University of Mumbai

No. AAMS_UGS/ICC/2022-23/167

CIRCULAR:-

Sub :- M.E. Degree Course by adding new branch for (Information Security).

Ref :- RB/MU-2022/CR-263/Edn-5/1004, dated 12th September, 2022.

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/2022-23/86 dated 20th August, 2022, relating to the adding new branch for (Artificial Intelligence and Data Science) (CBCS).

They 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 vide item No. 6 and subsequently passed by in the faculty of Science & Technology and then by the Board of Deans at its meeting held on 05th July, 2022 **vide** item No.6.29 (N) have been accepted by the Academic Council at its meeting held on 11th July, 2022 **vide** item No. 6.29 (A) and subsequently approved by the Management Council at its meeting held on 28th July, 2022 **vide** item No. 8 and that in accordance therewith, in exercise of the powers conferred upon the Management Council under Section 74(4) of the Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017) for the **Ordinance 5134 relating to M.E. Degree Course has been by adding new branch for (Information Security)**, and to read as under:-

Amendment of O. 5134 relating to M.E. Degree Course has been by adding new branch for (Information Security).

Existing O. 5134 :-

Any person who has passed an examination for the Degree of Bachelor of Engineering of this University or the degree of Bachelor of Engineering of any other University recognized as equivalent to the Bachelor of Engineering degree of the University is deemed eligible for admission to the Masters degree course in Engineering in the specific branch in which he/she has taken the degree of Bachelor of Engineering of a related branch as listed below :-

Master of Engineering	Bachelor of Engineering
1. Civil Engineering with (i) Environmental Engineering Subjects (ii) Hydraulics Engineering Subjects (iii) Water Resource Engineering Subjects	a. Civil Engineering OR b. Environmental Engineering OR c. Construction Engineering OR d. Water Management

1. Civil Engineering with (iv) Structural Engineering Subjects (v) Construction Management Subjects (vi) Goo-technical Engineering Subjects (vii) Traffic and Transportation Engineering Subjects	a. Civil Engineering OR b. Construction Engineering OR c. Structural Engineering
1. Civil Engineering - Construction Engineering and Management	a. Civil Engineering OR b. Construction Engineering
2. Mechanical Engineering with (i) Machine Design Subjects (ii) Automobile Engineering Subjects (iii) CAD/ CAM & Robotics subjects	a. Mechanical Engineering OR b. Automobile engineering OR c. Production Engineering OR d. Aerospace / Aeronautical Engineering
2. Mechanical Engineering with (iv) Fluid Pumping Machine Subjects (v) Internal Combustion Engineering Subject (vi) Thermal Engineering Subjects (vii) Heat Power subjects (viii) Energy Engineering subjects	a. Mechanical Engineering OR b. Automobile Engineering OR c. Aerospace / Aeronautical Engineering
2. Mechanical Engineering with (viii) Manufacturing systems Engineering subjects (ix) Production Engineering subjects	a. Mechanical Engineering OR b. Automobile Engineering OR c. Production Engineering OR d. Industrial Engineering OR e. Machine Tool Engineering OR f. Metallurgical Engineering
2. Mechanical Engineering i) Energy System & Management ii) Product Design & Development	a. Mechanical Engineering OR b. Automobile Engineering OR c. Production Engineering OR d. Aerospace Engineering
3. Production Engineering	a. Mechanical Engineering OR b. Automobile Engineering OR c. Production Engineering OR d. Industrial Engineering OR e. Machine Tool Engineering OR f. Metallurgical Engineering
4. Electrical Engineering with (i) Control Systems Engineering Subjects (ii) Power Systems Engineering Subjects (iii) Power Electronics and Drives	a. Electrical Engineering OR b. Electronics Engineering OR c. Instrumentation Engineering OR d. Power Electronics OR e. Electronics and Power OR f. Industrial Electronics OR g. Electronics and Telecommunication Engineering

4. Electrical Engineering - Power Plant Engineering & Energy Management	a. Electrical Engineering OR b. Electronics & Power OR c. Power Engineering OR d. Instrumentation Engineering
5. Electronics Engineering **6. Electronics & Telecommunication Engineering**	a. Electrical Engineering Or b. Electronics Engineering OR c. Electronics and Telecommunication Engineering OR d. Instrumentation Engineering OR e. Computer Engineering OR f. Power Engineering OR g. Biomedical Engineering OR h. Information Technology
7. Instrumentation Engineering **8. Instrumentation & Control Engineering**	a. Electrical Engineering OR b. Electronics engineering OR c. Instrumentation Engineering OR d. Power Electronics OR e. Biomedical Engineering OR f. Mechanical Engineering OR g. Chemical Engineering
9. Computer Engineering	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics and Telecommunication Engineering e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
10. Information Technology **11. Information Technology in Information Security** **12. Information Technology in Information and Cyber warfare** **13. Information Technology in AI and Robotics**	All Branches of the Bachelor of Engineering/ Technology degree courses
14. Biomedical Engineering	a. Biomedical Engineering OR b. Computer Engineering OR c. Instrumentation Engineering OR d. Electronics Engineering OR e. Electronics and Telecommunication Engineering OR f. Electrical Engineering OR g. Information Technology OR h. Electronics and Power Engineering OR i. Electrical and Electronics Engineering OR j. Power Electronics
15. Chemical Engineering	a. Chemical Engineering OR b. Chemical Technology OR c. Petrochemical Engineering OR d. Petroleum Engineering OR e. Biotechnology

16. Signal Processing	a. Electrical Engineering OR b. Electronics Engineering OR c. Electronics & Telecommunication Engineering OR d. Instrumentation Engineering OR e. Computer Engineering OR f. Power Electronics OR g. Biomedical Engineering
17. Packing Technology	a. B.E. (Printing & Packing Technology) OR b. B.E. (Printing Technology) OR c. B.E. (Packing Technology) OR d. B.E. (Mechanical Engineering) OR e. B.E. (Chemical Engineering) OR f. B.E. (Plastic Engineering) OR g. B.E. (Polymers Engineering) OR h. B.E. (Food Technology) OR i. B.E. (Bio-Technology)
18. Advance Communication & Information System	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics & Telecommunication Engineering Or e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
19. Artificial Intelligence	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics and Telecommunication Engineering OR e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
20. Artificial Intelligence and Data Science	All Branches of the Bachelor of Engineering/ Technology degree courses

Notwithstanding what is stated above, candidate who have passed the Section A and section B examination conducted by the (1) The Institution of Engineers (India), Kolkota 700020 and (2) Institution of Electronics and Telecommunication Engineers (India), New Delhi, is deemed eligible for admission to the Master of Engineering degree course in the specific branch in which they have passed Section A and Section B examination of a related branch as listed above.

And.

Any person who has passed an examination for the Degree of Bachelor of Engineering of this University or the Degree of Bachelor of Engineering/ Bachelor of Technology of any other University recognized as equivalent to the Bachelor of Engineering Degree of this University is deemed eligible for admission to the Master degree course in Engineering / Technology in the specific branch in which he / she has taken the degree of Bachelor of Engineering / Bachelor of Technology of a related branch as listed below:

Master of Technology	Bachelor of Engineering/ Bachelor of Technology
1. Computer Engineering	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics & Tele-Communication Engineering OR e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
2. Chemical Engineering	a. Chemical Engineering OR b. Chemical Technology OR c. Petrochemical Engineering OR d. Petroleum Engineering OR e. Biotechnology
3. Artificial Intelligence	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR g. Electronics and Telecommunication Engineering OR h. Instrumentation Engineering OR i. Information Technology OR g. Power Electronics
4. Transportation Engineering	a. Civil Engineering OR b. Construction Engineering OR c. Structural Engineering

The Amended Ordinance 5134:-

Any person who has passed an examination for the Degree of Bachelor of Engineering of this University or the degree of Bachelor of Engineering of any other University recognized as equivalent to the Bachelor of Engineering degree of the University is deemed eligible for admission to the Masters degree course in Engineering in the specific branch in which he/she has taken the degree of Bachelor of Engineering of a related branch as listed below :-

Master of Engineering	Bachelor of Engineering
1. Civil Engineering with (i) Environmental Engineering Subjects (ii) Hydraulics Engineering Subjects (iii)Water Resource Engineering Subjects	a. Civil Engineering OR b. Environmental Engineering OR c. Construction Engineering OR d. Water Management
1. Civil Engineering with (iv) Structural Engineering Subjects (v) Construction Management Subjects (vi) Goo-technical Engineering Subjects (vii) Traffic and Transportation Engineering Subjects	a. Civil Engineering OR b. Construction Engineering OR c. Structural Engineering

