learning Topics:** Optimization using Genetic Algorithm, Simulated Annealing	7		CO5

| VI | **Artificial Neural Network (ANN) and Deep Learning (DL)** | Introduction to ANN, Neural network representation, Problems, perceptrons: Single and Multilayer networks, back propagation and regularization, batch normalizations; Applications in Information security.

Deep Learning : Introduction,, Machine Learning Vs Deep Learning, Architecture of Deep Learning like LSTM, autoencoders, working of Deep Learning and applications .in Information security
Self-learning Topics: Deep Belief Networks | 4 | C06 |

Text Books:
1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, third edition,2014
2. Tom M. Mitchell, "Machine Learning", McGraw Hill.1997
3. Anuradha Srinivasaraghavan, Vincy Joseph, "Machine Learning", Wiley.2019
4. Sivanandan S.N, Deepa S. N., "Principles of Soft Computing", Wiley, 2009

References:
1. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
2. Han Kamber, "Data Mining Concepts and Techniques", Morgan Kaufman Publishers. third edition, 2012
3. Peter Harrington, "Machine Learning in Action", Dreamtech Press,2012
4. Marsland S., "Machine Learning: An Algorithmic Perspective", CRC Press,2014
5. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley,2020

Online References:
1. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=MachineLearning
2. https://machinelearningmastery.com/practical-machine-learning-problems/
3. https://onlinecourses.nptel.ac.in/noc22_cs29/preview
4. https://nptel.ac.in/courses/106106139
5. https://www.coursera.org/learn/machine-learning

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
MEISL101	Program Lab- 1	--	2	--	--	2	--	2

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISL101	Program Lab-I	--	--	--	--	--	25	25	50

Lab Objectives: Students will try

1. To be familiarized with the requirements of an enterprise and provide suitable IP addressing plan and best possible routing protocol for an enterprise network.

2. To recognize the hierarchical network model for the enterprise and construct a suitable design for an enterprise network and test it using Cisco packet Tracer.

3. To study OMneT++ simulation.

4. To study and implement Asymmetric Key Algorithms.

5. To implement Diffie-Helman Key Exchange algorithm.

6. To implement algorithms used in Secure computations.

Lab Outcomes: Students will be able to

1. Analyse customer requirements, routing protocols and design the Enterprise Network using CDNA

(BT Level 6).

2. Configure Wireless LAN using Cisco packet Tracer (BT Level 6).

3. Implement a Network using OmneT++ and analyze the QoS parameters (BT Level 6).

4. Implement Asymmetric Key Algorithms (BT Level 6).

5. Implement the Symmetric Key Generation algorithm (BT Level 6).

6. Implement algorithms used in homomorphic encryption (BT Level 6).

Prerequisite: Basic knowledge of networking techniques (BT Level 6).

 DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic knowledge of Networking techniques, Networking Topology, OSI Layer, Internetworking Devices.	02	-
I	Internet Protocol and Routing Protocols	Internet Protocol Version 4 Design, Internet Protocol Version 6 Design, Routing Protocol Characteristics, RIP, EIGRP, and IS-IS, OSPF, BGP, Route Manipulation, and IP Multicast.	04	LO1
II	WLAN configuration	Design Fundamentals: Campus Wireless LAN, Infrastructure, wireless controllers, wireless controller configuration data model, Aps, Wireless design models, Centralized deployments with guest wireless.	04	LO2
III	OMNeT++ and CDNA	WLAN configuration using packet tracer, Getting started with OMNeT++, Installing OMNeT++, OMNeT++ Simulations, Creating and Running simulation.	04	LO3
IV	Asymmetric Key Algorithms	Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality,Principles of Public-Key Cryptosystems,RSA	06	LO4

V	Key management	Key Management, Diffie-Hellman Key Exchange algorithm	02	LO5
VI	Secure Computation	Principal of Secure computation, Homomorphic algorithms,Fully homomorphic,Computational Model-addition, subtraction, multiplication, Division	04	LO6

Experiment list:

1. Implement DHCP, EIGRP, OSPF, PAT in an Enterprise Network using cisco packet tracer.

2. Design Wireless LAN and provide end to end communication using cisco packet tracer.

3. Create a network using OMneT++ and analyze the QoS parameters.

4. Designing Network and Automation using Cisco DNA.

5. Configuration of SAN using SimSANs (Simulating Storage Area Networks).

6. Implement RSA algorithm.

7.Implement Diffie-Helman Key Exchange algorithm.

8. Implement DES/AES algorithm.

9. Design and implement a homomorphic algorithm for addition of two single digit numbers.

Text Books:

1. CCDA 200-310 Official Cert Guide by Anthony Bruno and Steve Jordan, Cisco Press, 2016.

2. Learning OMNeT++ has published a book in authored by Thomas Chamberlain, Packt Publishing, 2013.

3. Introduction to Cryptography with coding Theory, Pearson,WadenTrapp, 2020.

4. Forouzan B., "Cryptography and Network Security , Second Edition, Tata McGraw Hill, 2005.

Reference Books:

1. Authorized Self-Study Guide, Designing for Cisco Internetwork Solutions (DESGN), Second Edition, Cisco Press-Diane Teare, 2007.

2. Enterprise Network Design, Neeraj Khairwal, Trupti Lotlikar, Staredu solutions, 2019.

3. Charlie Kaufman, Radia Perlman and mike speciner "Network security, private communication in a public world" , Second Edition, Pearson, 2022.

Online References:

S.No	Website/Reference link
1.	https://www.cisco.com/c/en/us/td/docs/solutions/CVD/Campus/cisco-campus-lan-wlan-design-guide.html
2.	https://omnetpp.org
3.	https://www.cisco.com/c/en_in/products/cloud-systems-management/dna-center/index.html
4.	https://www.simsans.org/
5.	https://www.coursera.org/lecture/security-privacy-big-data-protection/homomorphic-encryption-H8Une

Term Work:

Term Work shall consist of at least 10 practical based on the above list. Also Term Work Journal must include Assignement as mentioned in above syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiments) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral Exam: An Oral exam will be held based on the above syllabus.

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISL102	Skill Based Lab-1	--	02	--	00	02	--	02

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISL102	Skill Based Lab-1	--	--	--	--	50	50	--	100

Course Objectives:

Sr. No	Lab Objectives
The Lab experiments aims:	
1	To understand the basic concepts of secure network architecture.
2	To understand the Access Control List (ACL) for secure data flow.
3	To Understand Network Address Translator (NAT).
4	To Understand use of firewall in design of secure network.
5	To Understand use of Intrusion detection system (IDS) & Intrusion prevention system (IPS) in design of secure network.
6	To Understand network monitoring operations.

Course Outcomes:

Sr. No	Lab Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
On successful completion, of course, learner/student will be able to:		
1	Understand and describe network architectures.	L1,L2,L3
2	Understand importance of and implementation of secure administrative access on routers.	L1,L2,L3
3	Understand and implement Network Address Translation.	L1,L2,L3,L4,L5
4	Understand and implement Firewall.	L1,L2,L3,L4,L5
5	Understand and implement Intrusion detection and intrusion prevention system.	L1,L2,L3,L4,L5
6	Understand DHCP and network monitoring operations.	L1,L2,L3,L4,L5

Prerequisite: Introduction to Computer Networking

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Computer Networking	2	

I	Secure Network	Network threats, mitigation techniques and the basics of securing a network.	**4**	
II	ACL	Secure administrative access on a router. Standard ACLs and how to configure ACLs.	**4**	
III	NAT Implementation	Requirements of NAT, Variations of NAT. Implementation of NAT to secure the network.	**4**	
IV	Design of Firewall	Exploration of firewall technologies. Cryptography Implement firewall technologies to secure the network perimeter.	**4**	
V	Implementation of IDS and IPS	Methods for implementing data confidentiality and integrity. IDS and IPS function and operation. Categories of IPS and IDS.	**4**	
VI	DHCP and Network Monitoring	An introduction to DHCP. High level design. Monitoring network operations.	**4**	

Text Books:

1. Odom, W. "CCNA ICND 2". Cisco Press, 2008. Cisco Networking Academy Programme.

2. "CCNA4 Exploration, Accessing the WAN", Graziani, R & Vachon, B., Connecting Networks Companion Guide, Cisco Press (2014).

Guidelines for Mini Project as per above syllabus.

- Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
- Students should do survey and identify needs, which shall be converted into problem statement how to contribute to open source mini project in consultation with faculty supervisor/head of department/internal committee of faculties.
- Students shall submit implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of recent contribute to open source mini project.
- A log book to be prepared by each group, wherein group can record weekly work progress, guide/supervisor can verify and record notes/comments.
- Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning.
- Students in a group shall understand contribute to open source problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.
- Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
- The solution to be validated with proper justification and report using open source tools to be compiled in standard format of University of Mumbai.
- With the focus on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the open source Mini Projects.

Guidelines for Assessment of Mini Project:

Term Work

- The review/ progress monitoring committee shall be constituted by head of departments of each institute. The progress of mini project to be evaluated on continuous basis, minimum two reviews in each semester.
- 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;

- o Marks awarded by guide/supervisor based on log book : 30
- o Marks awarded by review committee : 10
- o Quality of Project Report :05

Term Work:

Term Work shall consist of at least 10 practical based on the above list. Also Term Work Journal must include Mini-Project as mentioned in above syllabus.

Term Work Marks: 50 Marks (Total marks) = 45 Marks (Mini-project) + 5 Marks (Attendance)

Oral Exam: An Oral exam will be held based on the above syllabus.

Course Code	Course Name	Credits
IE1011	**Product Life Cycle Management**	**03**

Course Objectives: Students will try :

1. To familiarize the students with the need, benefits and components of PLM
2. To acquaint students with Product Data Management & PLM strategies
3. To give insights into new product development program and guidelines for designing and developing a product
4. To familiarize the students with Virtual Product Development

Course Outcomes: Students will be able to :

1. Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
2. Illustrate various approaches and techniques for designing and developing products.
3. Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
4. Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant

Module	Detailed Contents	Hrs
01	**Introduction to Product Lifecycle Management (PLM):**Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications **PLM Strategies:**Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy , Change management for PLM	10
02	**ProductDesign:**Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process	09
03	**Product Data Management (PDM):**Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation	05
04	**Virtual Product Development Tools:**For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques,	05

	Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case studies		
05	**Integration of Environmental Aspects in Product Design:**Sustainable Development, Design for Environment,Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design	05
06	**Life Cycle Assessment and Life Cycle Cost Analysis:**Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis	05

Assessment:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:
Some guidelines for setting up the question paper.Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

1. John Stark, "Product Lifecycle Management: Paradigm for 21st Century Product Realisation", Springer-Verlag, 2004. ISBN: 1852338105
2. Fabio Giudice, Guido La Rosa, AntoninoRisitano, "Product Design for the environment-A life cycle approach", Taylor & Francis 2006, ISBN: 0849327229
3. SaaksvuoriAntti, ImmonenAnselmie, "Product Life Cycle Management", Springer, Dreamtech, ISBN: 3540257314
4. Michael Grieve, "Product Lifecycle Management: Driving the next generation of lean thinking", Tata McGraw Hill, 2006, ISBN: 0070636265

Course Code	Course Name	Credits
IE1012	**Reliability Engineering**	**03**

Objectives:

1. To familiarize the students with various aspects of probability theory
2. To acquaint the students with reliability and its concepts
3. To introduce the students to methods of estimating the system reliability of simple and complex systems
4. To understand the various aspects of Maintainability, Availability and FMEA procedure

Outcomes: Learner will be able to…

1. Understand and apply the concept of Probability to engineering problems
2. Apply various reliability concepts to calculate different reliability parameters
3. Estimate the system reliability of simple and complex systems
4. Carry out a Failure Mode Effect and Criticality Analysis

Module	Detailed Contents	Hrs
01	**Probability theory:** Probability: Standard definitions and concepts; Conditional Probability, Baye's Theorem. **Probability Distributions:** Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance. **Measures of Dispersion:** Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis.	08
02	**Reliability Concepts:** Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve. **Failure Data Analysis:** Hazard rate, failure density, Failure Rate, Mean Time To Failure (MTTF), MTBF, Reliability Functions. **Reliability Hazard Models:** Constant Failure Rate, Linearly increasing, Time Dependent Failure Rate, Weibull Model. Distribution functions and reliability analysis.	08
03	**System Reliability:** System Configurations: Series, parallel, mixed configuration, k out of n structure, Complex systems.	05
04	**Reliability Improvement:** Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis. System Reliability Analysis – Enumeration method, Cut-set method, Success Path method, Decomposition method.	08
05	**Maintainability and Availability:** System downtime, Design for Maintainability: Maintenance requirements, Design methods: Fault Isolation and self-diagnostics, Parts standardization and Interchangeability, Modularization and Accessibility, Repair Vs Replacement. Availability – qualitative aspects.	05
06	**Failure Mode, Effects and Criticality Analysis:** Failure mode effects analysis, severity/criticality analysis, FMECA examples. Fault tree construction, basic symbols, development of functional reliability block diagram, Fau1t tree analysis and Event tree Analysis	05

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

1. L.S. Srinath, "Reliability Engineering", Affiliated East-Wast Press (P) Ltd., 1985.
2. Charles E. Ebeling, "Reliability and Maintainability Engineering", Tata McGraw Hill.
3. B.S. Dhillion, C. Singh, "Engineering Reliability", John Wiley & Sons, 1980.
4. P.D.T. Conor, "Practical Reliability Engg.", John Wiley & Sons, 1985.
5. K.C. Kapur, L.R. Lamberson, "Reliability in Engineering Design", John Wiley & Sons.
6. Murray R. Spiegel, "Probability and Statistics", Tata McGraw-Hill Publishing Co. Ltd.