1. Civil Engineering – Construction Engineering and Management	a. Civil Engineering OR b. Construction Engineering
2. Mechanical Engineering with (i) Machine Design Subjects (ii) Automobile Engineering Subjects (iii) CAD/ CAM & Robotics subjects	a. Mechanical Engineering OR b. Automobile engineering OR c. Production Engineering OR d. Aerospace / Aeronautical Engineering
2. Mechanical Engineering with (iv) Fluid Pumping Machine Subjects (v) Internal Combustion Engineering Subject (vi) Thermal Engineering Subjects (vii) Heat Power subjects (viii) Energy Engineering subjects	a. Mechanical Engineering OR b. Automobile Engineering OR c. Aerospace / Aeronautical Engineering
2. Mechanical Engineering with (ix) Manufacturing systems Engineering subjects (x) Production Engineering subjects	a. Mechanical Engineering OR b. Automobile Engineering OR c. Production Engineering OR d. Industrial Engineering OR e. Machine Tool Engineering OR f. Metallurgical Engineering
2. Mechanical Engineering i) Energy System & Management ii) Product Design & Development	a. Mechanical Engineering OR b. Automobile Engineering OR c. Production Engineering OR d. Aerospace Engineering
3. Production Engineering	a. Mechanical Engineering OR b. Automobile Engineering OR c. Production Engineering OR d. Industrial Engineering OR e. Machine Tool Engineering OR f. Metallurgical Engineering
4. Electrical Engineering with (i) Control Systems Engineering Subjects (ii) Power Systems Engineering Subjects (iii) Power Electronics and Drives	a. Electrical Engineering OR b. Electronics Engineering OR c. Instrumentation Engineering OR d. Power Electronics OR e. Electronics and Power OR f. Industrial Electronics OR g. Electronics and Telecommunication Engineering
4. Electrical Engineering – Power Plant Engineering & Energy Management	a. Electrical Engineering OR b. Electronics & Power OR c. Power Engineering OR d. Instrumentation Engineering
5. Electronics Engineering 6. Electronics &Telecommunication Engineering	a. Electrical Engineering Or b. Electronics Engineering OR c. Electronics and Telecommunication Engineering OR d. Instrumentation Engineering OR e. Computer Engineering OR f. Power Engineering OR g. Biomedical Engineering OR h. Information Technology

7. Instrumentation Engineering 8. Instrumentation & Control Engineering	a. Electrical Engineering OR b. Electronics engineering OR c. Instrumentation Engineering OR d. Power Electronics OR e. Biomedical Engineering OR f. Mechanical Engineering OR g. Chemical Engineering
9. Computer Engineering	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics and Telecommunication Engineering e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
10. Information Technology 11. Information Technology in Information Security 12. Information Technology in Information and Cyber warfare 13. Information Technology in AI and Robotics	All Branches of the Bachelor of Engineering/ Technology degree courses
14. Biomedical Engineering	a. Biomedical Engineering OR b. Computer Engineering OR c. Instrumentation Engineering OR d. Electronics Engineering OR e. Electronics and Telecommunication Engineering OR f. Electrical Engineering OR g. Information Technology OR h. Electronics and Power Engineering OR i. Electrical and Electronics Engineering OR j. Power Electronics
15. Chemical Engineering	a. Chemical Engineering OR b. Chemical Technology OR c. Petrochemical Engineering OR d. Petroleum Engineering OR e. Biotechnology
16. Signal Processing	a. Electrical Engineering OR b. Electronics Engineering OR c. Electronics & Telecommunication Engineering OR d. Instrumentation Engineering OR e. Computer Engineering OR f. Power Electronics OR g. Biomedical Engineering
17. Packing Technology	a. B.E. (Printing & Packing Technology) OR b. B.E. (Printing Technology) OR c. B.E. (Packing Technology) OR d. B.E. (Mechanical Engineering) OR e. B.E. (Chemical Engineering) OR

	f. B.E. (Plastic Engineering) OR g. B.E. (Polymers Engineering) OR h. B.E. (Food Technology) OR i. B.E. (Bio-Technology)
18. Advance Communication & Information System	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics & Telecommunication Engineering Or e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
19. Artificial Intelligence	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics & Telecommunication Engineering Or e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
20. Artificial Intelligence and Data Science	All Branches of the Bachelor of Engineering/ Technology degree courses
21. Information Security	**Passed B.E./B/Tech. and as per the O.5134**

Notwithstanding what is stated above, candidate who have passed the Section A and section B examination conducted by the (1) The Institution of Engineers (India), Kolkota 700020 and (2) Institution of Electronics and Telecommunication Engineers (India), New Delhi, is deemed eligible for admission to the Master of Engineering degree course in the specific branch in which they have passed Section A and Section B examination of a related branch as listed above.

And

Any person who has passed an examination for the Degree of Bachelor of Engineering of this University or the Degree of Bachelor of Engineering/ Bachelor of Technology of any other University recognized as equivalent to the Bachelor of Engineering Degree of this University is deemed eligible for admission to the Master degree course in Engineering / Technology in the specific branch in which he / she has taken the degree of Bachelor of Engineering / Bachelor of Technology of a related branch as listed below:

Master of Technology	**Bachelor of Engineering/ Bachelor of Technology**
1. Computer Engineering	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics & Telecommunication Engineering Or e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics

2. Chemical Engineering	a. Chemical Engineering OR b. Chemical Technology OR c. Petrochemical Engineering OR d. Petroleum Engineering OR e. Biotechnology
3. Artificial Intelligence	a. Computer Engineering OR b. Electrical Engineering OR c. Electronics Engineering OR d. Electronics & Telecommunication Engineering Or e. Instrumentation Engineering OR f. Information Technology OR g. Power Electronics
4. Transportation Engineering	a. Civil Engineering OR b. Construction Engineering OR c. Structural Engineering

from the academic year 2021-22. (The circular is available on the University's website www.mu.ac.in).

2.12.22

MUMBAI – 400 032
17th November, 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/6.29 (A) /11/07/2022
M.C./8/28/07/2022

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.

py for information and necessary action :-

1. **The Deputy Registrar, College Affiliations & Development Depart (CAD),**
2. **College Teachers Approval Unit (CTA),**
3. **The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),**
4. **The Deputy Registrar, Academic Appointments & Quality Assu (AAQA)**
5. **The Deputy Registrar, Research Administration & Promotion Cell (RAPC),**
6. **The Deputy Registrar, Executive Authorities Section (EA)**
   He is requested to treat this as action taken report on the conce resolution adopted by the Academic Council referred to the a circular.
7. **The Deputy Registrar, PRO, Fort, (Publication Section),**
8. **The Deputy Registrar, Special Cell,**
9. **The Deputy Registrar, Fort Administration Department (FAD) Record Section,**
10. **The Deputy Registrar, Vidyanagari Administration Department (VAD),**

Copy for information :-

1. **The Director, Dept. of Information and Communication Techn (DICT), Vidyanagari,**
   He is requested to upload the Circular University Website
2. **The Director of Department of Student Development (DSD),**
3. **The Director, Institute of Distance and Open Learning (IDOL Admi Vidyanagari,**
4. **All Deputy Registrar, Examination House,**
5. **The Deputy Registrars, Finance & Accounts Section,**
6. **The Assistant Registrar, Administrative sub-Campus Thane,**
7. **The Assistant Registrar, School of Engg. & Applied Sciences, Kaly**
8. **The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,**
9. **P.A to Hon'ble Vice-Chancellor,**
10. **P.A to Pro-Vice-Chancellor,**
11. **P.A to Registrar,**
12. **P.A to All Deans of all Faculties,**
13. **P.A to Finance & Account Officers, (F & A.O),**
14. **P.A to Director, Board of Examinations and Evaluation,**
15. **P.A to Director, Innovation, Incubation and Linkages,**
16. **P.A to Director, Department of Lifelong Learning and Extension (DLLE),**
17. **The Receptionist,**
18. **The Telephone Operator,**

Copy with compliments for information to :-

19. **The Secretary, MUASA**
20. **The Secretary, BUCTU.**

AC – 11 July, 2022
Item No. – 6.29 (N)

University of Mumbai

Syllabus for

M.E. (Information Security)

(Sem. - I to IV)

(Choice Based Credit System)

(Introduced from the academic year 2021-22 and 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:_____ Duration of Course	2 Years
R:_____ Intake Capacity	18
R:_____ Scheme of Examination	CBCS R21
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: 2021-22 and 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

From Co-ordinator's Desk:-

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) give freedom to affiliated Institutes to add few (PEO's) course objectives course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, developed curriculum accordingly. In addition to outcome based education, **Choice Based Credit System** is also introduced to ensure quality of engineering education.

Choice Based Credit and Grading System enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes Faculty of Technology has devised a transparent credit assignment policy adopted ten points scale to grade learner's performance. Credit system was implemented for First Year of Engineering fromthe academic year 2016-2017. Subsequently this system will be carried forward for Second Year Engineering in the academic year 2017-2018, for Third Year Final Year Engineering in the academic years 2018-2019, 2019-2020, respectively.

Dr. S. K. Ukarande

Co-ordinator,

Faculty of Technology,

Member - Academic Council

University of Mumbai, Mumbai

Preamble

It is an honor and a privilege to present the revised syllabus of Master of Engineering in Information Technology (effective from year 2016-17) with inclusion of cutting edge technology.

Information Technology is comparatively a young branch among other engineering disciplines in University of Mumbai. It is evident from the placement statistics of various colleges affiliated to University of Mumbai that IT branch has taken the lead in the placement. The branch also provides multi-faceted scope like better placement and promotion of entrepreneurship culture among students, and increased Industry Institute Interactions.

It has been observed that graduate engineers having work experience in IT industry would prefer to pursue their post graduate studies in IT in spite of having done their graduation degree in any branch . Keeping these aspects in mind, University of Mumbai has designed postgraduate courses as per current requirements of IT industry.

The syllabus is peer reviewed by experts from reputed industries and as per their suggestions it covers future trends in IT technology and research opportunities available due to these trends.

I would like to thank senior faculties of IT department of all colleges affiliated to Mumbai University for significant contribution in framing the syllabus. Also behalf of all faculties I thank all the industry experts for their valuable feedback and suggestions.

I sincerely hope that the revised syllabus will help all post graduate engineers to face the future challenges in the field of information and technology

Program Outcome for Postgraduate Program in Information Technology

1. Apply Core Information Technology knowledge to develop stable and secure IT system
2. Design, IT infrastructures for an enterprise using concepts of best practices in information Technology management and security to enterprise processes.
3. Manage IT projects using written and oral communication skills in collaborative environments by Participating on teams that address solutions for IT management challenges.
4. Identify and discuss professional, individual, organizational, societal, and regulatory implications of Information systems and technology.
5. Assess Security of the IT Systems and able to respond to any breach in IT system
6. Ability to work in multidisciplinary projects and make it IT enabled.
7. Ability to propose the system to reduce carbon footprint.
8. Ability to adapt the lifelong learning process to be in sync with trends in Information Technology

Dr. Deven Shah

Chairman (Ad-hoc Board Information Technology)

University of Mumbai)

Program Structure for M. E. Information Security
Mumbai University
(With Effect from 2021-22 and 2022-2023)

Semester I

Subject Code	Subject Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ME-ISC101	Advanced Web Technologies	04	--	--	04	--	--	04
ME-ISC102	IT Infrastructure Design	04	--	--	04	--	--	04
ME-ISC103	Cryptography and PKI	04	--	--	04	--	--	04
ME-ISDLOC-I104	Department Level Optional Course-I	04	--	--	04	--	--	04
ME-ISILOC-I105	Institute Level Optional Course-I	03	--	--	03	--	--	03
ME-ISL101	Laboratory-I	--	02	--	--	01	--	01
ME-ISL102	Laboratory-II	--	02	--	--	01	--	01
Total		**19**	**04**	**--**	**19**	**02**	**--**	**21**

Subject Code	Subject Name	Examination Scheme							
		Theory					Term Work	Pract./ oral	Total
		Internal Assessment			End Sem. Exam.	Exam Duration (thr)			
		Test1	Test 2	Avg.					
ME-ISC101	Advanced Web Technologies	20	20	20	80	3	--	--	100
ME-ISC102	IT Infrastructure Design	20	20	20	80	3	--	--	100
ME-ISC103	Cryptography and PKI	20	20	20	80	3	--	--	100
ME-ISDLOC-I104	Department Level Optional Course-I	20	20	20	80	3	--	--	100
ME-ISILOC-I105	Institute Level Optional Course-I	20	20	20	80	3	--	--	100
ME-ISL101	Laboratory-I	--	--	--	--		25	25	50
ME-ISL102	Laboratory-II	--	--	--	--		25	25	50
Total		**100**	**100**	**100**	**400**		**50**	**50**	**600**

 # Department Level Optional Course (DLOC)

Every student is required to take one Department Level Optional Course for Semester I and Semester II. Different sets of courses will run in both the semesters. Students can take these courses from the list of department electives, which are closely allied to their disciplines.

 # Institute Level Optional Course (ILOC)

Every student is required to take one Institute Level Optional Course for Semester I and Semester II, which is not closely allied to their disciplines. Different sets of courses will run in the both the semesters.

Subject Code	**Department Level Optional Course (DLOC)**	**Subject Code**	**Institute Level Optional Course (ILOC)**
Semester I			
ME-ISDLOC-I1041	Ad-hoc Networks	ME-ISILOC-I1051	Product Lifecycle Management
ME-ISDLOC-I1042	IoT	ME-ISILOC-I1052	Reliability Engineering
ME-ISDLOC-I1043	Cloud Computing	ME-ISILOC-I1053	Management Information System
ME-ISDLOC-I1044	Unix OS & OS Security	ME-ISILOC-I1054	Design of Experiments
		ME-ISILOC-I1055	Operation Research
		ME-ISILOC-I1056	Cyber Security and Laws
		ME-ISILOC-I1057	Disaster Management and Mitigation Measures
		ME-ISILOC-I1058	Energy Audit and Management

End Semester Examination: In all six questions to be set, each of 20 marks, out of these any four questions to be attempted by students. Each question will comprise of mixed questions from different units of the subjects.

Semester II

Subject Code	Subject Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ME-ISC201	Network Security	04	--	--	04	--	--	04
ME-ISC202	Application and Web Security	04	--	--	04	--	--	04
ME-ISC203	Security & Risk Management	04	--	--	04	--	--	04
ME-ISDLOC-II204	Department Level Optional Course-I	04	--	--	04	--	--	04
ME-ISILOC-II205	Institute Level Optional Course-I	03	--	--	03	--	--	03
ME-ISL201	Laboratory-III	--	02	--	--	01	--	01
ME-ISL202	Laboratory-IV	--	02	--	--	01	--	01
Total		**19**	**04**	**--**	**19**	**02**	**--**	**21**

Subject Code	Subject Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem. Exam	Exam Duration(hrs)	Term Work	Pract./ oral	Total
		Test1	Test 2	Avg.					
ME-ISC201	Network Security	20	20	20	80	3	--	--	100
ME-ISC202	Application and Web Security	20	20	20	80	3	--	--	100
ME-ISC203	Security & Risk Management	20	20	20	80	3	--	--	100
ME-ISDLOC-II204	Department Level Optional Course-I	20	20	20	80	3	--	--	100
ME-ISILOC-II205	Institute Level Optional Course-I	20	20	20	80	3	--	--	100
ME-ISL201	Laboratory-III	--	--	--	--		25	25	50
ME-ISL202	Laboratory-IV	--	--	--	--		25	25	50
Total		**100**	**100**	**100**	**400**		**50**	**50**	**600**

 # Department Level Optional Course (DLOC)

Every student is required to take one Department Level Optional Course for Semester I and Semester II. Different sets of courses will run in both the semesters. Students can take these courses from the list of department electives, which are closely allied to their disciplines.

 # Institute Level Optional Course (ILOC)

Every student is required to take one Institute Level Optional Course for Semester I and Semester II, which is not closely allied to their disciplines. Different sets of courses will run in the both the semesters.

Subject Code	Department Level Optional Course (DLOC)	Subject Code	Institute Level Optional Course (ILOC)
Semester II			
ME-ISDLOC-II2041	Law of Data Security and Investigations	ME-ISILOC-II2051	Project Management
ME-ISDLOC-II2042	IT Security Strategic Planning, Policy and Leadership	ME-ISILOC-II2052	Finance Management
ME-ISDLOC-II2043	Hacker Technique, Exploits and Incident handling	ME-ISILOC-II2053	Entrepreneurship Development and Management
ME-ISDLOC-II2044	Advanced Computer Forensic Analysis	ME-ISTILOC-II2054	Human Resource Management
		ME-ISILOC-II2055	Professional Ethics and CSR
		ME-ISIEC-II2056	Research Methodology
		ME-ISILOC-II2057	IPR and Patenting
		ME-ISILOC-II2058	Digital Business Management
		ME-ISILOC-II2059	Environmental Management

End Semester Examination: In all six questions to be set, each of 20 marks, out of these any four questions to be attempted by students. Each question will comprise of mixed questions from different units of the subjects.

Semester III

Subject Code	Subject Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ME-ISS301	Seminar	--	06	--	--	03	--	03
ME-ISD301	Dissertation I	--	24	--	--	12	--	12
Total		--	30	--	--	15	--	15

Subject Code	Subject Name	Examination Scheme						
		Theory						
		Internal Assessment			End Sem.Exam.	Term Work	Oral.	Total
		Test1	Test 2	Avg.				
ME-ISS301	Seminar	--	--	--	--	50	50	100
ME-ISD301	Dissertation I	--	--	--	--	100	--	100
Total		--	--	--	--	**150**	**50**	**200**

Semester IV

Subject Code	Subject Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ME-ISD401	Dissertation II	--	30	--	--	15	--	15
Total		--	30	--	--	15	--	15

Subject Code	Subject Name	Examination Scheme						
		Theory						
		Internal Assessment			End Sem.Exam.	Term Work	Oral.	Total
		Test1	Test 2	Avg.				
ME-ISD401	Dissertation II	--	--	--	--	100	100	200
Total		--	--	--	--	**100**	**100**	**200**

* The Term Work and Oral of Project II of Semester IV should be assessed jointly by the pair of Internal and External Examiners

Note- The Contact Hours for the calculation of load of teacher are as follows
Seminar - 01 Hour / week / student
A project I and II - 02 Hour / week / student

End Semester Examination: In all, six questions to be set, each of 20 marks, out of these any four questions to be attempted by students. Each question will comprise of mixed questions from different units of the subjects.