Course Code	Course Name	Credits
IE1013	**Management Information System**	**03**

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

Outcomes: Learner 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	Detailed Contents	Hrs
01	Introduction To Information Systems (IS): Computer Based Information Systems, Impact of IT on organizations, Imporance of IS to Society. Organizational Strategy, Competitive Advantages and IS.	4
02	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	7
03	Ethical issues and Privacy: Information Security. Threat to IS, and Security Controls	7
04	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.	7
05	Computer Networks Wired and Wireless technology, Pervasive computing, Cloud computing model.	6
06	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.	8

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

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

Course Code	Course Name	Credits
IE1014	**Design of Experiments**	**03**

Objectives:
1. To understand the issues and principles of Design of Experiments (DOE)
2. To list the guidelines for designing experiments
3. To become familiar with methodologies that can be used in conjunction with experimental designs for robustness and optimization

Outcomes: Learner will be able to…
1. Plan data collection, to turn data into information and to make decisions that lead to appropriate action
2. Apply the methods taught to real life situations
3. Plan, analyze, and interpret the results of experiments

Module	Detailed Contents	Hrs
01	**Introduction** Strategy of Experimentation Typical Applications of Experimental Design Guidelines for Designing Experiments Response Surface Methodology	06
02	**Fitting Regression Models** Linear Regression Models Estimation of the Parameters in Linear Regression Models Hypothesis Testing in Multiple Regression Confidence Intervals in Multiple Regression Prediction of new response observation Regression model diagnostics Testing for lack of fit	08
03	**Two-Level Factorial Designs** The 2^2 Design The 2^3 Design The General 2^k Design A Single Replicate of the 2^k Design The Addition of Center Points to the 2^k Design, Blocking in the 2^k Factorial Design Split-Plot Designs	07
04	**Two-Level Fractional Factorial Designs** The One-Half Fraction of the 2^k Design The One-Quarter Fraction of the 2^k Design The General 2^{k-p} Fractional Factorial Design Resolution III Designs Resolution IV and V Designs Fractional Factorial Split-Plot Designs	07

05	**Response Surface Methods and Designs** Introduction to Response Surface Methodology The Method of Steepest Ascent Analysis of a Second-Order Response Surface Experimental Designs for Fitting Response Surfaces	07
06	**Taguchi Approach** Crossed Array Designs and Signal-to-Noise Ratios Analysis Methods Robust design examples	04

Assessment:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:
Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

1. Raymond H. Mayers, Douglas C. Montgomery, Christine M. Anderson-Cook, Response Surface Methodology: Process and Product Optimization using Designed Experiment, 3rd edition, John Wiley & Sons, New York, 2001
2. D.C. Montgomery, Design and Analysis of Experiments, 5th edition, John Wiley & Sons, New York, 2001
3. George E P Box, J Stuart Hunter, William G Hunter, Statics for Experimenters: Design, Innovation and Discovery, 2nd Ed. Wiley
4. W J Dimond, Peactical Experiment Designs for Engineers and Scintists, John Wiley and Sons Inc. ISBN: 0-471-39054-2
5. Design and Analysis of Experiments (Springer text in Statistics), Springer by A.M. Dean, and D. T.Voss

Course Code	Course Name	Credits
IE1015	**Operations Research**	**03**

Objectives:

1. Formulate a real-world problem as a mathematical programming model.
2. Understand the mathematical tools that are needed to solve optimization problems.
3. Use mathematical software to solve the proposed models.

Outcomes: Learner will be able to…

1. Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
2. Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
3. Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
4. Understand the applications of integer programming and a queuing model and compute important performance measures

Module	Detailed Contents	Hrs
01	**Introduction to Operations Research**: Introduction, , Structure of the Mathematical Model, Limitations of Operations Research **Linear Programming**: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M-method, Two Phase Method, Revised simplex method, **Duality**, Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis **Transportation Problem**: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method. **Assignment Problem**: Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem, Travelling Salesman Problem **Integer Programming Problem**: Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique. Introduction to Decomposition algorithms.	14
02	**Queuing models**: queuing systems and structures, single server and multi-server models, Poisson input, exponential service, constant rate service, finite and infinite population	05
03	**Simulation**: Introduction, Methodology of Simulation, Basic Concepts,	05

	Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation	
04	**Dynamic programming**. Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.	05
05	**Game Theory**. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	05
06	**Inventory Models**: Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model,	05

Assessment:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:
Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

1. Taha, H.A. "Operations Research - An Introduction", Prentice Hall, (7th Edition), 2002.
2. Ravindran, A, Phillips, D. T and Solberg, J. J. "Operations Research: Principles and Practice", John Willey and Sons, 2nd Edition, 2009.
3. Hiller, F. S. and Liebermann, G. J. "Introduction to Operations Research", Tata McGraw Hill, 2002.
4. Operations Research, S. D. Sharma, KedarNath Ram Nath-Meerut.
5. Operations Research, KantiSwarup, P. K. Gupta and Man Mohan, Sultan Chand & Sons.

Course Code	Course Name	Credits
IE1016	**Cyber Security and Laws**	**03**

Objectives:

1. To understand and identify different types cybercrime and cyber law
2. To recognized Indian IT Act 2008 and its latest amendments
3. To learn various types of security standards compliances

Outcomes: Learner will be able to…

1. Understand the concept of cybercrime 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	Detailed Contents	Hrs
01	**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.	4
02	**Cyber offenses & Cybercrime:** How criminal plan the attacks, Social Engg, Cyber stalking, Cyber café and Cybercrimes, Bot nets, 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	9
03	**Tools and Methods Used in Cyber line** Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)	6
04	**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	8
05	**Indian IT Act.** Cyber Crime and Criminal Justice : Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments	6
06	**Information Security Standard compliances** SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI.	6

Assessment:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:
Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination.

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

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. William Stallings*, Cryptography and Network Security,* Pearson Publication
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

Course Code	Course Name	Credits
IE1017	**Disaster Management and Mitigation Measures**	**03**

Objectives:

1. To understand physics and various types of disaster occurring around the world
2. To identify extent and damaging capacity of a disaster
3. To study and understand the means of losses and methods to overcome /minimize it.
4. To understand role of individual and various organization during and after disaster
5. To understand application of GIS in the field of disaster management
6. To understand the emergency government response structures before, during and after disaster

Outcomes: Learner will be able to…

1. Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
2. Plan of national importance structures based upon the previous history.
3. Get acquainted with government policies, acts and various organizational structure associated with an emergency.
4. Get to know the simple do's and don'ts in such extreme events and act accordingly.

Module	Detailed Contents	Hrs
01	Introduction 1.1 Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.	03
02	Natural Disaster and Manmade disasters: Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.	09
03	Disaster Management, Policy and Administration Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management. Policy and administration: Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process.	06
04	Institutional Framework for Disaster Management in India: 4.1 Importance of public awareness, Preparation and execution of emergency management programme.Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India.Methods and measures to avoid disasters, Management of	06

	casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations. 4.2 Use of Internet and softwares for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.	
05	**Financing Relief Measures:** Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events.	09
06	**Preventive and Mitigation Measures:** Pre-disaster, during disaster and post-disaster measures in some events in general Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids.	06

Assessment:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:
Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

1. 'Disaster Management' by Harsh K.Gupta, Universities Press Publications.
2. 'Disaster Management: An Appraisal of Institutional Mechanisms in India' by O.S.Dagur, published by Centre for land warfare studies, New Delhi, 2011.
3. 'Introduction to International Disaster Management' by Damon Copolla, Butterworth Heinemann Elseveir Publications.
4. 'Disaster Management Handbook' by Jack Pinkowski, CRC Press Taylor and Francis group.
5. 'Disaster management & rehabilitation' by Rajdeep Dasgupta, Mittal Publications, New Delhi.
6. 'Natural Hazards and Disaster Management, Vulnerability and Mitigation – R B Singh, Rawat Publications
7. Concepts and Techniques of GIS –C.P.Lo Albert, K.W. Yonng – Prentice Hall (India) Publications. (Learners are expected to refer reports published at national and International level and updated information available on authentic web sites)

Course Code	Course Name	Credits
IE1018	**Energy Audit and Management**	**03**

Objectives:

1. To understand the importance energy security for sustainable development and the fundamentals of energy conservation.
2. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management
3. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

Outcomes: Learner will be able to…

1. To identify and describe present state of energy security and its importance.
2. To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
3. To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
4. To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
5. To analyze the data collected during performance evaluation and recommend energy saving measures

Module	Detailed Contents	Hrs
01	**Energy Scenario:** Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, Energy Conservation Act- 2001 and its Features. Basics of Energy and its various forms, Material and Energy balance	04
02	**Energy Audit Principles:** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution. Elements of monitoring& targeting; Energy audit Instruments; Data and information-analysis. Financial analysis techniques: Simple payback period, NPV, Return on investment (ROI), Internal rate of return (IRR)	08
03	**Energy Management and Energy Conservation in Electrical System:** Electricity billing, Electrical load management and maximum demand Control; Power factor improvement, Energy efficient equipments and appliances, star ratings. **Energy efficiency measures in lighting system, Lighting control:** Occupancy sensors, daylight integration, and use of intelligent controllers. Energy conservation opportunities in: water pumps, industrial drives, induction motors, motor retrofitting, soft starters, variable speed drives.	10

04	**Energy Management and Energy Conservation in Thermal Systems:** Review of different thermal loads; Energy conservation opportunities in: Steam distribution system, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system. General fuel economy measures in Boilers and furnaces, Waste heat recovery, use of insulation- types and application. HVAC system: Coefficient of performance, Capacity, factors affecting Refrigeration and Air Conditioning system performance and savings opportunities.	10
05	**Energy Performance Assessment:** On site Performance evaluation techniques, Case studies based on: Motors and variable speed drive, pumps, HVAC system calculations; Lighting System: Installed Load Efficacy Ratio (ILER) method, Financial Analysis.	04
06	**Energy conservation in Buildings:** Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of Non-Conventional and Renewable Energy Sources	03

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

REFERENCES:

1. Handbook of Electrical Installation Practice, Geofry Stokes, Blackwell Science
2. Designing with light: Lighting Handbook, By Anil Valia, Lighting System
3. Energy Management Handbook, By W.C. Turner, John Wiley and Sons
4. Handbook on Energy Audits and Management, edited by A. K. Tyagi, Tata Energy Research Institute (TERI).
5. Energy Management Principles, C.B.Smith, Pergamon Press
6. Energy Conservation Guidebook, Dale R. Patrick, S. Fardo, Ray E. Richardson, Fairmont Press
7. Handbook of Energy Audits, Albert Thumann, W. J. Younger, T. Niehus, CRC Press
8. www.energymanagertraining.com
9. www.bee-india.nic.in

Course Code	Course Name	Credits
IE1019	**Development Engineering**	**03**

Objectives:

1. To familiarise the characteristics of rural Society and the Scope, Nature and Constraints of rural Development
2. To provide an exposure toimplications of 73rdCAA on Planning, Development and Governance of Rural Areas
3. An exploration of human values, which go into making a 'good' human being, a 'good' professional, a 'good' society and a 'good life' in the context of work life and the personal life of modern Indian professionals
4. To familiarise the Nature and Type of Human Values relevant to Planning Institutions

Outcomes: Learner will be able to…

1. Demonstrateunderstanding of knowledge for Rural Development.
2. Prepare solutions for Management Issues.
3. Take up Initiatives and design Strategies to complete the task
4. Develop acumen for higher education and research.
5. Demonstrate the art of working in group of different nature
6. Develop confidence to take up rural project activities independently

Module	Contents	Hrs
1	Introduction to Rural Development Meaning, nature and scope of development; Nature of rural society in India; Hierarchy of settlements; Social, economic and ecological constraints for rural development Roots of Rural Development in India Rural reconstruction and Sarvodaya programme before independence; Impact of voluntary effort and Sarvodaya Movement on rural development; Constitutional direction, directive principles; Panchayati Raj - beginning of planning and community development; National extension services.	08
2	Post-Independence rural Development Balwant Rai Mehta Committee - three tier system of rural local Government; Need and scope for people's participation and Panchayati Raj; Ashok Mehta Committee - linkage between Panchayati Raj, participation and rural development.	06
3	Rural Development Initiatives in Five Year Plans Five Year Plans and Rural Development; Planning process at National, State, Regional and District levels; Planning, development, implementing and monitoring organizations and agencies; Urban and rural interface - integrated approach and local plans; Development initiatives and their convergence; Special component plan and sub-plan for the weaker section; Micro-eco zones; Data base for local planning; Need for decentralized planning; Sustainable rural development	07

4	Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including - XI schedule, devolution of powers, functions and finance; Panchayati Raj institutions - organizational linkages; Recent changes in rural local planning; Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource mapping, resource mobilization including social mobilization; Information Technology and rural planning; Need for further amendments.	04
5	Values and Science and Technology Material development and its values; the challenge of science and technology; Values in planning profession, research and education Types of Values Psychological values — integrated personality; mental health; Societal values — the modern search for a good society; justice, democracy, rule of law, values in the Indian constitution; Aesthetic values — perception and enjoyment of beauty; Moral and ethical values; nature of moral judgment; Spiritual values; different concepts; secular spirituality; Relative and absolute values; Human values— humanism and human values; human rights; human values as freedom, creativity, love and wisdom	10
6	Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education	04

Assessment:

Internal Assessment for 20 marks:
Consisting **Two Compulsory Class Tests**
First test based onapproximately 40% of contents and second test based on remainingcontents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:
Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.
1. Question paper will comprise of total **six questions**, **each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only **Four questions need to be solved**

Reference
1. ITPI, Village Planning and Rural Development, ITPI, New Delhi
2. Thooyavan, K.R. Human Settlements: A 2005 MA Publication, Chennai
3. GoI, Constitution (73rdGoI, New Delhi Amendment) Act, GoI, New Delhi
4. Planning Commission, Five Year Plans, Planning Commission
5. Planning Commission, Manual of Integrated District Planning, 2006, Planning Commission New Delhi
6. Planning Guide to Beginners
7. Weaver, R.C., The Urban Complex, Doubleday
8. Farmer, W.P. et al, Ethics in Planning, American Planning Association, Washington

9. How, E., Normative Ethics in Planning, Journal of Planning Literature, Vol.5, No.2, pp. 123-150
10. Watson, V. Conflicting Rationalities: -- Implications for Planning Theory and Ethics, Planning Theory and Practice, Vol. 4, No.4, pp.395 – 407

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISC201	Information Security	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISC201	Information Security	20	20	20	80	--	--	--	100

Course Objectives:
1. Study the threats to Information Security and learn the architecture and frameworks of Information Security
2. Get acquainted with the pillars of security & explain the Access Controls Techniques
3. Acquire knowledge of the Information Systems Management terms and terminologies
4. Gain information regarding the aspects of Software Application security & Web Security
5. Be aware of the the different Malicious Software , explain their effects and role of the Anti-Virus Software
6. Learn about the vulnerabilities and threats to Network Security and means to overcome them.
.
Course Outcomes:
Students will try to
1. Identify the threats to Information Security and describe the architecture and frameworks of Information Security(BL level 1)
2. Define the Pillars of Security & explain the Access Controls Techniques(BL level 2)
3. Describe the Information Systems Management terms and terminologies (BL level 2)
4. Discuss the aspects of Software Application security & Web Security(BL level 2)
5. Classify the different Malicious Software , explain their effects and role of the Anti-Virus Software(BL level 2)
6. Identify the vulnerabilities and threats to Network Security and means to overcome them.(BL level 2)

Prerequisite: Computer Networks and Cryptography

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Pre-requisite	Computer Networks and Cryptography	02	

I	Information Security Threats & Frameworks Principles	Security Threats to Information Security: External and Internal Threats. Information Security Frameworks and Information Security Architecture: A layered approach to security. Information Security Management Systems Framework Provided by ISO/IEC 27001:2013, NIST Special Publication 800-39, SABSA information security architecture. **Self Learning Topics:** Study advanced Security frameworks and compare them	06	CO1
II	Pillars of Security & Access Controls	People-Organization of Information Security. Specific Roles and Responsibilities.Policies, Procedures, and Processes, Technology.Implementation of Information Security, Principles of Information Security.Access control layers.Access Control Strategies. Implementing Access Controls.AAA Framework **Self Learning Topics:** Study the Access Controls for IBM/Oracle	07	CO2
III	Information Systems Management	Risk Management-Risk Assessment Life Cycle.Incident Response-Incident Response Life Cycle.Incident Response Plan. Incident Response Team. Incident Response execution **Self Learning Topics:** Case study of real time Incident Response plan	06	CO3
IV	Application & Web Security	Aspects of Software Application Security. Important Guidelines for Secure Design and Development. Web Browsers, Web Servers, and Web Applications: Important Reasons for Issues on the Web, Vulnerabilities in Web Browsers, Vulnerabilities of Web Servers, Important Attacks on the Web Applications, How to Overcome Web Application Vulnerabilities Self Learning Topics: Study of any Opensource tool for Web application Security	07	CO4
V	Malicious Software and Anti-Virus Software	Malware Software-Spyware, Adware, Trojans, Rootkits, Viruses, Worms, Backdoors, Botnets, Anti-Virus Software **Self Learning Topics:** Read current literature and articles on Malicious Software and Anti-Virus Software attacks real time case study	05	CO5
VI	Network Security	Network Vulnerabilities and Threats, Reconnaissance, Denial-of-Service (DoS) and Distributed Denial-of-Service (DDoS), Attacks on Networks, Firewalls-Types, and Working, Firewall Deployment Architecture.IDS and IPS: IDS/IPS System Architecture and Framework **Self Learning Topics**: Study case study for how to develop secure networks	06	CO6

Text Books:
1. The InfoSec Handbook-An Introduction to Information Security-Umesh Hodeghatta Rao and Umesha Nayak. Apress Open
2. Computer Security Principles and Practice, William Stallings, Sixth Edition, Pearson Education
3. Network Security and Cryptography, Bernard Menezes, Cengage Learning
4. Network Security Bible, Eric Cole, Second Edition, Wiley
5. Rational Cybersecurity for Business-Dan Blum Apress Open,2020

Reference Books:
1.Implementing Information Security based on ISO 27001_ISO 27002
2.Managing Risk and Information Security, Malcolm W. Harkins,Apress 2016
3.Information Security Policy Development for Compliance: ISO/IEC 27001, NIST SP 800-53, Barry L. Williams, CRC press

Online References:

S.No	Website/Reference link
1.	https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical /Oral	Tutorial	Total
MEISC202	Blockchain Technology	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
MEISC202	Blockchain Technology	20	20	20	80	--	--	--	100

Course Objectives:

Sr.No	Course Objectives
1	To get acquainted with the concept of Distributed ledger system and Blockchain.
2	To learn the concepts of consensus and mining in Blockchain through the Bitcoin network.
3	To understand Ethereum and develop-deploy smart contracts using different tools and frameworks.
4	To understand permissioned Blockchain and explore Hyperledger Fabric.
5	To understand different types of crypto assets.
6	To apply Blockchain for different domains IOT, AI and Cyber Security.

Course Outcomes:

After the successful completion of this course, learner will be able to:

Sr.No	Course Outcomes	BT level
1	Describe the basic concept of Blockchain and Distributed Ledger Technology.	L2
2	Interpret the knowledge of the Bitcoin network, nodes, keys, wallets and transactions	L3
3	Implement smart contracts in Ethereum using different development frameworks.	L3
4	Develop applications in permissioned Hyperledger Fabric network.	L3
5	Interpret different Crypto assets and Crypto currencies	L3
6	Analyze the use of Blockchain with AI, IoT and Cyber Security using case studies.	L4

Prerequisite: Cryptography and Distributed Systems

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	**Cryptography and Distributed Systems (prerequisite)**	Hash functions, Public – Private keys, SHA, ECC, Digital signatures, Fundamental concepts of Distributed systems	2	—-
I	**Introduction to DLT and Blockchain**	Distributed Ledger Technologies (DLTs) Introduction, Types of Blockchains **Blockchain:** Origin, Phases, Components **Block in a Blockchain**: Structure of a Block, Block Header Hash and Block Height, The Genesis Block, Linking Blocks in the Blockchain, Merkle Tree. **Self-learning Topics:** Blockchain Demo	4	CO1
II	**Consensus and Mining**	What is Bitcoin and the history of Bitcoin, Bitcoin Transactions, Bitcoin Concepts: keys, addresses and wallets, Bitcoin Transactions, validation of transactions, PoW consensus **Bitcoin Network**: Peer-to-Peer Network Architecture, Node Types and Roles, Incentive based Engineering, The Extended Bitcoin Network, Bitcoin Relay Networks, Network Discovery, Full Nodes, Exchanging "Inventory", Simplified Payment Verification (SPV) Nodes, SPV Nodes and Privacy, Transaction Pools, Blockchain Forks **Self-learning Topics:** Study and	8	CO2

		compare different consensus algorithms like PoA, PoS, pBFT		
III	**Permissionless Blockchain: Ethereum**	Components, Architecture of Ethereum, Miner and mining node, Ethereum virtual machine, Ether, Gas, Transactions, Accounts, Patricia Merkle Tree, Swarm, Whisper and IPFS, Ethash, End to end transaction in Ethereum, **Smart Contracts**: Smart Contract programming using solidity, Metamask (Ethereum Wallet), Setting up development environment, Use cases of Smart Contract, Smart Contracts: Opportunities and Risk. **Smart Contract Deployment**: Introduction to Truffle, Use of Remix and test networks for deployment **Other Permissionless Blockchain platforms Introduction:** IOTA, Hashgraph, EOS, etc. **Self-learning Topics:** Smart contract development using Java or Python	10	CO3
IV	**Permissioned Blockchain : Hyperledger Fabric**	Introduction to Framework, Tools and Architecture of Hyperledger Fabric Blockchain. **Components**: Certificate Authority, Nodes, Chain codes, Channels, Consensus: Solo, Kafka, RAFT Designing Hyperledger Blockchain **Other Permissioned Blockchain platforms Introduction:** CORDA, Quoram, etc. **Self-learning Topics:** Fundamentals of Hyperledger Composer	7	CO4
V	**Crypto assets and Cryptocurrencies**	Fungible and Nonfungible tokens, ERC20 and ERC721 standards, comparison between ERC20 & ERC721, ICO, STO, Different Crypto currencies **Self-learning Topics:** Defi, Metaverse, Types of cryptocurrencies	4	CO5

VI	**Blockchain Applications & Research Areas**	Blockchain in IoT, AI , Cyber Security, **Research Areas**: Interoperability, Privacy, Performance, Oracles, Security of smart contracts and platforms **Self-learning Topics:** Applications of Blockchain in various domains Education, Energy, Healthcare, real-estate, logistics, supply chain	4	CO6

Text Books:

1. "Mastering Bitcoin, PROGRAMMING THE OPEN BLOCKCHAIN", 2nd Edition by Andreas M. Antonopoulos, June 2017, Publisher(s): O'Reilly Media, Inc. ISBN: 9781491954386.
2. Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly, 2018.
3. Blockchain Technology, Chandramouli Subramanian, Asha A George, Abhillash K. A and Meena Karthikeyen, Universities press, Year: 2020 .
4. Hyperledger Fabric In-Depth: Learn, Build and Deploy Blockchain Applications Using Hyperledger Fabric, Ashwani Kumar, BPB publications, Year: 2020.
5. Solidity Programming Essentials: A beginner's Guide to Build Smart Contracts for Ethereum and Blockchain, Ritesh Modi, Packt publication, Year: 2018
6. Cryptoassets: The Innovative Investor's Guide to Bitcoin and Beyond, Chris Burniske& Jack Tatar.

Reference:

1. Mastering Blockchain, Imran Bashir, Packt Publishing 2. Mastering Bitcoin Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media
2. Blockchain Technology: Concepts and Applications, Kumar Saurabh and Ashutosh Saxena, Wiley.
3. The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them, Antony Lewis.for Ethereum and Blockchain, Ritesh Modi, Packt publication.
4. Mastering Bitcoin Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media

Online References:

1. NPTEL courses:
   a. Blockchain and its Applications,
   b. Blockchain Architecture Design and Use Cases
2. www.swayam.gov.in/
3. www.coursera.org
4. https://ethereum.org/en/
5. https://www.trufflesuite.com/tutorials
6. https://hyperledger-fabric.readthedocs.io/en/release-2.2/whatis.h
7. Blockchain demo: https://andersbrownworth.com/blockchain/
8. Blockchain Demo: Public / Private Keys & Signing: https://andersbrownworth.com/blockchain/public-private-keys/

Assessment:

Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE2031	Application and Web Security	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					

MEISCPE2031	Applicati on and Web Security	20	20	20	80	--	--	--	100

Course Objectives: Students will try

1. To reveal the underlying in web application.
2. To understand the browser security principles.
3. To understand web applications vulnerabilities.
4. To understand web application mitigations.
5. To identify and aid in fixing any security vulnerabilities during the web development process.
6. To understand the security principles in developing a reliable web application

Course Outcomes: Students will be able to

1. To understand the security principles in developing a reliable web application –(BT- L1,L2)
2. Identify the various types of security issues in web browser.-(BT L1,L2)
3. Identify the various types of threats in developing a web application. –(BT-L1,L2)
4. Identify the various types of mitigation measures of web applications.-(BT- L1,L2)
5. Apply the security principles in developing a reliable web application.-(BT-L1,L2,L3)
6. Use industry standard tools for web application security.-(BT-L1,L2)

Prerequisite: Introduction to Information & Network Security.