Subject Code	Subject Name	Credits
ME-ISC101	**Advanced Web Technology**	**04**
Prerequisite: web programming, C language		

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
I	Web Technology Basics & HTML 5.0	**Introduction to web technologies**: Web system architecture-1,2,3 and n tier architecture, URL, domain name system, overview of HTTP and FTP, Cross browser compatibility issues, W3C Validators **Web Site Design Issues**: Planning a Web Site –Objective and Goals, Audience, Organizing contents. **Publishing of Web Site**. **Function of Web Server** **Basic HTML**: Formatting and fonts, Anchors, images, lists, tables, frames and forms. XML basics. **HTML 5:** Fundamental Syntax and Semantics, Progressive Markup and Techniques, Forms, Native Audio and Video, Micro data and Custom data, Accessibility, Geo-location, Canvas.	09
II	Responsive web design with HTML5 and CSS3	**Introduction to CSS**: Evolution of CSS, Syntax of CSS, Exploring CSS Selectors, Inserting CSS in an HTML Document, Defining Inheritance in CSS	02
		CSS3 and Responsive Web Design. **CSS3:** Selectors, Typography and color Modes Stunning Aesthetics with CSS3, CSS3 Transitions, Transformations and Animations, Conquer Forms HTML5 and CSS3	06
III	Web Services	**Web Services:** Web services, Evolution and differences with Distributed computing, XML, WSDL, SOAP, UDDI, Transactions, Business Process Execution Language for Web Services, WS-Security and the Web services security specifications, WS-Reliable Messaging, WS-Policy, WS-Attachments. REST-ful web services, Resource Oriented Architecture, Comparison of REST, SOA, SOAP.	07
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 REST Client **Open Source Frameworks and CMS for RIA:** Django, Drupal, Joomla introduction and comparison.	08
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	08

		Your Web Analytics Soul Mate. The Awesome World of Clickstream Analysis: Metrics. The Key to Glory: Measuring Success. Failing Faster: Unleashing the Power of Testing and Experimentation.	
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), 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.	08

Text Books:

1. HTML 5 Black Book: Kogent Learning solutions
2. Tim O'Reilly, What is Web 2.0? : Design Patterns and Business Models for the Next Generation of Software, O'REILLY
3. John Davies, Rudi Studer, and Paul Warren John , "Semantic Web Technologies: Trends and Research in Ontology-based Systems", Wiley & Son'
4. Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity
Avinash Kaushik, ISBN: 978-0-470-52939-3, wiley publication.

References:

1. Grigoris Antoniou and Frank van Harmelen,. A Semantic Web Primer: MIT Press,2004, ISBN 0-262-01210-3
2. Deane Brker, Web Content Management: Systems, Features, and Best Practices, O'Reilly & Associates incorporated, 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
5. An introduction to RDF and Jena RDF API, www.jena.apache.org/tutorials/rdf_api.html.

List of Experiments: based on Laboratory Practical's/ Case studies

1. Design a website with features like login for users and several gadgets, it should atleast have a twitter box, a video, a calendar with events, event announcements and information with a registration form.

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 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.

Subject Code	Subject Name	Credits
ME-ISC102	**IT Infrastructure Design**	**04**

Prerequisite: Basic knowledge of Networking techniques.

Module	Detailed content	Hours
I	- Basic of Networking Topology - OSI Layer Basics - Basics of Internetworking Devices Enterprise Network Design: Understanding Network Requirement analysis, Architecture and Design Process Network Architecture: Component Architecture –Routing, Network Management, Performance, Security. Architectural models: topological, flow model, Functional model Addressing And Routing Architecture, Network Management Architecture, Performance Architecture Border less Network Architecture. Network Design: Designing the network topology and solutions-Top Down Approach Network Structure Model: Hierarchical Network Model, Enterprise wide network Architecture model- Enterprise Edge Area. E-commerce, Internet Connectivity to remote, enterprise branch and enterprise Data center module. High Availability Network Services- Workstation to Router redundancy and LAN High Availability protocols, Route, Server Redundancy, Load Balancing., link Media Redundancy.	11
II.	Enterprise LAN Design: Ethernet Design Rule. 100 Mbps Fast Ethernet Design rules, gigabit Ethernet Design Rules, 10 Gigabit Ethernet Design rules, 10GE Media types Understanding Working of Repeater, hub, Bridge, routers, Layer2/3 Switch Campus LAN Design Best Practice Server Farm Design, DMZ design. Campus LAN QoS consideration Multicast Traffic Consideration	6
III.	Data Center Design: Architecture Consideration: Infrastructure Model, Service Layers Model of Cloud computing. Cloud Reference Architecture Framework, Cloud Data Center Building Blocks. Cloud Data Center Technology Architecture Trust in Cloud Data Center The elements of cloud visibility The elements of cloud protection Cloud Control, Compliance and SLA. Telecommunications Infrastructure Standard for Data Centers ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers , NSI/NECA/BICSI-002 Data Center Design and Implementation Best Practices Purpose of TIA-942 Design Elements - Cabling Design, Facility Design, Network Design. Relationship of Spaces, Data Center Topology Data Center Tiers Basic Data	10

	Center Design Example.	
IV.	Enterprise Wireless LAN Architecture: Components of Centralize Architecture: understanding 802.11X standards, LWAPP WLAN Controller. WLAN technologies (Narrow Band, Spread Spectrum, FHSS, DSS) and topologies, Wireless Network Components: Access Point and NICs, Router etc; WLAN enterprise design, WLAN performance, WLAN monitoring and troubleshooting, WLAN security. Intra and inter controller roaming.	5
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.	7
VI.	Software Defined Network : Understanding SDN and Open Flow : SDN – Network Virtualization Techniques, SDN Building Blocks, OpenFlow messages – Controller to Switch, Symmetric and Asynchronous messages, Implementing OpenFlow Switch, OpenFlow controllers , PoX and NoX, NetApp Development on top of SDN, Open Flow in Cloud Computing. Case study: how SDN changed Traditional Enterprise network Design	9

References:

1. Network Analysis, Architecture, and Design 3rd Edition, Morgan Kaufman, James D.
2. CCDA Cisco official Guide
3. Cisco Cloud Computing - Data Center Strategy, Architecture, and Solutions by Kapil Bakshi - Cisco Systems White paper
4. https://en.wikipedia.org/wiki/TIA-942
5. "Data Center Top-of-Rack Architecture Design" . *White paper*. Cisco Systems. April 18, 2011. Retrieved July 10, 2013.
6. Software Defined Networking with Open Flow : PACKT Publishing Siamak Azodolmolky
7. Storage Network Management and Retrieval by Dr. Vaishali Khairnar, Nilima Dongre, Wiley India
8. Storage Networks explained by Ulf Troppen, wiley publication
9. Storage Area Network Essentials: A Complete Guide to Understanding and Implementing SANs by Richard Barker, Paul Massiglia, Wiley India

List of Experiments: based on Laboratory Practical's/ Case studies

1. Design on Enterprise LAN.
2. Design on Enterprise Wireless LAN.
3. Case study on SAN and RAID.

Assessment:

Internal: 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 the end semester examination.

Subject Code	Subject Name	Credits
ME-ISC103	**Cryptography and PKI**	**04**

Course Objective:

- Provide knowledge of Cryptography.
- Provide Knowledge of Symmetric and Asymmetric Algorithms.
- Give insight on Message Authentication and Hash Functions.
- Understand the concepts of Digital Signatures and Public Key Infrastructure.

Course Outcome: Students should be able to

- Discuss knowledge & concepts of Cryptography.
- Implement Symmetric and Asymmetric Algorithms.
- Develop Message Authentication and Hash Functions.
- Identify the concepts of Digital Signatures and Public Key Infrastructure.

Prerequisite: Computer Networks.

Sr. No.	Module	Detailed content	Hours
I	Cryptography	**Computer Networks OSI layers.** Introduction, Security Trends, Model for Network Security. **Cryptography: Concepts and Techniques:** Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Stegnography, Key Range and Key Size, Possible Types of Attacks	10
II	Symmetric Key Algorithms	**Symmetric Key Algorithms:** DES,3DES, AES, IDEA, RC4, RC5, Confidentiality using symmetric encryption.	10
III	Number Theory & Cryptography	**Introduction to Number Theory:** Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms **Public- Key Cryptography and RSA:** Principles of Public-Key Cryptosystems, RSA, Key Management, Diffie-Helman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.	10
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, HMAC	10
V	Digital Signatures and Public Key Infrastructure	**Digital Signatures and Public Key Infrastructure (PKI):** Digital Signatures, Authentication Protocols, DSS, Authentication Applications: Kerberos, X.509 Authentication Service Digital Certificates, Private Key Management, PKI Trust Models, Public Key Cryptography Standards, Revocation, Directories and PKI, PKIX and Security.	10

VI	Elliptic Curves	**Elliptic Curves:** The Addition Law, Elliptic curve Mod p, Factoring with Elliptic Curves, Elliptic Curve Cryptosystems **Cryptography in Java, .NET and Operating Systems:** Cryptographic Solutions using Java, Cryptographic Solutions using Microsoft .NET Framework, Cryptographic Toolkits, Security and Operating Systems, Database Security.	10

Text Books/References:

1. Information Security Principal and Practice: Mark stamp, Wiley
2. Cryptography and security, wiley, Shyamala, harini
3. Stallings, W., "Cryptography and Network Security", Fourth Edition, Pearson
4. Introduction to Cryptography with coding Theory, Pearson,WadenTrappe
5. Forouzan B., "Cryptography and Network Security", Second Edition, Tata McGraw Hill
6. Bernard Menezes, "Network Security and Cryptography", Cengage Learning.
7. Charlie Kaufman, Radia Perlman and mike speciner "Network security, private communication in a public world" , Second Edition, Pearson

List of Experiments: based on Laboratory Practical's/ Case studies

1. Implement RSA algorithm.
2. Implement Diffie-Helman Key Exchange algorithm.
3. Implement AES algorithm.

Assessment: Internal: 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.