DETAILED SYLLABUS: total six module for each subject and total 36 hours to be distributed among six modules.

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Overview of Web Applications: Introduction history of web applications interface ad structure benefits and drawbacks of web applications Web application Vs Cloud application	2	
I	Web Application Security Fundamentals	Security Fundamentals: Input Validation - Attack Surface Reduction Rules of Thumb-Classifying and Prioritizing Threads **Self-learning Topics:** Cookies, Access Control.	**4**	**CO1**
II	Browser Security Principles	Origin Policy - Exceptions to the Same-Origin Policy - Cross-Site Scripting and Cross-Site Request Forgery - Reflected XSS - HTML Injection **Self-learning Topics:** HTTPS, HTTP Proxies.	**4**	**CO2**
III	Web Application Vulnerabilities	Understanding vulnerabilities in traditional client server application and web applications, client state manipulation, cookie based attacks, SQL injection, cross domain attack (XSS/XSRF/XSSI) http header injection. SSL vulnerabilities and testing - Proper encryption use in web application - Session vulnerabilities and testing - Cross-	**8**	**CO3**

		site request forgery **Self-learning Topics:** SSH Tunneling Cleaning traces ,Cleaning the event log Advanced phishing attacks		
IV	Web Application Mitigations	HTTP request, HTTP response, rendering and events , html image tags, image tag security, issue, java script on error , Javascript timing , port scanning , remote scripting , running remotecode, frame and iframe , browser sandbox, policy goals, same origin policy, library import, domain relaxation **Self-learning Topics:** Nikto, OWASP ZAP.	**7**	**CO4**
V	Secure Website Design	Secure website design: Architecture and Design Issues for Web Applications, Deployment Considerations Input Validation, Authentication, Authorization, Configuration Management ,Sen- sitive Data, Session Management, Cryptography, Parameter Manipulation, Exception Manage- ment, Auditing and Logging, Design Guidelines, Forms and validity, Technical implementation **Self-learning Topics:** Wapiti, SQL Map	**8**	**CO5**
VI	Cutting Edge Web Application Security	Clickjacking - DNS rebinding - Flash security - Java applet security - Single-sign-on solution and security - IPv6 impact on web security **Self-learning Topics:** https://owasp.org/www-community/Free_for_Open_Source_Application_Security_Tools	**6**	**CO6**

Text Books:
1. Sullivan, Bryan, and Vincent Liu. Web Application Security, A Beginner's Guide. McGraw Hill Profe ssional, 2011.
2. Stuttard, Dafydd, and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. John Wiley Sons, 2011

References:
1. OReilly Web Security Privacy and Commerce 2nd Edition 2011
2. Professional Pen Testing for Web application, Andres andreu, wrox press
3. Carlos Serrao, Vicente Aguilera, Fabio Cerullo, "Web Application Security" Springer; 1st Edition.

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE2032	Machine Learning for Security	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE2032	Machine Learning for Security	20	20	20	80	--	--	--	100

Prerequisite:	DBMS, Python Programming, Data Structure and analysis
Course Objectives:	1. To understand the basic concepts of Machine Learning in Security. 2. To understand and apply the Machine Learning algorithms in security domain. 3. To apply classification algorithms for Anomaly Detection. 4. To analyze real time security problems using Machine learning algorithms. 5. To explore the domain of secure consumer web. 6. To understand the Adversarial machine Learning Environment.

	Upon completion of the course, the learners will be able to:	

	Course Outcomes	BT Level
Course Outcomes:	1. Explain the fundamentals of Machine Learning in Security.	L2
	2. Apply Machine Learning algorithms in real world problems of security.	L3
	3. Apply Machine algorithms for Anomaly Detection.	L3
	4. Analyze Malware and Network Traffic using Machine learning algorithms.	L4
	5. Examine and secure the consumer web.	L4
	6. Understand the vulnerabilities of machine learning algorithms in Adversarial environments	L2

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Prerequisite Concepts and Course Introduction	**02**	
I	Introduction Machine Learning and Security	Cyber Threat Landscape, Economy, Hacking Skills and Indirect Monetization; What Is and not Machine Learning, Machine Learning System Maturity and Scalability; What's Important for Security Machine Learning Systems? Data Quality: Bias in Datasets, Label Inaccuracy, Missing Data; Model Quality: Hyperparameter Optimization, Feedback Loops, A/B Testing of Models, Repeatable and Explainable Results; Adversaries Using Machine Learning; Real-World Uses of Machine Learning in Security; Spam Fighting: An Iterative Approach. **Self-Learning:** Limitations of Machine Learning in Security	**07**	**CO1**
II	Classification and Clustering	Machine Learning: Problems and Approaches, Training Algorithms to Learn, Supervised Classification Algorithms, Practical Considerations in Classification, Evaluating Classification Results, Clustering Algorithms, Evaluating Clustering Results **Self-Learning:** Implementation of Classification and Clustering algorithms	**07**	**CO2**
III	Anomaly Detection	Anomaly Detection Versus Supervised Learning, Intrusion Detection with Heuristics, Data-Driven Methods, Feature Engineering for Anomaly Detection, Anomaly Detection	**06**	**CO3**

		with Data and Algorithms, Challenges of Using Machine Learning in Anomaly Detection, Response and Mitigation. **Self-Learning:** Practical System Design Concerns		
IV	Malware Analysis and Network Traffic Analysis	Malware Analysis: Understanding Malware, Feature Generation, Classification using features. Network Traffic Analysis: Theory of Network Defense, Machine Learning and Network Security, Building a Predictive Model to Classify Network Attacks. **Self-Learning:** Case studies for Malware Analysis and Network Traffic Analysis	07	CO4
V	Securing the Consumer Web	Consumer Web Monetizing, Types of Abuse and handling; Account handling, Financial Fraud, Supervised Learning for Abuse Problems; Data Labeling, Cold Start Versus Warm Start, False Positives and False Negatives, Multiple Responses, Large Attacks, Clustering Abuse, Clustering Spam Domains, Generating and Scoring Clusters. **Self-Learning:** Future Directions in Clustering and securing the consumer web.	06	CO5
VI	Adversarial Machine Learning	The Importance of Adversarial ML, Security Vulnerabilities in Machine Learning Algorithms, Attack Technique: Model Poisoning and Evasion Attack **Self-Learning:** Proper calibration of machine learning to match the behavior as per expectations	04	CO6

Books & Useful Links:

Text Books:	1. Clarence Chio, David Freeman, "Machine Learning and Security" O'Reilly Media, 2018. **2.** C. Bishop, Pattern Recognition and Machine Learning, Springer – 2006.
Reference Books:	1. R. Duda, P. Hart and D. Stork, Pattern Classification, Wiley. 2. S. Theodoridis and K. Koutroumbas, Pattern Recognition, Academic Press. 3. E. Alpaydin, Introduction to Machine Learning, PHI. 4. G. James, D. Witten, T. Hastie, and R. Tibshirani, Introduction to Statistical Learning, Springer **5.** T. Mitchell, Machine Learning, McGraw Hill.
Useful Links:	1. https://onlinecourses.nptel.ac.in/noc22_cs29/preview 2. https://nptel.ac.in/courses/106105152 3. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview 4. https://onlinecourses.nptel.ac.in/noc21_cs16/preview 5. https://www.classcentral.com/course/independent-machine-learning-security-12651

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on

minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tuto rial	Total credits
MEISCPE2033	Investigating Crypto Currency	03	--	--	80	--	--	

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE2 033	Investigating Crypto Currency	20	20	20	80	--	--	--	100

Course Objectives: Students will try to
1)   To get acquainted with the concept of Block and Blockchain
2)   To learn the concepts of consensus and mining in Blockchain
3)   To get familiar with the bitcoin currency and its history
4)   To understand and apply the concepts of keys, wallets and transactions in the Bitcoin Network
5)   To acquire the knowledge of Bitcoin network, nodes and their roles
6)   To analyze the applications& case studies of Blockchain

Course Outcomes:Students will be able to

1)   Describe the basic concept of Blockchain (BT Level 2)
2)   Associate knowledge of consensus and mining in Blockchain (BT Level 2)
3)   Summarise the bitcoincryptocurrency at an abstract level(BT Level2)
4)   Apply the concepts of keys, wallets and transactions in the Bitcoin network (BT Level3)
5)   Interpret the knowledge of Bitcoin network, nodes and their roles (BT Level2)
6)   Illustrate the applications of Blockchain and analyze case studies (BT Level 3)

Prerequisite: 1. Data structures
             2. Cryptography
DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	**Introduction to Cryptography (prerequisite)**	Hash functions, Public key cryptography, Digital Signature (ECDSA) **Comment** (Prerequisite syllabus should not be considered for paper setting)	**2**	

I	**Introduction to Blockchain**	Structure of a Block, Block Header , Block Identifiers: Block Header Hash and Block Height , The Genesis Block, Linking Blocks in the Blockchain, Merkle Trees and Simplified Payment Verification (SPV). **Self-learning Topics:** Blockchain Demo	**4**	1
II	**Consensus and Mining**	Decentralized Consensus, Byzantine General's Problem, Independent Verification of Transactions, Mining Nodes, Aggregating Transactions into Blocks, Constructing the Block header, Mining the Block, Successfully Mining the Block, Validating a New Block, Assembling and Selecting Chains of Blocks, Blockchain Forks **Self-learning Topics:** Study different consensus algorithms	**8**	2
III	**Introduction to Bitcoin**	What isBitcoin and the history of Bitcoin, Getting the first bitcoin, finding the current price of bitcoin and sending and receiving bitcoin, Bitcoin Transactions. **Self-learning Topics:** Study the website coinmarketcap.com/	**3**	3
IV	Concepts of Bitcoin	**Keys and addresses, Wallets and Transactions:** Public Key Cryptography and Cryptocurrency, Private and Public Keys, Bitcoin Addresses, Base58 and Base58Check Encoding, Nondeterministic (Random) Wallets, Deterministic (Seeded) Wallets, HD Wallets (BIP-32/BIP-44), Wallet Best Practices, Using a Bitcoin Wallets, Transaction Outputs and Inputs, Transaction Fees, Transaction Scripts and Script Language, Turing Incompleteness, Stateless Verification, Script Construction (Lock + Unlock), Pay-to-Public-Key-Hash (P2PKH), Bitcoin Addresses, Balances, and Other Abstractions **Self-learning Topics:** Visit and use https://bitcoin.org/en/	**8**	4
V	**Bitcoin Networks**	Peer-to-Peer Network Architecture, Node Types and Roles, Incentive based Engineering The Extended Bitcoin Network, Bitcoin Relay Networks, Network Discovery, Full Nodes, Exchanging "Inventory",	**7**	5

		Simplified Payment Verification (SPV) Nodes, Bloom Filters, SPV Nodes and Privacy, Encrypted and Authenticated Connections, Transaction Pools **Self-learning Topics:** Study technical papers based on bitcoin security		
VI	**Blockchain Applications & case studies**	Domain-Specific Applications: FinTech, Internet of Things, Industrial and Manufacturing, Energy, Supply chain & Logistics, Records & Identities, Healthcare Case studies related to crypto currencies Concept of Altcoin **Self-learning Topics:** Read Technical papers on Blockchain applications	**7**	6

Text Books:

1. "Mastering Bitcoin, PROGRAMMING THE OPEN BLOCKCHAIN" , 2nd Edition by Andreas M. Antonopoulos, June 2017, Publisher(s): O'Reilly Media, Inc. ISBN: 9781491954386.

2. "Blockchain Applications: A Hands-On Approach", by ArshdeepBahga, Vijay Madisetti, Paperback – 31 January 2017.

3. "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", July 19, 2016, by Arvind Narayanan, Joseph Bonneau, EdwardFelten, Andrew Miller, Steven Goldfeder, Princeton University Press.

Reference Books:

1. "Mastering Blockchain", by Imran Bashir, Third Edition,Packt Publishing

2. "Mastering Ethereum: Building Smart Contracts and Dapps Paperback" byAndreas Antonopoulos, Gavin Wood, Publisher(s): O'Reilly Media

3. "BLOCKCHAIN REVOLUTION: HOW THE TECHNOLOGY BEHIND BITCOIN IS CHANGING MONEY, BUSINESS AND THE WORLD $ Don Tapscott and Alex Tapscot, PORTFOLIO PENGUIN, 856157449

Online References:

1. **https://andersbrownworth.com/blockchain/**

2. https://andersbrownworth.com/blockchain/public-private-keys/

3. https://www.coursera.org/learn/cryptocurrency

4. https://coinmarketcap.com/

Assessment:
Internal Assessment Test:

   Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:

   Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
MEISCPE2034	Design Thinking	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE2034	Design Thinking	20	20	20	80	--	--	--	100

Course Objectives:

Sr. No.	Course Objectives
The course aims:	
1	To stress the importance of good design.
2	To recognize the latest and future issues and challenges in innovation.
3	To expose the student with state of the art perspectives, ideas, concepts, and solutions related to the design and innovation using design thinking principles.
4	To develop an advanced innovation and growth mindset form of problem identification and reframing, and insight generation.
5	To provide a social and thinking space for the recognition of innovation challenges and the design of creative solutions.
6	To propose a concrete, feasible, viable and relevant innovation project/challenge with Implementation

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
On successful completion, of course, learner/student will be able to:		
1	Understand good features of designs.	L2
2	Understand importance of innovation in day to day life	L2
3	Illustrate and analyze user needs and formulate design and innovation using design thinking principles.	L4
4	Interpret and evaluate the data collected during the process of problem	L5

		identification and reframing, and insight generation.	
5		Evaluate designs based on theoretical frameworks and methodological approaches.	L5
6		Design innovative applications that are usable, effective and efficient for intended users	L6

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	**Prerequisite**	Software Engineering concepts and anyprogramming Language	2	
I	**Introductio nto design**	Good and Poor Design, What is Interaction Design, The User Experience, The Process Of Interaction Design, Interaction Design and the User Experience, Necessity of UI/UX, **Self-learning Topics:** Study of Various interactiveday to day application	5	CO1
II	**Design Thinking Background**	Definition of design thinking, business uses of design thinking, variety of approaches within the design thinking discipline, design thinking mindset **Self-learning Topics:** Design thinking in businessapplication	5	CO2
III	**Design Thinking Approach**	Fundamental Concepts: Empathy, ethnography, divergent thinking convergent thinking,visual thinking, assumption testing, prototyping, and validation within design Thinking, Design Thinking Resources Human resource, preferred space prepared, materials commonly used, dynamic between design thinking teams and the organization 3.3 Design Thinking Processes Design thinking approaches, Double	8	CO3

		Diamond approach, d.School 5-Stage approach, Growth approach, role of project management within design thinking **Self-learning Topics:** Study of Various resources for design thinking		

IV	**Design Thinking inPractice**	4.1 Process Stages of Designing for Growth 4.2 Design Thinking Tools and Methods need to use tools and methods, visualization , journey mapping , value chain analysis , mind mapping , brainstorming, concept development assumption testing, rapid prototyping customer co-creation, learning launch. **Self-learning Topics:** Study of concept development with any application	7	CO4 / CO5
V	UX Evaluation, The Interaction Cycle and the User Action Framework	UX Goals, Metrics and Targets, UX Evaluation Techniques.-Formative vs summative ,Analysis, The interaction cycle, The user action framework adding a structured knowledge base to the interaction cycle, Interaction cycle and user action framework content categories, Role of affordances within the UAF, Practical value of the UAF. **Self-learning Topics:** Study of UI and UX goals with any application	7	CO5
VI	Design Thinking Application	This section explores practical case study related to product development in a design thinking effort.Any domain is preferable. **Self-learning Topics:** Study of any domain application	5	CO5/ CO6

Text Books:

1. "Designing for growth: A design thinking tool kit for managers", by Jeanne Liedtka and Tim Ogilvie., 2011, ISBN 978-0-231-15838-1
2. "The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems", by Michael Lewrick, Patrick Link, Larry Leifer., 2018, ISBN 978-1-

119-46747-2

3. "Presumptive design: Design provocations for innovation", by Leo Frishberg and Charles Lambdin., 2016, ISBN: 978-0-12-803086-8
4. "Systems thinking: Managing chaos and complexity: A platform for designing business architecture.", "Chapter Seven: Design Thinking", by Jamshid Gharajedaghi, 2011, ISBN 978-0-12-385915-0
5. Interaction Design, by J. Preece, Y. Rogers and H. Sharp. ISBN 0-471-49278-7.
6. Human Computer Interaction, by Alan Dix, Janet Finlay, Gregory D Abowd, Russell Beale

References:

1. Karmic Design Thinking by Prof. Bala Ramadurai, available at Amazon (paperback), Amazon(e-book),

    Flipkart, Pothi, halfpricebooks.in.

2. Design: Creation of Artifacts in Society by Prof. Karl Ulrich, U. Penn

3. Change by Design by Tim Brown.

4. The UX Book, by Rex Hartson and Pardha S Pyla

5. Donald A. Norman, "The design of everyday things", Basic books.

6. Jeff Johnson, "Designing with the mind in mind", Morgan Kaufmann Publication.

Online References: https://nptel.ac.in/courses/110106124

https://onlinecourses.nptel.ac.in/noc22_mg32/preview

https://onlinecourses.nptel.ac.in/noc21_ar05/preview

https://nptel.ac.in/courses/124/107/124107008/

https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/

https://nptel.ac.in/courses/107/103/107103083/

https://www.youtube.com/watch?v=6C2Ye1makdY&list=PLW-zSkCnZ-gD5TDfs1eL5EnH2mQ0f9g6B

    https://xd.adobe.com/ideas/process/

Assessment:
Internal Assessment Test:

    Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
    Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered inquestion papers of end semester examination.

		Theory	Practical	Tutorial	Theory	Practical /Oral	Tutorial	Total
EISCPE2041	Devops and Devsecops	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
MEISCPE2041	Devops and Devsecops	20	20	20	80	--	--	--	100

Course Objectives:

The course will help the students to

1. Understand and analyze the concepts of DevOps and DevSecOps.

2. Define and understand the Continuous integration process in DevOps.

3. Understand the different Configuration management tools in DevOps and DevSecOps

4. Describe the various deployments using Infrastructure as a Code.

5. Understand and analyze the Static Application Security Testing & Log Management process in DevSecOps.

6. Describe the aspects of containerization and micro service applications in in DevOps and DevSecOps process.

Course Outcomes: Six Course outcomes
Learner should be able to:

1. Explain the basics concepts of DevOps and DevSecOps. (BT Level 1)
2. Describe and apply Continuous integration in DevOps. (BT Level 1 & 3)
3. Understand and Analyze different Configuration management tools in DevOps and DevSecOps. (BT Level 2 & 4)
4. Understand and apply the infrastructure deployments using Infrastructure as a Code. (BT Level 2 & 3)
5. Understanding the Static Application Security Testing & Log Management process in DevSecOps. (BT level 2)
6. Recognize and examine the containerization and micro service applications in in DevOps and DevSecOps. (BT Level 1 & 2)

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Concepts of Software Engineering, Software Project Management, Computer Network, Security and Operating System.	02	
I	**Introduction to**	The waterfall model, Agile Model, Overview	**06**	**CO 1**

	DevOps	of DevOps, Challenges for the development and operations teams, in a DevOps environment, Agile vs DevOps, Lifecycle of DevOps projects, Stages in DevOps, Applications of DevOps environment, Continuous integration, Cloud provisioning, Configuration management, Continuous delivery, Continuous testing and deployment, Continuous monitoring, Tools and technologies.		**(BT Level 1)**
		Self-learning Topics: Study the recent trends in DevSecOps and related technologies		
II	**Continuous Integration**	Overview of Continuous integration, Tools and stack for Continuous integration, Introduction to Jenkins, Architecture of Jenkins, Jenkins Pipeline, Integrating Jenkins and SonarQube , E-mail notifications in Jenkins, Continuous integration using Visual Studio Team Services, Continuous integration in VSTS.	**06**	**CO 2** **(BT Level 1 & 3)**
		Self-learning Topics: Comparison between different continuous integration tools.		
III	**Configuration Management**	Introduction to Configuration Management, different tools used for Configuration management, an overview of the Chef configuration management tool, Using Ansible for Configuring IaaS Infrastructure, Infrastructure as Code (IaC), Technical requirements Ansible artifacts, creating an inventory for targeting Ansible Hosts, configuring hosts in the inventory, writing a basic playbook, Understanding Ansible modules, Protecting data with Ansible Vault.	**04**	**CO 3** **(BT Level 2 & 4)**
		Self-learning Topics:		

		Study of different Configuration management tools.		
IV	**Infrastructure as a Code**	Introduction to Infrastructure automation, Infrastructure as a code, Overview of Terraform, Installation by script, Configuring Terraform for Azure, Creating the Azure SP, Configuring the Terraform provider, Terraform configuration for local development and testing, writing a Terraform script to deploy Azure infrastructure, Terraform good practices, Better visibility with the separation of files, Protection of sensitive data, Dynamizing the code with variables and interpolation functions, Deploying the infrastructure with Terraform. **Self-learning Topics:** Study of deploying infrastructure as a code on different cloud platforms.	**09**	**CO 4** **(BT Level 2 & 3)**
V	**Static Application Security Testing & Log Management**	An introduction to SonarQube, Issues and coding standards, Ensuring that your code is doing things right, Working with duplicate code, Optimizing source code documentation, Keeping your source code files elegant, Improving your application design, Introduction to Log Management, Centralizing logs with Syslog, Using syslog templates, Managing log rotation with the Logrotate utility, Installing ElasticSearch, Logstash, and Kibana, Importing logs into Elasticsearch with Logstash, Using Kibana queries to explore data, Using Kibana queries to examine data. **Self-learning Topics:** Study of SAST and	**05**	**CO 5** **(BT Level 2)**

VI	**Introduction to Containers & Microservices**	Introduction to Docker, comparing Docker containers with virtual machines, a simple analogy docker terminology, Docker containers, images, and registries, Container design principles, Containerizing monolithic applications, deploying a monolithic application as a container, Service-oriented architecture, Microservices architecture, Data sovereignty per microservice, The relationship between microservices and the bounded context pattern, Logical architecture versus physical architecture, challenges and solutions for distributed data management. **Self-learning Topics:** Comparative analysis between different Micro service architectures frameworks.	**07**	**CO 6** **(BT Level 1 & 2)**
		Log management Tools.		

Text Books:

1. G. ann Campbell, Patroklos p. papapetrou, "SonarQube in Action", Manning Publication.

2. Cesar de la Torre, Bill Wagner, '.NET Microservices – Architecture for Containerized .NET Applications', Microsoft Press

3. Paul Swartout, "Continuous Delivery and DevOps: A Quickstart Guide", Pakt Publication

4. Michael Duffy, "DevOps Automation Cookbook",Pakt Publication

5. Mitesh Soni, "DevOps Bootcamp", Pakt Publication

Reference Books:

1. Mitesh Soni, "DevOps for Web Development", Pakt Publication

2. Wouter de Kort, "DevOps on the Microsoft Stack", Pakt Publication

3. Mikael Krief, "Learning DevOps", Pakt Publication.

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on   minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.
End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE204 2	IT security Strategic planning, policy and Leadership	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks			End Sem. Exam	Term Work	Practical	Oral	Total
		Internal assessment							
		Test 1	Test 2	Avg. of 2 Tests					
MEISCPE2042	IT security Strategic planning, policy and Leadership	20	20	20	80	--	--	--	100

Course Objectives: Students will able:

1. To understand and define the Strategic Planning Process.
2. To understand and define the Information Security Process and manage it.
3. To understand the legal issues.
4. Define the security policies.
5. Do the assessment of the security as per policy.
6. Study and define the Leadership and management system.