Subject Code	Subject Name	Credits
ME-ISDLOC-I1041	**Ad-hoc Networks**	**04**
Prerequisite: Network, Operating System, Wireless Technology		

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
I	**Introduction**	Introduction – Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms. Wireless Network. Characteristics of the Wireless channel. Cellular and Ad-Hoc Wireless Networks, Applications of Ad-Hoc Wireless Networks/MANET/Wireless Sensor Network/VANET. Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks. Mobility, Hidden and Exposed terminal Problems, Characteristics of an Ideal Routing Protocol for Ad-Hoc Wireless Networks	**10**
II	**Medium access protocols**	MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.11p, 802.15. HIPER LAN	**8**
III	**Ad hoc routing protocols**	Introduction – Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source–Initiated On–Demand Approaches – Ad hoc On–Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) –Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) – Location–Aided Routing (LAR) – Power–Aware Routing (PAR) – Zone Routing Protocol (ZRP).	**8**
IV	**Multicast routing in ad-hoc networks**	Introduction – Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols –Classifications of Multicast Routing Protocols – Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols – Summary of Tree and Mesh based Protocols – Energy–Efficient Multicasting – Multicasting with Quality of Service Guarantees – Application – Dependent Multicast Routing – Comparisons of Multicast Routing Protocols.	**8**
V	**Transport layer– security protocols**	Introduction – Issues in Designing a Transport Layer Protocol for Ad hoc Wireless Networks – Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks – Classification of Transport Layer Solutions – TCP over Ad hoc Wireless Networks – Other Transport Layer Protocols	**8**

		for Ad hoc Wireless Networks – Security in Ad Hoc Wireless Networks – Network Security Requirements – Issues and Challenges in Security Provisioning – Network Security Attacks – Key Management – Secure Routing in Ad hoc Wireless Networks.	
VI	**Mobile/vehicular Ad-hoc Networks**	MANET, VANET, Design issues, Routing, MANET vs VANET, Various Attacks on MANET/VANET, Attacks on Routing Mechanisms, Security Mechanisms in the Network Layer, Security Mechanisms in the Data - Link Layer, Key Management.	**6**

Text book

1. S. Sarkar, T. Basavraju and C. Puttamdappa, "Ad hoc mobile wireless networks principles, protocols and applications" , second edition, CRC Press, 2016.
2. Al-Sakib Khan Pathan, Muhammad Mostafa Monowar, Zubair Md. Fadlullah, "Building Next-Generation Converged Networks: Theory and Practice, CRC Press, 2013.
3. Stefano Basagni, Marco Conti, Silvia Giordano, Ivan Stojmenovic, "Mobile Ad Hoc Networking: The Cutting Edge Directions", John Wiley 2013.
4. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007

References

1. C. K. Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall, PTR, 2001.
2. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000
3. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Prentice Hall, PTR, 2004
4. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005

Practical

1. Implement Ad-hoc network using BlueHoc Simulator.
2. Implement MANET using DARS Simulator.
3. Implement simple VANET/WSN using NS2.

Assessment:

Internal: 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.

Subject Code	Subject Name	Credits
ME-ISDLOC-I1042	**Internet of Things**	**04**
Perquisite: Web Programming, Microcontroller		

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
I	Introduction to Internet of Things	Web Programming Concepts, Tools, Framework. Definition of Internet of Things (IoT), IoT Paradigm, IoT Architecture – State of the Art, IoT Protocols, IoT Communication Models, IoT in Global Context, Real world scenarios, Different Areas, Examples Trends in the Adaption of the IoT (Cloud Computing, Big Data Analytics, Concepts of Web of Things, Concept of Cloud of Things with emphasis on Mobile Cloud Computing, Smart Objects).	8
II	Open – Source Prototyping Platforms for IoT	Basic Arduino Programming Extended Arduino Libraries, Arduino – Based Internet Communication, Raspberry PI, Sensors and Actuators and Interfacing.	8
III	IoT Protocol & Technology	RFID + NFC, Wireless Networks + WSN, RTLS + GPS, Agents + Multi – Agent Systems, Composition Models for the Web of Things and resources on the Web, Discovery, Search, IoT Mashups and Others. IoT Protocols - M2M, BacNet, ModBus, Bluetooth, Wifi, ZigBee.	8
IV	Wireless Sensor Networks	History and Context, The Node, Connecting Nodes, Networking Nodes, Secured Communication for IoT. Networking and the Internet - IP Addressing, Protocols - MQTT, CoAP, REST Transferring data.	6
V	Data Analytics for IoT	Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study, Tools for IoT:- Chef, Chef Case Studies, Puppet, Puppet Case Study - Multi-tier Deployment, NETCONF-YANG Case Studies, IoT Code Generator.	10
VI	Application and Use Cases	Concrete Applications and Use – Cases of Web Enabled Things: Energy Management and Smart Homes, Ambient Assisted Living, Intelligent Transport, Etc. Cloud of Things and Big Data. Business Cases and Issues - Agriculture, Music Therapy, Smart Home, Smart Grid Network, Wearable, Healthcare.	8

Text Books:

1 The Internet of Things (MIT Press) by Samuel Greengard.

2 The Internet of Things (Connecting objects to the web) by Hakima Chaouchi (Wiley Publications).

3 Internet of Things (A Hands-on-Approach) by Arshdeep Bhaga and Vijay Madisetti.

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 Ovidiu Vermesan and Peter Friess.

3 Building Internet of Things with Arduino by Charalampos Doukas.

List of Experiments :

1) Implement A Heterogeneous, Hierarchical Wireless Sensor Network using Cooja/ MSPSim Simulator also add routing protocol, broadcasting message in WSN.
2) Create a smart city and IoT WSN using CupCARBON U-ONE 2.8.5 simulator and senscript.
3) Building machine to machine (M2M) applications such as remote monitoring/Vehicle Tracking, fleet management or smart grid using M2MLabs open source application framework.

Assessment:

Internal: 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.

Subject Code	Subject Name	Credits
ME-ISDLOC-I1043	**Cloud Computing**	**04**

	Module	**Detailed content**	**Hours**
I		Virtualization: What is Virtualization, Virtualization theory, VMDK File Structure, Advantages and Disadvantages of machine being a file, CPU Virtualization, Memory Virtualization, Interrupt Management VMFS file system, Storage Virtualization, Network Virtualization, Virtual machine and Security issues	13
II	VMware Virtualization Technologies	VMware Virtualization Technologies : ESX internals Microsoft –Windows Virtualization Technologies :Hyper-V Xen and KVM Hypervisor. QEMU , SUN's VirtualBox	08
III	Cloud computing	Introduction to cloud computing, cloud architecture and service models, the economics and benefits of cloud computing, horizontal/vertical scaling, thin client, multimedia content distribution, multiprocessor and virtualization, distributed storage, security and federation/presence/identity/privacy in cloud computing, disaster recovery,	10
IV	cloud computing services	free cloud services and open source software, and example commercial cloud services Cloud Computing and Virtualization Host Clusters Storage Virtualization VM clusters Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud **Cloud computing security architecture:** Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control-Identity management, Access control, Autonomic Security **Cloud computing security challenges**: Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.	12
V	Cloud Platform Architectures	Cloud Platform Architectures o Amazon AWS o Microsoft Azure o Google App Engine o Google MapReduce / Yahoo Hadoop o Eucalyptus, Nimbus, OpenStack	12
VI	Cloud Platform Applications.	Issues in cloud computing, Implementing real time application over cloud platform Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud	08

Text Books/Reference Book:

1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
2. Enterprise Cloud Computing by Gautam Shroff,Cambridge
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India
4. Google Apps by Scott Granneman,Pearson
5. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
6. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
7. Cloud Computing Bible by Barrie Sosinsky, Wiley India
8. Stefano Ferretti et.al.QoS–aware Clouds", 2010 IEEE 3rd International Conference on Cloud Computing
9. Virtualization for Dummies : , Wiley India.

Assessment:

Internal: 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.

Subject Code	Subject Name	Credits
ME-ISDLOC-I1044	**Unix OS & OS Security**	**04**
Prerequisite: Operating System		

Sr. No.	Module	Detailed content	Hours
I	Unix OS	**What is OS? Kernel, thread, process, scheduling algorithms etc.** **Unix System Overview:** Unix Architecture, Logging in, Files and Directories, Input and Output, Programs and Processes, Error Handling, User Identification, Signals, Time Values, System Calls and Library Functions	06
II	System Data Files	**System Data Files and Information:** Password file, Shadow passwords, Group file, Supplementary Group IDs, Implementation Differences, Login Accounting, System Identification, Time and Date routines	04
III	Thread Control	**Thread Control:** Thread Limits, Thread attributes, synchronization attributes, Reentrancy, Thread-specific data, Cancel options, signals, threads and I/O, threads and fork **Daemon Processes:** Daemon characteristics, coding rules, Error logging, Single-instance daemons, Daemon conventions	08
IV	Advanced I/O	**Advanced I/O:** Nonblocking I/O, Record Locking, Streams, I/O Multiplexing, Asynchronous I/O, Related functions, Memory mapped I/O	10
V	Interprocess	**Interprocess Communication:** Pipes, FIFO, Semaphores, Message Queues, Shared Memory **Network IPC: Sockets** Socket Descriptors, Addressing, Connection Establishment, Data Transfer, Socket Options, Out-of-band data, Nonblocking and Asynchronous I/O **Advanced IPC:** streams-based pipes, Unix Domain Sockets, Passing File Descriptors	10