Course Outcomes: Students will be able:

1. Understand and define the Strategic Planning Process. (BT-L2)

2. Understand and define the Information Security Process and manage it. (BT-L2)
3. Understand the legal issues. (BT-L2)
4. Understand the security policies. (BT-L2)
5. Do evaluation and assessment of the security as per policy.(BT-L2)
6. Understand the Security leadership and management system. (BT-L2)

Prerequisite: Network and Security.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic concepts of Network and security.	02	
I	Strategic Planning Process:	Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and theIndian ITA 2000, A global Perspective on cybercrimes. Value of strategic planning, implementation of strategic planning, overall planning process and strategic matrix model, horizon analysis, visioning, environmental scans (SWOT, PEST, Porter's 5 forces), historical analysis,mission, vision, and value statements, planning process core, candidate initiatives, the prioritization process, resource and IT change management in planning, how to build the roadmap, setting up assessments. **Self-learning Topics:** Institutional assessment, revising the plan.	**06**	**CO1**
II	Information Security Management:	Risks and attacks in an information system environment, Requirements on confidentiality, integrity, availability, authentication, non-repudiation, Information Security Technologies, Types of Information Security policies and their hierarchy, relationship to business process, Security organizations, Risk assessment, different approaches, Information Security Management Standards, Audit policy, Protecting Computer-Held Information Systems. **Self-learning Topics:** Case study on Institution Information Security and audit policies.	**06**	**CO2**
III	Legal Issues:	Computer crimes, Disk Protection, Intellectual property, E-commerce law, Data Protection issues,	**04**	**CO3**

		Information Security Audits. **Self-learning Topics:** Case study on E-Commerce website data protection and audit.		
IV	Security Policy Development:	positive and negative tone, consistency of policy bullets, the role of policy, awareness and training, the SMART approach to policy development and assessment, ISMS as governing policy, Policy versus procedure, Organizational Assumptions, Beliefs and Values (ABVs), Relationship of mission statement to policy, Organizational culture **Self-learning Topics:** Case study on institution security policy and assessment.	**06**	**CO4**
V	Security Policy Assessment:	Using the principles of psychology to implement policy, How policy protects people, organizations and information, the process to handle a new risk, Policy header components and how to use them, Issue-specific policies, Behavior related polices, acceptable use, ethics, Warning banners, Policy development process, Policy review **Self-learning Topics:** Case study for policy assessment ie define policy, process, issues and review to improve.	**08**	**CO5**
VI	Management and Leadership Skills:	Leadership building blocks, Coaching & training, Change management, Team development, Motivating, Developing the vision, Leadership development, Building competencies, Importance of communication, Selfdirection, Brainstorming, Relationship building, Teamwork concepts, Leader qualities, Leadership benefits, Leadership Introspection, Assessment of Organization Culture Should Shape Security Strategies, process, Identify Risks and measure security. **Self-learning Topics:** Case Study on Security Leadership and management system for organization.	**07**	**CO6**

Text & Refernces Books:

1. http://www.sans.org
2. Robert M. Grant, "Contemporary Strategy Analysis: Concepts, Techniques,
3. Applications", 5th Edition
4. Mickie Krause Nozaki, "Information Security Management Handbook", 4th Edition
5. Michael E. Whitman, "Management Of Information Security",
6. http://www.sans.org/reading_room/whitepapers/policyissues/security-policy-roadmapprocess-

7. creating-security-policies_494
8. Information Security Policies Made Easy, 10th Edition
9. http://net.educause.edu/ir/library/pdf/pub7008i.pdf
10. Marlene Caroselli, "Leadership Skills for Managers"
11. http://managementhelp.org/freebusinesstraining/leadership.htm
12. CISO Leadership Essential Principals for Success. ISC Press.

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE2043	Hacker Technique, Exploits and Incident Handling	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MEISCPE 2043	Hacker Technique, Exploits and Incident Handling	20	20	20	80	--	--	--	100

Course Objectives: Students will try
1. To understand incident response techniques.
2. To identify various types of penetration testing tools.
3. To identify types of password attack techniques.
4. To understand how to protect critical assets.
5. To understand endpoint detection tools.
6. To understand the capture the flag event.

Course Outcomes: Students will be able to

1. To understand how to apply a dynamic approach to incident response.-(BT-L2)
2. Identify the threats using various types of penetration testing tools. (BT-L3)
3. To understand various types of password and access attack techniques. (BT-L2)
4. Apply defense strategies to protect critical assets.(BT-L3)

5. To understand attackers techniques to evade endpoint detection tools.(BT-L2)
6. To understand which crafty techniques attackers use and protect system form them.(BT-L2)

Prerequisite: Introduction to Information & Network Security.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Introduction to Information & Network Security	2	
I	Incident Response and Cyber Investigations	Incident Response; Digital Investigations; Live Examination; Network Investigations; Memory Investigations; Malware Investigations; Cloud Investigations. **Self-learning Topics:** Bootcamp: Linux Olympics	4	CO1
II	Scanning, and Enumeration Attacks	Open-Source Intelligence; DNS Interrogation; Website Reconnaissance; Network and Host Scanning; Cloud Spotlight: Cloud Scanning; Enumerating Shadow Cloud Targets. **Self-learning Topics:** Nmap, SMB, DeepBlueCLI.	6	CO2
III	Password and Access Attacks	Password Attacks; Understanding Password Hashes; Password Cracking; Defense Spotlight: Domain Password Audit Tool (DPAT); Cloud Spotlight: Insecure Storage. **Self-learning Topics:** Netcat, OWASP ZAP	6	CO3
IV	Public-Facing and Drive-By Attacks	Metasploit Framework; Drive-By Attacks; Defense Spotlight: System Resource Usage Monitor; Command Injection; Cross-Site Scripting (XSS); SQL Injection; Cloud Spotlight: SSRF and IMDS Attacks. **Self-learning Topics:** nessus, SQL Map	8	CO4
V	Evasion and Post-Exploitation Attacks	Endpoint Security Bypass; Pivoting and Lateral Movement; Hijacking Attacks; Covering Tracks; Establishing Persistence; Defense Spotlight: Real Intelligence Threat Analytics; Data Collection. **Self-learning Topics: Metasploit, Hping3.**	7	CO5
VI	Capture-the-Flag Event	Target Discovery and Enumeration; Applying Opensource Intelligence and Reconnaissance Information Gathering; Public-Facing Asset Compromise; Email Compromise; Attacking Windows Active Directory; Password Spray, Guessing, and Credential Stuffing Attacks; Post Exploitation Pivoting and Lateral Movement; Choosing, Configuring, and Delivering Exploits; Internal Attacker Compromise	7	CO6

		Attribution
		Self-learning Topics: https://buildyourfuture.withgoogle.com/events/ctf/

Text Books:
1. Hacker Techniques, Tools, and Incident Handling, 3rd Edition, by Sean-Philip Oriyano**.**

2. Ethical Hacking - Capture the Flag Walkthroughs - v2

References:
1. Hacker Techniques, Exploits & Incident Handling (Security 504)
   http://www.sans.org/training/description.php?mid=40
2. https://booksite.elsevier.com/samplechapters/9781597496278/Chapter_3.pdf
3. Carlos Serrao, Vicente Aguilera, Fabio Cerullo, "Web Application Security"
   Springer; 1st Edition.
4. Metasploit Penetration Testing Cookbook - Third Edition by by Daniel Teixeira, Abhinav Singh, Monika Agarwal

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of end semester examination

		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
MEISCPE2044	Advanced Computer Forensic Analysis	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
MEISCPE2044	Advanced Computer Forensic Analysis	20	20	20	80	--	--	--	100

Course Objectives: Students will try
1. To understand computer forensic technology.
2. To identify types of computer forensic systems.
3. To explore the procedures for identification, preservation, and extraction of digital evidence.
4. To explore the electronic evidence, identification of forensic data.
5. To identify the information warfare and tactics of terrorists in cyber attcks.
6. To explore advanced computer forensics systems.

Course Outcomes: Students will be able to
1. Understand the computer forensic technology.-(BT-L2)
2. To discuss the types of computer forensics systems.-(BT-L3)
3. Understand the process of collection, analysis and recovery of the digital evidence(BT-L2)
4. Understand the process of computer analysis.(BT-L2)
5. To explore cyber terrorism techniques.(BT-L3)
6. To discuss advance computer forensics system and advanced encryption(BT-L3)

Prerequisite: Introduction to Information & Network Security.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Introduction to Information & Network Security	2	
I	Overview of computer Forensics Technology	Introduction to computer forensics, use of forensics in law enforcement, employment proceedings, computer Forensics services. Types of computer Forensics Technology- Military, law, spyware and Adware, Biometrics security systems **Self-learning Topics:** Relevant law to combat computer crime – Information Technology Act	5	**CO1**
II	Types of Computer Forensics systems	Internet security, IDS, Firewall, Public key, net privacy systems. **Self-learning Topics:** Types of IDS and Firewall	6	**CO2**

III	Computer Forensics evidence and capture	Data recovery, evidence collection and data seizure, duplication and preservation of digital evidence. **Self-learning Topics:** dd, WinHex, Helix3Pro	**6**	**CO3**
IV	Computer Forensics Analysis	Discovery of electronic evidence- electronic document discovery, identification of data- Time keeping, forensic identification and analysis of technical surveillance devices. **Self-learning Topics:**	**8**	**CO4**
V	The information warfare Arsenal and Tactics of terrorists and Rogues	The Terrorist profile, the dark world of the cyber underground, new tools of terrorism, information warfare. **Self-learning Topics: Case study** https://icct.nl/app/uploads/2021/05/Handbook-ch-29-Jayakumar-Cyber-Attacks-by-Terrorists-and-other-Malevolent-Actors.pdf	**6**	**CO5**
VI	Advance Computer Forensics	Advanced computer Forensics systems and future directions- advanced encryption, hacking, advanced trackers. **Self-learning Topics**: +Autopsy, SIFT Workstation	**6**	**CO6**

Text Books:
1. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition.
2. Marjie T Britz, "Computer Forensics and Cyber Crime: An Introduction", Pearson Education, 2nd Edition
3. Cyber terrorism and Information warfare by M.N Sirohi

References:
4. Mari E-Helen Maras, "Computer Forensics: Cybercriminals, Laws, and Evidence", Jones & Bartlett Learning; 2nd Edition, 2014.
5. Majid Yar, "Cybercrime and Society", SAGE Publications Ltd, Hardcover, 2nd Edition
6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer.
7. Handbook of Computer Crime Investigation, edited by Eoghan Casey

Assessment:
Internal Assessment Test:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination:
Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of end semester examination

		Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical & Oral	Tutorial	Total
MEISL201	Program Lab -II	--	2	--	--	1	--	01

		Examination Scheme						
Subject Code	Subject Name	Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg. of 2 Tests				
MEISL201	Program lab II	--	--	--	--	25	25	50

Lab Objectives: Six Lab Objectives

Sr.No	Course Objectives
1	To comprehend application and web security issues
2	To learn about the various malicious software and techniques to combat them
3	To study the Network security aspects and tools to apply the security to a given network
4	To develop and deploy smart contracts on local Blockchain.
5	To deploy the smart contract on test networks.
6	To develop a full-fledged decentralized application.

Lab Outcomes: Six Lab outcomes (Based on Blooms Taxonomy)

Sr.No	Course Outcomes	BT level
1	To analyze the application and web security issues and use tools to handle them	3,4
2	To identify the various malicious software and use techniques to combat them	2,4
3	To interpret the Network security aspects and handle the tools to apply the security to a given network	2,4
4	Develop and test smart contract on local Blockchain.	3,4
5	Develop and test smart contract on Ethereum test networks.	3,4
6	Write and deploy smart contract using Remix IDE and Metamask.	4

Prerequisite: Operating Systems, VM ware, and Computer and Network Security, Java, python, Javascript

DETAILED SYLLABUS: Syllabus related Lab experiment must be considered and mapped with Blooms Taxonomy. total six module for each subject and total 24 hours to be distributed among six modules.

Sr. No.	Module	Detailed Content	Hours	LO Mapping
0	Prerequisite	Operating Systems, VM ware, and Computer and Network Security. Java, Python, JavaScript	2	—

1	Application & Web Security	1. To ensure the security of a web browser (Mozilla Firefox/Google Chrome). 2. Demonstrate different types of vulnerabilities for hacking websites / Web Applications. 3. Analysis of the Security Vulnerabilities of E-commerce services	4	LO1
2	Malicious Software and Anti-Virus Software	1. Capturing malware using honeypots, implementing honeypots, medium interaction, and high interaction honeypots. 2. Malware analysis tools and techniques 3. Antivirus Software and their functionality	4	LO2
3	Network Security	1. Study and demonstrate the use of Reconnaissance tools for network information gathering. 2. Study the features of firewall in providing network security and set Firewall Security in windows. 3.To setup and configure an IDS	4	LO3
4	Local Blockchain	Introduction to Truffle, establishing local Blockchain using Truffle Mini Project: Allocation of the groups	2	LO4
5	Smart contracts	Solidity programming language, chain code(Java/JavaScript/Go), deployment on Truffle local Blockchain	2	LO4
6	Deployment and publishing smart contracts on Ethereum test network	Ethereum Test networks (Ropsten/Gorelli/Rinkeby),deployment on test networks, Web3.js/Web3.py for interaction with Ethereum smart contract	3	LO5
7	Remix IDE and Metamask	Smart contract development and deployment using Metamask and Remix	3	LO6

Text Books:
1. Ethereum Smart Contract Development, Mayukh Mukhopadhyay, Packt publication.
2. Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain, Ritesh Modi, Packt publication.
3. Hands-on Smart Contract Development with Hyperledger Fabric V2, Matt Zand, Xun Wu, and Mark Anthony Morris, O'Reilly.
4. Hacking Web Apps-Detecting & Preventing Web Application Security problems-Mike Shema, Syngress-Elsevier
5. Hacking Malware & Rootkits exposed-Malware & Rootkits exposed Security Secrets & SolutionsMichael A Davis, Sean M Bodmer, Aaron LeMasters-McGraw Hill
6. Wireshark Network Analysis_ The Official Wireshark Certified Network Analyst Study Guide

References:

1. Mastering Blockchain, Imran Bashir, Packt Publishing
2. Introducing Ethereum and Solidity, Chris Dannen, APress.
3. Hands-on Blockchain with Hyperledger, Nitin Gaur, Packt Publishing.