VI	OS Security	**Terminal I/O:** Special Input characters, Getting and setting terminal attributes, Terminal option flags, sty command, Baud rate functions, Line Control functions, Terminal Identification, canonical, noncanonical mode, Terminal window size, termcap, terminfo, curses **Security in Unix OS:** Monitoring The System, Account Security, File system security, network Security, Major service Security. **Security in ordinary operating system:** Unix security, windows security Verifiable security goals: Information flow, information flow secrecy models, information flow integrity model, the challenges of trusted process, covert channels **Security Kernels:** The Security Kernels, secure communications processor - Scomp, Gemini secure OS. Securing commercial OS: Retrofitting security into a commercial OS, History Retrofitting commercial OS, Commercial era, microkernel era, unix era- IX, domain and type enforcement.	15

Text Books/References:

1. W. Richard Stevens, UNIX Network Programming, Volume 1: Networking API's, Sockets, and XTI, 2nd edition
2. Maurice Bach, "The Design of the UNIX Operating System
3. Uresh Vahalia, "UNIX Internals: The New Frontiers
4. Arnold Robbins, "Unix in a Nutshell", O'Reilly
5. Eleen Frisch, "Essential System Administration: Tools and Techniques for Linux and Unix Administration", O'Reilly
6. Trent Jaeger, Operating system security, Morgan & Claypool Publishers, 2008
7. Guide to Operating system security , Thomson
8. Andrew S Tanenbaum , Modern Operating systems
9. Secure Operating Systems. John Mitchell. Multics-Orange Book-Claremont

List of Experiments: based on Laboratory Practical's/ Case studies

1. Experiment 1 (Basic commands)

I.a) Installation of Unix/Linux operating system.

b) Study of logging/logout details.

c) Study of Unix/Linux general purpose utility command list obtained from (man, who,

cat, cd, cp, ps, ls, mv, rm,mkdir, rmdir, echo, more, date, time, kill, history, chmod,

chown, finger, pwd, cal, logout, shutdown) commands.

d) Study of vi editor.(http://www.tutorialspoint.com/unix/pdf/unix-vi-editor.pdf)

e) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.

f) Study of Unix/Linux file system (tree structure).

g) Study of .bashrc, /etc/bashrc and Environment variables

2. I. Write a shell script program to display the process attributes.

II. Write a shell script to change the priority of processes.

III. Write a shell script to change the ownership of processes

IV. Write a program to send back a process from foreground.

V. Write a program to retrieve a process from background.

VI. Write a program to create a Zombie process.

VII. Write a program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.

3. I. Write a shell script program to check variable attributes of file and processes.

II. Write a shell script program to check and list attributes of processes.

III. Shell Script program to implement read, write, and execute permissions.

IV. Shell Script program for changing process priority.

Assessment:

Internal: 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.

Course Code	Course Name	Credits
ME-ISILOC-I1051	Product Life Cycle Management	03

Objectives:

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

Outcomes: Learner 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, Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case	05

	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

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

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
ME-ISILOC-I1052	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

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.

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
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4. Only Four question need to be solved.

Course Code	Course Name	Credits
ME-ISILOC-I1053	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

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

Assessment:

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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.**

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4. Only Four question need to be solved.

Course Code	Course Name	Credits
ME-ISILOC-I1054	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** 1.1 Strategy of Experimentation 1.2 Typical Applications of Experimental Design 1.3 Guidelines for Designing Experiments 1.4 Response Surface Methodology	06
02	**Fitting Regression Models** 2.1 Linear Regression Models 2.2 Estimation of the Parameters in Linear Regression Models 2.3 Hypothesis Testing in Multiple Regression 2.4 Confidence Intervals in Multiple Regression 2.5 Prediction of new response observation 2.6 Regression model diagnostics 2.7 Testing for lack of fit	08
03	**Two-Level Factorial Designs** 3.1 The 2^2 Design 3.2 The 2^3 Design 3.3 The General2^k Design 3.4 A Single Replicate of the 2^k Design 3.5 The Addition of Center Points to the 2^k Design, 3.6 Blocking in the 2^k Factorial Design 3.7 Split-Plot Designs	07
04	**Two-Level Fractional Factorial Designs** 4.1 The One-Half Fraction of the 2^k Design 4.2 The One-Quarter Fraction of the 2^k Design 4.3 The General 2^{k-p} Fractional Factorial Design 4.4 Resolution III Designs 4.5 Resolution IV and V Designs 4.6 Fractional Factorial Split-Plot Designs	07
05	**Response Surface Methods and Designs** 5.1 Introduction to Response Surface Methodology	07

	5.2 The Method of Steepest Ascent 5.3 Analysis of a Second-Order Response Surface 5.4 Experimental Designs for Fitting Response Surfaces	
06	**Taguchi Approach** 6.1 Crossed Array Designs and Signal-to-Noise Ratios 6.2 Analysis Methods 6.3 Robust design examples	04

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

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
ME-ISILOC-I1055	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, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of	05

	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

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.

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
ME-ISILOC-I1056	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 andinformation 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, Botnets, Attack vector, Cloud computing, Proliferation ofMobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed byMobile Devices, Registry Settings for Mobile Devices, AuthenticationService Security, Attacks on Mobile/Cell Phones, Mobile Devices:Security Implications for Organizations, Organizational Measures forHandling Mobile, Devices-Related Security Issues, OrganizationalSecurity Policies and Measures in Mobile Computing Era, Laptops	9
03	**Tools and Methods Used in Cyberline** Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)	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

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

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
ME-ISILOC-I1057	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:** **2.1 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** **2.2 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** **3.1 Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management.** **3.2 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 casualties, set up of emergency facilities, importance of effectivecommunication amongst different agencies in such situations.** **4.2 Use of Internet and softwares for effective disaster management. Applications**	06

	of GIS, Remote sensing and GPS in this regard.	
05	**Financing Relief Measures:** **5.1 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.** **5.2 International relief aid agencies and their role in extreme events.**	09
06	**Preventive and Mitigation Measures:** 6.1 Pre-disaster, during disaster and post-disaster measures in some events in general 6.2 Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication 6.3 Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. 6.4 Do's and don'ts in case of disasters and effective implementation of relief aids.	06

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)

Assessment:

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End Semester Theory Examination:
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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
ME-ISILOC-I1058	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 inputenergy 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	10

	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.	
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

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

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.**

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4. Only Four question need to be solved.

Subject Code	Subject Name	Credits
ME-ISL101	**Laboratory I (Core Course Lab)**	**01**

Module	**Detailed content**	**Lab. Sessions**
1	**Two Laboratory Practical's to be conducted for each of the core subjects as suggested in the subject syllabus.**	24

Modality and Assessment:

1. Each Laboratory assignment will be done in a group of two students. The Faculty teaching each core subject will be required to propose and evaluate the respective Laboratory assignments. These will be essentially hands-on practical and not theory / research review types of assignments.
2. **End Semester Examination:** Practical/Oral examination is to be conducted by pair of internal and external examiners.

Subject Code	Subject Name	Credits
ME-ISL102	**Laboratory II –(DLOC & ILOC Lab)**	**01**

Module	**Detailed content**	**Lab. Sessions**
1	**Three Laboratory Practical's to be conducted for each of the DLOC & ILOC subjects as suggested in the subject syllabus.**	24

Modality and Assessment:

1. Each mini project assignment will be done by individual student. The Faculty teaching elective subject will be required to propose and evaluate the respective mini projects. These will be essentially hands-on practical and not theory / research review types of projects
2. **End Semester Examination:** Practical/Oral examination is to be conducted by pair of internal and external examiners

SEMESTER II

Subject Code	Subject Name	Credits
ME-ISC201	**Network Security**	**04**

Module	Detailed content	Hours
1	**Security Problem in TCP/IP Protocol Suite:** Identification of Security issues in Ethernet, ARP, IP, TCP, Application and Routing protocols.	06
2	**Security Models:** Military and civil security, vulnerability and threat models, End-end security (COMSEC), link encryption (TRANSEC), compartments. Privacy. Authentication. Denial of service. Nonrepudiation. Issues in multi-level secure systems. Internet security models: IPv4/IPv6 encapsulation header	04
3	**Security at Network Layer** Routing algorithm vulnerabilities: route and sequence number spoofing, instability and resonance effects. Information hiding: DMZ networks, route aggregation and segregation ICMP redirect hazard: denial of service. ARP hazard: phantom sources, ARP explosions and slow links. Defending against Chernobyl packets and meltdown. Fragmentation vulnerabilities and remedies: (ICMP Echo overrun) **IPSec:** IP Security Overview, IP Security Architecture, Security Associations, Security Association Database, Security Policy Database, Tunnel and Transport mode, AH and ESP, IP and IPv6, Encapsulating Security Payload, Internet Key Exchange	10
4	**Security at Transport Layer: SSL and TLS** Secure network infrastructure services: DNS, NTP, SNMP, SSL Architecture, SSL/TLS Basic Protocol, SSL Message Formats, Session Resumption, Computing the keys, Client Authentication, PKI as deployed bySSL, Version Numbers, Negotiating Cipher Suites, Negotiating Compression Methods, Exportability, Encoding, Mobile systems: Address Export and re-use. Session key management: Blind-key cryptosystems (NTP).	12
5	**Security at Application Layer: PGP, S/MIMIE** E-mail security, PGP, PEM, S/MIME, Secure binding of multimedia streams, Secure RTP. Secure RSVP.	10
6	**Firewalls and IDS** Firewalls: Network partitioning, firewall platforms, partitioning models and methods, Secure SNMP, Secure routing interoperability: virtual networks (DARTnet/CAIRN). Transparent and opaque network services. Source masking and hidden channels. IDS, Honeypots, Honey nets,	06
7	**Wireless Network Security:** Introduction, How wifi works, WEP, Technique of hacking wireless network, countermeasure	04
8	**Network Packet analysis**: Packet analysis and Packet sniffing in Hub and Switched environment, Analysis of packet for security i.e Sync Scan, OS Fingerprinting	04
9	NOS Security issues: Windows and Linux environment	04