Online References:
1. https://trufflesuite.com/
2. https://metamask.io/
3. https://remix.ethereum.org/

Term-Work: Term-Work shall consist of 10 experiments a Also Term-work must include at least 2 assignments
Term Work Marks: 25 Marks (Total marks) =15 Marks (10 Experiments) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral Exam: An Oral exam will be held based on the experiments conducted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical & Oral	Tutorial	Total
MEISL202	Design Thinking Lab (SBL)	--	4	--	--	2	--	02

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg. of 2 Tests				
MEISL202	Design Thinking Lab (SBL)	--	--	--	--	50	50	100

Lab Objectives:

Sr. No	Lab Objectives
1	Understand the design thinking process.
2	Understand and prepare a detail journey map for your problem.
3	Understand and design a mock-up and innovation model of your problem.
4	Understand the different technologies and apply it.
5	Understand and create a prototype
6	Use testing software by apply different test modes.

Lab Outcomes:

Sr. No	Lab Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand and apply the design thinking process.	L1,L2,L3
2	Prepare a detail journey map for your problem.	L1,L2,L3
3	Design a mock-up and innovation model of your problem.	L6
4	Understand the different technologies and apply it.	L1,L2
5	create a prototype for your problem	L6
6	Use testing software by apply different test modes.	L1,L2,L3,L4

Prerequisite: Any programming language.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	LO Mapping
I	Introduction	Concept of design thinking, what is design thinking, core elements of design thinking. Key principles and mindset. Mindset & attitudes. Five different phases of Design thinking.	**06**	LO1
II	Deconstructing stereotypes through creative collaboration & Immersion.	. Structure of the project Focus: gender equality Results of the creative collaboration. Immersion, Reframing, Exploratory Research, Desk Research.	**04**	LO2
III	A step-by-step guide	A thousand and one methods Facilitate your team Be curious! Be compassionate! Be creative! Be constructive!	**04**	LO3

IV	Analysis and Synthesis	Insight Cards, Affinity Diagram, Conceptual Map, Guiding Criteria, Personas, Empathy Map, User's journey, Blueprint.	**06**	LO4
V	Ideation	Brainstorming, Co-creation workshop, Idea Menu, Decision Matrix.	**05**	LO4,LO5
VI	Prototyping and tesing	Paper Prototyping, Volumetric Model, Staging, Storyboard, Service Prototyping. Use tools for testing.	**05**	LO6

Text & Refernces Books:
1. An introduction to design thingking, standard.
2. A practical guide for design thinking, 2019
3. Design thinking a guide book
4. Design Thinking Business Innovation.
5. Handbook of Design Thinking tips and tools for how to design thinking.
6. Design Thinking Handbook, Eli Woolery.

Guidelines for Mini Project as per above syllabus.
- Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
- Students should do survey and identify needs, which shall be converted into problem statement how to contribute to open source mini project in consultation with faculty supervisor/head of department/internal committee of faculties.
- Students shall submit implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of recent contribute to open source mini project.
- A log book to be prepared by each group, wherein group can record weekly work progress, guide/supervisor can verify and record notes/comments.
- Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning.
- Students in a group shall understand contribute to open source problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.
- Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
- The solution to be validated with proper justification and report using open source tools to be compiled in standard format of University of Mumbai.
- With the focus on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the open source Mini Projects.

Guidelines for Assessment of Mini Project:
Term Work
- The review/ progress monitoring committee shall be constituted by head of departments of each institute. The progress of mini project to be evaluated on continuous basis, minimum two reviews in each semester.

- 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;
  - Marks awarded by guide/supervisor based on log book : 30
  - Marks awarded by review committee : 10
  - Quality of Project Report :05

Term Work:

Term Work shall consist of at least 10 practical based on the above list. Also Term Work Journal must include Mini-Project as mentioned in above syllabus.

Term Work Marks: 50 Marks (Total marks) = 40 Marks (Mini-project) + 5 Marks (Attendance)

Oral Exam: An Oral exam will be held based on the above syllabus.

Course Code	Course Name	Credits
IE2011	**Project Management**	**03**

Objectives:
1. To familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques.
2. To appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

Outcomes: Learner will be able to…
1. Apply selection criteria and select an appropriate project from different options.
2. Write work break down structure for a project and develop a schedule based on it.
3. Identify opportunities and threats to the project and decide an approach to deal with them strategically.

4. Use Earned value technique and determine & predict status of the project.
5. Capture lessons learned during project phases and document them for future reference

Module	Detailed Contents	Hrs
01	**Project Management Foundation:** Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager. Negotiations and resolving conflicts. Project management in various organization structures. PM knowledge areas as per Project Management Institute (PMI).	5
02	**Initiating Projects:** How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics.	6
03	**Project Planning and Scheduling:** Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart. Introduction to Project Management Information System (PMIS).	8
04	**Planning Projects:** Crashing project time, Resource loading and leveling, Goldratt's critical chain, Project Stakeholders and Communication plan. Risk Management in projects: Risk management planning, Risk identification and risk register. Qualitative and quantitative risk assessment, Probability and impact matrix. Risk response strategies for positive and negative risks	6
05	**5.1 Executing Projects:** Planning monitoring and controlling cycle. Information needs and reporting,	8

	engaging with all stakeholders of the projects. Team management, communication and project meetings. **Monitoring and Controlling Projects:** Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep. Project audit. **Project Contracting** Project procurement management, contracting and outsourcing,	
06	**Project Leadership and Ethics:** Introduction to project leadership, ethics in projects. Multicultural and virtual projects. **Closing the Project:** Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study.	6

REFERENCES:

1. Jack Meredith & Samuel Mantel, Project Management: A managerial approach, Wiley India, 7th Ed.

2. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 5th Ed, Project Management Institute PA, USA

3. Gido Clements, Project Management, Cengage Learning.

4. Gopalan, Project Management, , Wiley India

5. Dennis Lock, Project Management, Gower Publishing England, 9 th Ed.

Assessment:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:
Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Course Code	Course Name	Credits
IE2012	**Finance Management**	**03**

Objectives:

1. Overview of Indian financial system, instruments and market
2. Basic concepts of value of money, returns and risks, corporate finance, working capital and its management
3. Knowledge about sources of finance, capital structure, dividend policy

Outcomes: Learner will be able to…

1. Understand Indian finance system and corporate finance
2. Take investment, finance as well as dividend decisions

Module	Detailed Contents	Hrs
01	**Overview of Indian Financial System:** Characteristics, Components and Functions of Financial System. **Financial Instruments:** Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills. **Financial Markets:** Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market **Financial Institutions:** Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges	06
02	**Concepts of Returns and Risks:** Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio. **Time Value of Money:** Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting.	06
03	**Overview of Corporate Finance:** Objectives of Corporate Finance; Functions of Corporate Finance—Investment Decision, Financing Decision, and Dividend Decision. **Financial Ratio Analysis:** Overview of Financial Statements—Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.	09
04	**Capital Budgeting:** Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR)	10

	Working Capital Management: Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity's Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities.		
05	**Sources of Finance:** Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short Term Finance—Trade Credit, Bank Finance, Commercial Paper; Project Finance. **Capital Structure:** Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches— Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of Optimal Capital Structure	05	
06	**Dividend Policy:** Meaning and Importance of Dividend Policy; Factors Affecting an Entity's Dividend Decision; Overview of Dividend Policy Theories and Approaches— Gordon's Approach, Walter's Approach, and Modigliani- Miller Approach	03	

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1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
2. Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.
3. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.
4. Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) & Company Limited, New Delhi.

Assessment:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:
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4. Only Four question need to be solved.

Course Code	Course Name	Credits
IE2013	**Enterpreneurship Development and Management**	**03**

Objectives:

1. To acquaint with entrepreneurship and management of business
2. Understand Indian environment for entrepreneurship
3. Idea of EDP, MSME

Outcomes: Learner will be able to…

1. Understand the concept of business plan and ownerships
2. Interpret key regulations and legal aspects of entrepreneurship in India
3. Understand government policies for entrepreneurs

Module	Detailed Contents	Hrs
01	**Overview Of Entrepreneurship:** Definitions, Roles and Functions/Values of Entrepreneurship, History of Entrepreneurship Development, Role of Entrepreneurship in the National Economy, Functions of an Entrepreneur, Entrepreneurship and Forms of Business Ownership Role of Money and Capital Markets in Entrepreneurial Development: Contribution of Government Agencies in Sourcing information for Entrepreneurship	04
02	**Business Plans And Importance Of Capital To Entrepreneurship:** Preliminary and Marketing Plans, Management and Personnel, Start-up Costs and Financing as well as Projected Financial Statements, Legal Section, Insurance, Suppliers and Risks, Assumptions and Conclusion, Capital and its Importance to the Entrepreneur **Entrepreneurship And Business Development:** Starting a New Business, Buying an Existing Business, New Product Development, Business Growth and the Entrepreneur Law and its Relevance to Business Operations	09
03	Women's Entrepreneurship Development, Social entrepreneurship-role and need, EDP cell, role of sustainability and sustainable development for SMEs, case studies, exercises	05
04	**Indian Environment for Entrepreneurship:** key regulations and legal aspects , MSMED Act 2006 and its implications, schemes and policies of the Ministry of MSME, role and responsibilities of various government organisations, departments, banks etc., Role of State governments in terms of infrastructure developments and support etc., Public private partnerships, National Skill development Mission, Credit Guarantee Fund, PMEGP, discussions, group exercises etc	08
05	**Effective Management of Business:** Issues and problems faced by micro and small enterprises and effective management of M and S enterprises (risk management, credit availability, technology innovation, supply chain management, linkage with large industries), exercises, e-Marketing	08
06	**Achieving Success In The Small Business:** Stages of the small business life cycle, four types of firm-level growth strategies, Options – harvesting or closing small business Critical Success factors of small business	05

REFERENCES:

1. Poornima Charantimath, Entrepreneurship development- Small Business Enterprise, Pearson
2. Education Robert D Hisrich, Michael P Peters, Dean A Shapherd, Entrepreneurship, latest edition, The McGrawHill Company
3. Dr TN Chhabra, Entrepreneurship Development, Sun India Publications, New Delhi
4. Dr CN Prasad, Small and Medium Enterprises in Global Perspective, New century Publications, New Delhi
5. Vasant Desai, Entrepreneurial development and management, Himalaya Publishing House
6. Maddhurima Lall, Shikah Sahai, Entrepreneurship, Excel Books
7. Rashmi Bansal, STAY hungry STAY foolish, CIIE, IIM Ahmedabad
8. Law and Practice relating to Micro, Small and Medium enterprises, Taxmann Publication Ltd.
9. Kurakto, Entrepreneurship- Principles and Practices, Thomson Publication
10. Laghu Udyog Samachar
11. www.msme.gov.in
12. www.dcmesme.gov.in
13. www.msmetraining.gov.in

Assessment:

Internal:
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End Semester Theory Examination:

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4. Only Four question need to be solved.

Course Code	Course Name	Credits
IE2014	**Human Resource Management**	**03**

Objectives:

1. To introduce the students with basic concepts, techniques and practices of the human resource management.
2. To provide opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations.
3. To familiarize the students about the latest developments, trends & different aspects of HRM.
4. To acquaint the student with the importance of inter-personal & inter-group behavioral skills in an organizational setting required for future stable engineers, leaders and managers.

Outcomes: Learner will be able to…

1. Understand the concepts, aspects, techniques and practices of the human resource management.
2. Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.
3. Gain knowledge about the latest developments and trends in HRM.
4. Apply the knowledge of behavioral skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers.

Module	Detailed Contents	Hrs
01	**Introduction to HR** • Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions. • Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring and rightsizing, Empowerment, TQM, Managing ethical issues.	5
02	**Organizational Behavior (OB)** • Introduction to OB Origin, Nature and Scope of Organizational Behavior, Relevance to Organizational Effectiveness and Contemporary issues • Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness • Perception: Attitude and Value, Effect of perception on Individual Decision-making, Attitude and Behavior. • Motivation: Theories of Motivation and their Applications for Behavioral Change (Maslow, Herzberg, McGregor); • Group Behavior and Group Dynamics: Work groups formal and informal groups and stages of group development. Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team. • Case study	7
03	**Organizational Structure &Design** • Structure, size, technology, Environment of organization; Organizational Roles & conflicts: Concept of roles; role dynamics; role conflicts and	6

		stress. • Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership. • Power and Politics: Sources and uses of power; Politics at workplace, Tactics and strategies.	
04		**Human resource Planning** • Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale. • Performance Appraisal Systems: Traditional & modern methods, Performance Counseling, Career Planning. • Training & Development: Identification of Training Needs, Training Methods	5
05		**Emerging Trends in HR** • Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development , managing processes & transformation in HR. Organizational Change, Culture, Environment • Cross Cultural Leadership and Decision Making: Cross Cultural Communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women and ageing people, intra company cultural difference in employee motivation.	6
06		**HR & MIS** Need, purpose, objective and role of information system in HR, Applications in HRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals, Hotels and service industries **Strategic HRM** Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making; Strategic Intent – Corporate Mission, Vision, Objectives and Goals **Labor Laws & Industrial Relations** Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act	10

REFERENCES:

1. Stephen Robbins, Organizational Behavior, 16th Ed, 2013
2. V S P Rao, Human Resource Management, 3rd Ed, 2010, Excel publishing
3. Aswathapa, Human resource management: Text & cases, 6th edition, 2011
4. C. B. Mamoria and S V Gankar, Dynamics of Industrial Relations in India, 15th Ed, 2015, Himalaya Publishing, 15thedition, 2015
5. P. Subba Rao, Essentials of Human Resource management and Industrial relations, 5th Ed, 2013, Himalaya Publishing
6. Laurie Mullins, Management & Organizational Behavior, Latest Ed, 2016, Pearson Publications

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Course Code	Course Name	Credits
IE2015	**Professional Ethics and Corporat Social Responsibility (CSR)**	**03**

Objectives:

1. To understand professional ethics in business
2. To recognized corporate social responsibility

Outcomes: Learner will be able to…

1. Understand rights and duties of business
2. Distinguish different aspects of corporate social responsibility
3. Demonstrate professional ethics
4. Understand legal aspects of corporate social responsibility

Module	Detailed Contents	Hrs
01	**Professional Ethics and Business:** The Nature of Business Ethics; Ethical Issues in Business; Moral Responsibility and Blame; Utilitarianism: Weighing Social Costs and Benefits; Rights and Duties of Business	04
02	**Professional Ethics in the Marketplace:** Perfect Competition; Monopoly Competition; Oligopolistic Competition; Oligopolies and Public Policy **Professional Ethics and the Environment:** Dimensions of Pollution and Resource Depletion; Ethics of Pollution Control; Ethics of Conserving Depletable Resources	08
03	**Professional Ethics of Consumer Protection:** Markets and Consumer Protection; Contract View of Business Firm's Duties to Consumers; Due Care Theory; Advertising Ethics; Consumer Privacy **Professional Ethics of Job Discrimination:** Nature of Job Discrimination; Extent of Discrimination; Reservation of Jobs.	06
04	**Introduction to Corporate Social Responsibility:** Potential Business Benefits—Triple bottom line, Human resources, Risk management, Supplier relations; Criticisms and concerns—Nature of business; Motives; Misdirection. Trajectory of Corporate Social Responsibility in India	05
05	**Corporate Social Responsibility:** Articulation of Gandhian Trusteeship Corporate Social Responsibility and Small and Medium Enterprises (SMEs) in India, Corporate Social Responsibility and Public-Private Partnership (PPP) in India	08
06	**Corporate Social Responsibility in Globalizing India:** Corporate Social Responsibility Voluntary Guidelines, 2009 issued by the Ministry of Corporate Affairs, Government of India, Legal Aspects of Corporate Social Responsibility—Companies Act, 2013.	08

REFERENCES:

1. Business Ethics: Texts and Cases from the Indian Perspective (2013) by Ananda Das Gupta; Publisher: Springer.
2. Corporate Social Responsibility: Readings and Cases in a Global Context (2007) by Andrew Crane, Dirk Matten, Laura Spence; Publisher: Routledge.
3. Business Ethics: Concepts and Cases, 7th Edition (2011) by Manuel G. Velasquez; Publisher: Pearson, New Delhi.
4. Corporate Social Responsibility in India (2015) by BidyutChakrabarty, Routledge, New Delhi.

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4. Only Four question need to be solved.

Course Code	Course Name	Credits
IE2016	**Research Methodology**	**03**

Objectives:

1. To understand Research and Research Process
2. To acquaint students with identifying problems for research and develop research strategies
3. To familiarize students with the techniques of data collection, analysis of data and interpretation

Outcomes: Learner will be able to…

1. Prepare a preliminary research design for projects in their subject matter areas
2. Accurately collect, analyze and report data
3. Present complex data or situations clearly
4. Review and analyze research findings

Module	Detailed Contents	Hrs
01	**Introduction and Basic Research Concepts** Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle.Research methods vs Methodology Need of Research in Business and Social Sciences Objectives of Research **Issues** and Problems in Research Characteristics of Research:Systematic, Valid, Verifiable, Empirical and Critical	**09**
02	**Types of Research** Basic Research Applied Research Descriptive Research Analytical Research Empirical Research 　　2.6 Qualitative and Quantitative Approaches	**07**
03	**Research Design and Sample Design** Research Design – Meaning, Types and Significance Sample Design – Meaning and Significance Essentials of a good sampling Stages in Sample Design Sampling methods/techniques Sampling Errors	**07**
04	**Research Methodology** 4.1 Meaning of Research Methodology 4.2. Stages in Scientific Research Process: **a.** Identification and Selection of Research Problem **b.** Formulation of Research Problem **c.** Review of Literature **d.** Formulation of Hypothesis **e.** Formulation of research Design **f.** Sample Design **g.** Data Collection **h.** Data Analysis **i.** Hypothesis testing and Interpretation of Data	**08**

	j. Preparation of Research Report	
05	**Formulating Research Problem** **5.1** Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis	**04**
06	**Outcome of Research** Preparation of the report on conclusion reached Validity Testing & Ethical Issues Suggestions and Recommendation	**04**

REFERENCES:

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers Distributors.
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd ed), Singapore, Pearson Education

Assessment:

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End Semester Theory Examination:
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4. Only Four question need to be solved.

Course Code	Course Name	Credits
IE2017	**IPR and Patenting**	**03**

Objectives:

1. To understand intellectual property rights protection system
2. To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures
3. To get acquaintance with Patent search and patent filing procedure and applications

Outcomes: Learner will be able to…

1. understand Intellectual Property assets
2. assist individuals and organizations in capacity building
3. work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting

Module	Detailed Contents	Hr
01	**Introduction to Intellectual Property Rights (IPR)**: Meaning of IPR, Different category of IPR instruments - Patents, Trademarks,Copyrights, Industrial Designs, Plant variety protection, Geographical indications,Transfer of technology etc. **Importance of IPR in Modern Global Economic Environment:** Theories of IPR, Philosophical aspects of IPR laws, Need for IPR, IPR as an instrument of development	05
02	**Enforcement of Intellectual Property Rights:** Introduction, Magnitude of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) activein IPR enforcement **Indian Scenario of IPR:**Introduction, History of IPR in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level etc.	07
03	**Emerging Issues in IPR:**Challenges for IP in digital economy, e-commerce, human genome,biodiversity and traditional knowledge etc.	05
04	**Basics of Patents:**Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition etc), Process Patent and Product Patent, Precautions while patenting, Patent specification Patent claims, Disclosures and non-disclosures, Patent rights and infringement, Method of getting a patent	07
05	**Patent Rules:** Indian patent act, European scenario, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.)	08
06	**Procedure for Filing a Patent (National and International):** Legislation and Salient Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publicationetc, Time frame and cost, Patent Licensing, Patent Infringement	07

	Patent databases: Important websites, Searching international databases	

REFERENCE BOOKS:

1. Rajkumar S. Adukia, 2007, A Handbook on Laws Relating to Intellectual Property Rights in India, The Institute of Chartered Accountants of India
2. Keayla B K, Patent system and related issues at a glance, Published by National Working Group on Patent Laws
3. T Sengupta, 2011, Intellectual Property Law in India, Kluwer Law International
4. Tzen Wong and Graham Dutfield, 2010, Intellectual Property and Human Development: Current Trends and Future Scenario, Cambridge University Press
5. Cornish, William Rodolph & Llewelyn, David. 2010, Intellectual Property: Patents, Copyrights, Trade Marks and Allied Right, 7th Edition, Sweet & Maxwell
6. Lous Harns, 2012, The enforcement of Intellactual Property Rights: A Case Book, 3rd Edition, WIPO
7. Prabhuddha Ganguli, 2012, Intellectual Property Rights, 1st Edition, TMH
8. R Radha Krishnan & S Balasubramanian, 2012, Intellectual Property Rights, 1st Edition, Excel Books
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10. Kompal Bansal and Praishit Bansal, 2012, Fundamentals of IPR for Engineers, 1st Edition, BS Publications
11. Entrepreneurship Development and IPR Unit, BITS Pilani, 2007, A Manual on Intellectual Property Rights,
12. Mathew Y Maa, 2009, Fundamentals of Patenting and Licensing for Scientists and Engineers, World Scientific Publishing Company
13. N S Rathore, S M Mathur, Priti Mathur, Anshul Rathi, IPR: Drafting,Interpretation of Patent Specifications and Claims, New India Publishing Agency
14. Vivien Irish, 2005, Intellectual Property Rights for Engineers,IET
15. Howard B Rockman, 2004, Intellectual Property Law for Engineers and scientists, Wiley-IEEE Press

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4. Only Four question need to be solved.

Course Code	Course Name	Credits
IE2018	**Digital Business Management**	**03**

Objectives:

1. To familiarize with digital business concept
2. To acquaint with E-commerce
3. To give insights into E-business and its strategies

Outcomes: The learner will be able to …..

1. Identify drivers of digital business
2. Illustrate various approaches and techniques for E-business and management
3. Prepare E-business plan

Module	Detailed content	Hours
1	**Introduction to Digital Business-** Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy, **Drivers of digital business**- Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things(digitally intelligent machines/services) Opportunities and Challenges in Digital Business,	09
2	**Overview of E-Commerce** **E-Commerce-** Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals Other E-C models and applications, innovative EC System-From E- government and learning to C2C, mobile commerce and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, Using Affiliate marketing to promote your e- commerce business, Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC	06

3	**Digital Business Support services**: ERP as e –business backbone, knowledge Tope Apps, Information and referral system **Application Development:** Building Digital business Applications and Infrastructure	06
4	**Managing E-Business**-Managing Knowledge, Management skills for e-business, Managing Risks in e –business Security Threats to e-business -Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications	06
5	**E-Business Strategy**-E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy, E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation)	04
6	**Materializing e-business: From Idea to Realization**-Business plan preparation **Case Studies and presentations**	08

References:

1. A textbook on E-commerce**,** Er Arunrajan Mishra, Dr W K Sarwade,Neha Publishers & Distributors, 2011
2. E-commerce from vision to fulfilment, Elias M. Awad, PHI-Restricted, 2002
3. Digital Business and E-Commerce Management, 6th Ed, Dave Chaffey, Pearson, August 2014
4. Introduction to E-business-Management and Strategy, Colin Combe, ELSVIER, 2006
5. Digital Business Concepts and Strategy, Eloise Coupey, 2nd Edition, Pearson
6. Trend and Challenges in Digital Business Innovation, VinocenzoMorabito, Springer
7. Digital Business Discourse Erika Darics, April 2015, Palgrave Macmillan
8. E-Governance-Challenges and Opportunities in : Proceedings in 2nd International Conference theory and practice of Electronic Governance
9. Perspectives the Digital Enterprise –A framework for Transformation, TCS consulting journal Vol.5
10. Measuring Digital Economy-A new perspective -DOI:10.1787/9789264221796-enOECD Publishing

Assessment:

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Course Code	Course Name	Credits
IE2019	**Environmental Management**	**03**

Objectives:

1. Understand and identify environmental issues relevant to India and global concerns
2. Learn concepts of ecology
3. Familiarise environment related legislations

Outcomes: Learner will be able to…

1. Understand the concept of environmental management
2. Understand ecosystem and interdependence, food chain etc.
3. Understand and interpret environment related legislations

Module	Detailed Contents	Hrs
01	Introduction and Definition of Environment: Significance of Environment Management for contemporary managers, Career opportunities. Environmental issues relevant to India, Sustainable Development, The Energy scenario.	10
02	Global Environmental concerns : Global Warming, Acid Rain, Ozone Depletion, Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Man-made disasters, Atomic/Biomedical hazards, etc.	06
03	Concepts of Ecology: Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc.	05
04	Scope of Environment Management, Role & functions of Government as a planning and regulating agency. Environment Quality Management and Corporate Environmental Responsibility	10
05	Total Quality Environmental Management, ISO-14000, EMS certification.	05
06	General overview of major legislations like Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc.	03

REFERENCES:

1. Environmental Management: Principles and Practice, C J Barrow,

Routledge Publishers London, 1999
2. A Handbook of Environmental Management Edited by Jon C. Lovett and David G. Ockwell, Edward Elgar Publishing
3. Environmental Management, **T V Ramachandra and Vijay Kulkarni, TERI Press**
4. Indian Standard Environmental Management Systems — Requirements With Guidance For Use, Bureau Of Indian Standards, February 2005
5. Environmental Management: An Indian Perspective, S N Chary and Vinod Vyasulu, Maclillan India, 2000

6. Introduction to Environmental Management, Mary K Theodore and Louise Theodore, CRC Press
7. Environment and Ecology, Majid Hussain, 3rd Ed. Access Publishing. 2015

<u>Assessment</u>:

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