References:

1. Stallings, W., "Cryptography and Network Security: Theory and Practice", Second

Edition, John Wiley
2. “Charles P. Pfleeger “Security in computing”, Pearson Education
3. Stalling W., “ Network Security Essentials”, Pearson
4. Garfinkel S., Spafford G., “Practical Unix and Internet Security”, O'Reilly
5. Blacharski D., “Network Security in a Mixed Environment”
6. Practical Packet Analysis: Using Wireshark to Solve Real-Word Network problems by Chris Sanders

Assessment:

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Subject Code	Subject Name	Credits
ME-ISC202	**Application and Web Security**	**04**

Module	**Detailed content**	**Hours**
1	Introduction to Web applications Cookies , Session , Headers , Same-origin , Terminology Tools	02
2	Gathering Information On Target Finding Owner, IP Addresses And Email Addresses WHOIS tools DNS queries and zone transfers Using Nslookup Infrastructure Fingerprinting The Webserver Fingerprinting Webserver Modules Typical HTTP Services Ports Fingerprinting Frameworks And Applications Fingerprinting Third-Party Add-Ons Fingerprinting Custom Applications Mapping The Attack Surface Enumerating Resources Crawling The Website Finding Hidden Files Finding Back Up And Source Code Files Enumerating users accounts with Burp Proxy Relevant Information Through Misconfigurations Directory Listing Log And Configuration Files Google Hacking	08
3	Vulnerability Assessment Vulnerability Assessment vs Penetration testing Assessing vulnerabilities with using open source tools Browsing anonymously HTTP Proxies, Verifying proxy anonymity ,HTTP_VIA /HTTP_X_FORWARDED_FOR , Tor Network Tunneling for anonymity , SSH Tunneling Cleaning traces ,Cleaning the event log	10
4	Understanding OWASP top 10	2
4	Cross site scripting What it is—Basics Anatomy of a XSS exploitation The three types of XSS Reflected XSS Persistent XSS DOM-based XSS Finding XSS Finding XSS in PHP code XSS Exploitation XSS, Browsers and same origin policy Real world attacks Cookie stealing through XSS Defacement	6

	Advanced phishing attacks	
5	Introduction to SQL Injection How dangerous is a SQL Injection , How SQL Injection works How to find SQL Injections , How to find SQL Injections Finding Blind Sql Injections , SQL Injection Exploitation Exploiting INBAND (Union) SQL Injections Exploiting Error Based SQL Injection, Dumping database data Reading remote file system, Accessing the remote network Exploiting Blind SQL injection, Optimized Blind SQL injection Time Based Blind SQL Injection Tools Sqlmap, BSQL Hacker, Pangolin Tools taxonomy	08
6	Introduction Session attacks , HTTP Session Fixation Finding HTTP Session Fixation, Preventing HTTP Session Fixation CSRF Finding CSRF , Exploiting CSRF , Preventing CSRF File inclusion vulnerabilities , Local File Inclusion , Remote File Inclusion Web 2.0 Attacks How Ajax works , Defeating httpOnly—XST & Ajax Dissecting Ajax API's, Reverse engineering Ajax applications logic Exposed administrative functions	08
7	Application Security: Understanding SOA for EAI, WS-Security Standards	04
8	Application Security basics: Reverse Engineering, Attack vectors, input Validation, Secure SDLC- Data classification, Secure requirement-Secure Architecture. Factors in Developing An Application Security Program- Policies, procedures, baselines and guidelines, ROI on application security	04
9	Software Engineering and Security: Security Challenge in software engineering, Secure Software development methodologies, Waterfall model with security, Comprehensive Lightweight Application Security Process, Extreme Programming and Security, Aspect-Oriented Programming and Security	04
10	Database Security and Auditing: Database Application Security Model, Administration of Users, Profiles, Password policy, Privileges and roles, Virtual Private Database, Database Auditing model	04

References:

1. The Web Application Hacker's handbook, Defydd Stuttard, Wiley Publishing
2. Professional Pen Testing for Web application, Andres andreu, wrox press
3. Carlos Serrao, Vicente Aguilera, Fabio Cerullo, "Web Application Security" Springer; 1st Edition
4. Joel Scambray, Vincent Liu , Caleb Sima ,"Hacking exposed", McGraw-Hill; 3rd Edition (October, 2010)
5. OReilly Web Security Privacy and Commerce 2nd Edition 2011
6. Software Security Theory Programming and Practice, Richard sinn, cengage Learning
7. Database Security and Auditing, Hassan, Cengage Learning

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attempted by students.Minimum 80% syllabus should be covered in question papers of end semester examination.

Subject Code	Subject Name	Credits
ME-ISC203	**Security and risk management**	**04**

Module	**Detailed content**	**Hours**
1	Introduction to assessing Network Vulnerabilities: type and procedure of network vulnerability assessment	08
2	Principles of Security: Information Classification, Policy framework, role based security in an organization	04
3	Risk Assessment: Laws, Mandates and Regulations, Risk assessment best practices, Risk assessment best practice.	10
4	Risk Assessment Methodologies: Defense –in depth approach, risk analysis, Asset valuation approach, Quantitative and Qualitative risk-assessment approaches. Scoping the project, Understanding the attacker.	10
5	Performing the Assessment: Vulnerability scan and Exploitation: Internet Host and network enumeration, IP network Scanning, Assessing Remote Information Services, Assessing Web servers, Assessing Web Applications, Assessing Remote Maintenance Services, Assessing Database services, Assessing Windows Networking Services, Assessing Email services.	12
6	Open source tools used for Assessment and Evaluation, and exploitation framework	10
7	Final Report Preparation and Post Assessment Activists	06

Reference books:

1. Network Security assessment, Chris McNab, O'reilly
2. Inside Network Security Assessment, Michael Gregg, Pearson
3. Security in Computing, fourth Edition, Charles Pfleeger, Pearson
4. The Security Risk Assessment Handbook: Douglas LanDoll, Auerbach Publication.
5. Nina Godbole, "Information Systems Security", Wiley
6. Cyber Security: Sunit Belapur, Wiley
7. Whitman & Mattord. Management of Information Security. Thomson Course Technology (2004). ISBN: 0-619-21515-1

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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.

Subject Code	Subject Name	Credits
ME-ISDLOC-II2041	**Law of Data Security and Investigations**	**04**

Module	Detailed content	Hours
1	**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 Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical hacking.	08
2	**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	04
3	**E-Records, E-Discovery and Business Law:** Vicarious Liability, E-Discovery, Records Retention, Destruction, Email Retention, Forensics, Privacy Policies, Evidence Law, Signatures	08
4	**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	10
5	**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	10
6	**Applying Law to Emerging Dangers: Cyber Defense** Sony Root Kit Case Study, Crisis Communications, Choicepoint 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, Strategic Legal Procedures, Competitive Boundaries	10

References:

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

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Subject Code	Subject Name	Credits
ME-ISDLOC-II2042	**IT Security Strategic Planning, Policy and Leadership**	**04**

Module	Detailed content	Hours
1	Strategic Planning Process: 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, Institutional assessment, revising the plan.	08
2	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.	08
3	**Legal Issues:** **Computer crimes, Disk Protection, Intellectual property, E-commerce law, Data Protection issues, Information Security Audits.**	08
4	**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	08
5	Security Policy Assessment: Using the principles of psychology to implement policy, How policy protects people, organizations and information, Case study, the process to handle a new risk (Sexting), Policy header components and how to use them, Issue-specific policies, Behavior related polices, acceptable use, ethics, Warning banners, Policy development process, Policy review	10
6	Management and Leadership Skills: Leadership building blocks, Coaching & training, Change management, Team development, Motivating, Developing the vision, Leadership development, Building competencies, Importance of communication, Self-direction, Brainstorming, Relationship building, Teamwork concepts, Leader qualities, Leadership benefits	08

References:

1. http://iscanotes.com/MAY%202011/ISCA_Chap9_May-11.pdf
2. http://www.sans.org

3. Robert M. Grant, “Contemporary Strategy Analysis: Concepts, Techniques, 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-roadmap-process-creating-security-policies_494
7. Information Security Policies Made Easy, 10th Edition
8. http://net.educause.edu/ir/library/pdf/pub7008i.pdf
9. Marlene Caroselli, “Leadership Skills for Managers”
10. http://managementhelp.org/freebusinesstraining/leadership.htm

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Subject Code	Subject Name	Credits
ME-ISDLOC-II2043	**Hacker Technique, Exploits and Incident handling**	**04**

Module	**Detailed content**	**Hours**
1	Incident Handling Overview and preparation – Incident Handling Phase 2 identification, Incident Handling phase 3 containment Incident Handling: Recovering and improving capabilities, Type of incidents	06
2	Hacking Methodology : Enumeration, Scanning, Gaining Access , Maintaining access, Clearing Tracks	06
3	Reconnaissance , Scanning Host discovery, Network devices discovery, service discovery	08
4	Backdoors and Trojan horses , Buffer Overflows	04
5	Covering Tracks : Networks and Systems	06
6	Denial of Service Attacks, Exploiting System using Netcat	08
7	Format String Attacks	04
8	IP address Spoofing, Network sniffing	06
9	Password Attacks, rootkits	04
10	Session Hijacking and Defenses	04
11	Virtual Machine Attacks, Web application attacks, Worms, Bots & Bot-nets	04

Reference Books:

1. Jon Erickson, Hacking: The Art of Exploitation, Second Edition
2. Hacker Techniques, Exploits & Incident Handling (Security 504) http://www.sans.org/training/description.php?mid=40
3. Brain Hatch, Hacking Linux Exposed, 3rd edition Hacking Linux Exposed, 3rd edition

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Subject Code	Subject Name	Credits
ME-ISDLOC-II2044	**Advanced Computer Forensic Analysis**	**04**

Module	Detailed content	Hours
1	**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.	06
2	**Types of Computer Forensics systems** Internet security, IDS, Firewall, Public key, net privacy systems, vendor and computer Forensics services.	08
3	**Computer Forensics evidence and capture** Data recovery, evidence collection and data seizure, duplication and preservation of digital evidence, computer image verification and authentication	10
4	**Computer Forensics Analysis** Discovery of electronic evidence- electronic document discovery, identification of data- Time keeping, forensic identification and analysis of technical surveillance devices. Reconstructing fast events	10
5	**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, Arsenal and Tactics of private companies.	08
6	**Civilian casualties** The violation of privacy during information words. The individual exposed. Advanced computer Forensics systems and future directions- advanced encryption, hacking, advanced trackers, case studies.	08

Reference BOOKS:

1. Cyber Security : Belapure: wiley
2. By John R. Vacca Computer forensics: computer crime scene investigation, Volume 1
3. EnCase Computer Forensics . Sybex
4. Computer Forensics: Incident Response Essentials, Warren G. Kruse II & Jay G. Heiser
5. Computer Forensics & Privacy, Michael Caloyannides
6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, edited by Albert J. Marcella Jr. & Robert S. Greenfield
7. Handbook of Computer Crime Investigation, edited by Eoghan Casey

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Course Code	Course Name	Credits
ME-ISILOCII2051	**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 gateprocess. 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, engaging with all stakeholders of the projects. Team management, communication and project meetings. **5.2 Monitoring and Controlling Projects:**	8

	Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep. Project audit. **5.3 Project Contracting** Project procurement management, contracting and outsourcing,	
06	**6.1 Project Leadership and Ethics:** Introduction to project leadership, ethics in projects. Multicultural and virtual projects. **6.2 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, 7thEd.
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:

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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
ME-ISILOCII2052	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) **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.	10
05	**Sources of Finance:** Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short Term Finance—Trade Credit, Bank Finance, Commercial	05

	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	
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

REFERENCES:

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:

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End Semester Theory Examination:
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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
ME-ISILOCII2053	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:

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End Semester Theory Examination:
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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
ME-ISILOCII2054	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 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.	6
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

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
ME-ISILOCII2055	**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.

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
ME-ISILOCII2056	**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** **1.1** Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle.Research methods vs Methodology **1.2** Need of Research in Business and Social Sciences **1.3** Objectives of Research **1.4 Issues** and Problems in Research **1.5** Characteristics of Research:Systematic, Valid, Verifiable, Empirical and Critical	**09**
02	**Types of Research** **2.1.** Basic Research **2.2.** Applied Research **2.3.** Descriptive Research **2.4.** Analytical Research **2.5.** Empirical Research **2.6** Qualitative and Quantitative Approaches	**07**
03	**Research Design and Sample Design** **3.1** Research Design – Meaning, Types and Significance **3.2** 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 **j.** Preparation of Research Report	**08**
05	**Formulating Research Problem** **5.1** Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of	**04**

	data, Generalization and Interpretation of analysis	
06	**Outcome of Research** **6.1** Preparation of the report on conclusion reached **6.2** Validity Testing & Ethical Issues **6.3** 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, (2nded), Singapore, Pearson Education

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 at least 6 assignment on complete syllabus 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
ME-ISILOCII2057	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 **Patent databases:** Important websites, Searching international databases	07

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
9. M Ashok Kumar and mohd Iqbal Ali, 2-11, Intellectual Property Rights, 2nd Edition, Serial Publications
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

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 at least 6 assignment on complete syllabus 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
ME-ISILOCII 2058	**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:

Internal:
Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or at least 6 assignment on complete syllabus 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
ME-ISILOCII2059	**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

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.

Subject Code	Subject Name	Credits
ISL203	**Laboratory III**	**01**

Module	**Detailed content**	**Lab. Sessions**
1	- Working With Wireshark in Hub Environment for Packet Sniffing - Packet sniffing in Switch Environment	02
2	- Vulnerability Scanning technique using NESSUS	01
3	- REST Architecture :Web Mash up using PHP	02
4	- Vesrion Control – Software Configuration Management in Linux	01
5	- Customization of Linux Live CD	01
6	- Working with LVM in Linux	01
7.	- Exploring atleast two linux based web designing tools (Bluefish, Komodo etc.)	02
8.	- Exploring Content Management system on Linux	02

Reference Book:

1. linux Network Security. SPD
2. CMS design using PHP and Jquery , PACT
3. Wordpress MU beginners guide , PACT

Assessment:

End Semester Examination: Practical/Oral examination is to be conducted by pair of internal and external examiners

Subject Code	Subject Name	Credits
ISL204	**Laboratory IV**	**01**

Module	**Detailed content**	**Lab. Sessions**
1	**1 Mini Project based on any one of the selected level optional courses (DLOC & ILOC) subject.**	24

Modality and Assessment:

1. Each mini project assignment will be done by individual student. The Faculty teaching elective subject will be required to propose and evaluate the respective mini projects. These will be essentially hands-on practical and not theory / research review types of projects
2. **End Semester Examination:** Practical/Oral examination is to be conducted by pair of internal and external examiners

Subject Code	Subject Name	Credits
ISD301	**Seminar**	**03**

Guidelines for Seminar

- Seminar should be based on thrust areas in Information Security.
- Students should do literature survey and identify the topic of seminar and finalize in consultation with Guide/Supervisor. Students should use multiple literatures (at least 10 papers from Refereed Journals) and understand the topic and compile the report in standard format and present in front of Panel of Examiners. (pair of Internal and External examiners appointed by the University of Mumbai)
- **Seminar should be assessed based on following points**
  - Quality of Literature survey and Novelty in the topic
  - Relevance to the specialization
  - Understanding of the topic
  - Quality of Written and Oral Presentation

IMPORTANT NOTE :

1. Assessment of Seminar will be carried out by a pair of Internal and External examiner. The external examiner should be selected from approved panel of examiners for Seminar by University of Mumbai, OR faculty from Premier Educational Institutions /Research Organizations such as IIT, NIT, BARC, TIFR, DRDO, etc. OR a person having minimum Post-Graduate qualification with at least five years' experience in Industries.

2. Literature survey in case of seminar is based on the broader area of interest in recent developments and for dissertation it should be focused mainly on identified problem.

3. At least 4-5 hours of course on Research Methodology should be conducted which includes Literature Survey, Problems Identification, Analysis and Interpretation of Results and Technical Paper Writing in the beginning of 3rd Semester.

4. Students should publish at least one paper based on the seminar work in reputed International / National Conference/Journal (desirably in Referred Journal should be ISI/Scopus/SCI indexing)

Subject Code	Subject Name	Credits
ISD301 / ISD401	**Dissertation (I and II)**	**12 + 15**

Guidelines for Dissertation

- Students should do literature survey and identify the problem for Dissertation and finalize in consultation with Guide/Supervisor. Students should use multiple literatures and understand the problem. Students should attempt solution to the problem by analytical/simulation/experimental methods. The solution to be validated with proper justification and compile the report in standard format.

Guidelines for Assessment of Dissertation I

- Dissertation I should be assessed based on following points
-
  - Quality of Literature survey and Novelty in the problem
  - Clarity of Problem definition and Feasibility of problem solution
  - Relevance to the specialization
  - Clarity of objective and scope
- Dissertation I should be assessed through a presentation by a panel of Internal examiners appointed by the Head of the Department/Institute of respective Programme.

Guidelines for Assessment of Dissertation II

- Dissertation II should be assessed based on following points
  - Quality of Literature survey and Novelty in the problem
  - Clarity of Problem definition and Feasibility of problem solution
  - Relevance to the specialization or current Research / Industrial trends
  - Clarity of objective and scope
  - Quality of work attempted
  - Validation of results
  - Quality of Written and Oral Presentation
- Dissertation II should be assessed through a presentation jointly by Internal and External Examiners appointed by the University of Mumbai
- Students should publish at least one or two paper based on the work in reputed International / National Conference (desirably in Referred Journal should be ISI/Scopus/SCI indexing)