Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECC801	Optical Communication and Networks	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECC801	Optical Communication and Networks	20	20	20	80	03	--	--	100

Course pre-requisite:

FEC102 - Engineering Physics-I
FEC202 - Engineering Physics-II
ECC302 - Electronic Devices & Circuits
ECC405 - Principles of Communication Engineering
ECC501 - Digital Communication
ECC601 - Electromagnetics and Antenna

Course Objectives:

- Introduction to optical fiber network it's need, elements and fundamentals.
- To learn Parameters that limits the repeaterless transmission , its mitigation and Managing techniques.
- To learn high speed optical sources, detectors and Amplifiers.
- Study the multiplexing schemes SDH ,PDH and WDM and its applications for current and NGNs
- To have an insight into optical packet switched, bust switched and advanced networks
- Learn high speed network management techniques and challenges in its counterpart Free Space Optics

Course Outcome:

- Understand optical networks at large by identifying the types of fibers, cables and deployment.
- Design point to point optical fiber communication links using appropriate optical fibers, light sources, couplers, detectors, and multiplexers.
- Design a short haul or long-haul optical network with repeater by incorporating suitable amplifiers.
- Compare SDH, PDH and WDM techniques and implement.
- Explore concepts of designing and operating principles of modern optical communication systems and networks.
- Apply the knowledge acquired to design the next generation fiber and FSO networks for indoor and outdoor applications

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction and Basics of Optical fiber communication**	**07**
	1.1	Historical Development, Electromagnetic Spectrum, Optical Bands and Windows, Need for optical fiber communication, Fiber optic cable types and color codes, Block diagram**,** advantages and disadvantages of optical fiber cables, loss and bandwidth, applications and deployment.	
	1.2	Basics of Optical Fiber: Review of Ray theory, Wave theory, Light propagation in optical fiber Classification of optical fibers, Propagation modes, MFD in SMF	
	1.3	Fiber material, Fabrication techniques for high quality fiber: MCVD, fiber joints, fiber connectors, splices. Brief introduction to Photonic Crystal Fiber and its types.	
2.0		**Transmission Characteristic of Optical Fiber**	**07**
	2.1	Dispersion in Optical fiber, types of dispersion, Dispersion compensation techniques and dispersion measurements, Time domain and Frequency Domain measurements. Dispersion management, Need for dispersion management and Post compensation techniques.	
	2.2	Transmission losses in the optical fiber, Attenuation, Absorption losses, radiation losses and linear scattering losses, Comparison of optical fibers, Measurement of attenuation: Insertion loss, Return loss, OTDR.	
3.0		**Optical Communication Systems**	**07**
	3.1	Working principle and **c**haracteristics of sources Edge emitting LED,, Edge emitting LASER, VCEL, Spectrum, Noise, and Optical amplifiers .	
	3.2	Working principle and characteristics of detectors (PIN, APD),coherent and non-coherent detection, Intensity modulated direct detection, optical receivers, receiver performance: Bit error rate, Q function and Eye diagram	
	3.3	Point to point links system considerations, link power budget, and rise time budget	
4.0		**Optical Network System Components and Optical Networks**	**08**
	4.1	Couplers, isolators , circulators, multiplexers, Optical routers and filters - **f**iber gratings, Fabry ,switches and wavelength converters ,Add drop multiplexers	
	4.2	SONET and SDH standards, architecture of optical transport networks (OTNs), protection schemes in SONET/SDH, PDH	
	4.3	Operational principle of WDM, WDM network elements and Architectures. Types of WDM Networks, WDM Access Network, WDM Metro Networks, WDM Long Haul Networks Data center networks and Elastic Networks	
5.0		**Packet Switching and Access Networks**	**04**
	5.1	OTDM, multiplexing and de-multiplexing, synchronization and broadcast OTDM networks.	
	5.2	Network architecture overview, optical access networks. FTTH Network	
	5.3	Optical Burst switching Networks	
6.0		**Network Design and Management**	**06**
	6.1	Transmission system model, power penalty, transmitter, receiver, optical amplifiers, crosstalk.	
	6.2	Network management functions, configuration management, performance management, fault management, optical safety, and service interface	
	6.3	Introduction to free space optics and its challenges	
		Total	**39**

Text books:

1. John M. Senior, ―*Optical Fiber Communication*‖, Prentice Hall of India Publication, Chicago, 3rd Edition, 2013
2. Gerd Keiser, ―*Optical Fiber Communication*‖, Mc-Graw Hill Publication , Singapore, 4th Edition, 2012
3. T.L.Singhal –*Optical Fiber Communication Principles and Applications,* Cambridge Press, Edition 2016
4. Kumar Sivarajan and Rajiv Ramaswamy, Morgan Kauffman, *Optical Networks: A Practical Perspective,* Elsevier Publication Elsevier India Pvt. Ltd, 3rd Edition, 2010.
5. Ivan B. Djordjevin,__*Advanced Optical and Wireless Communication Systems,*Springer,Edition 2018.
6. Debasish Datta,*Optical Networks,*Oxword Cambridge University Press,2021
7. Kaushal, H.Jain, V.K. Kar,S, *Free Space Optical Communication* ,Springer,2017

Reference books

1. G Agarwal, ―*Fiber optic communication Systems*‖, John Wiley and Sons, 3rd Edition, New York 2014
2. Rajiv Ramaswami and Kumar N. Sivarajan, ―*Optical Networks: A Practical Perespective*‖, Elsevier Publication Elsevier India Pvt.ltd, 3rd Edition, 2010
3. P.E.Green, ―*Optical Networks*‖, Prentice Hall,1994
4. Biswanath Mukherjee, ―*Optical Communication Networks*‖, McGraw-Hill, 1997.
5. Le Nguyen Binh, ―*Optical Fiber Communication System: Theory and Practice with MATLAB and Simulink*‖, CRC Press, 2010
6. 2. Harry G. Parros, Communication Oriented Networks, Wiley
7. G. Agrwal, *Fiber Optic Communication Systems,* John Wiley and Sons, 3rd Edition, New York, 2014.

Further reading:

https://www.iitg.ac.in/psm/qip2015/material/Subir_Bandyopadhyay_Lecture1.pdf
https://www.rp-photonics.com/fiber_fabrication.html
www.osa.org

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8011	System on Chip Design	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (in Hrs.)	Term Work	Practical And Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. Of Test 1 and Test 2					
ECCDLO 8011	System on Chip Design	20	20	20	80	03	--	--	100

Course Prerequisite:

ECC303 Digital System Design
ECC503 Digital VLSI Design
ECM601 Mini Project 2B- FPGA based Project

Course Objectives:

1. To introduce modern system design using SoC
2. To understand the concept of hardware software co-design
3. To learn software and hardware design integration

Course Outcome:

After successful completion of the course student will be able to
CO1: Explain basics of SoC design
CO2: Design and verify SoC system
CO3: Explain physical design flow
CO4: Analyze routing issues in SoC Design
CO5: Interpret complex SoC design issues
CO6: Explain non-technical issues related to SoC

Module No.	Unit No.	Topics	Hrs.
1		**Introduction to SoC Design**	**08**
	1.1	The fundamental trends of SoC design, SoC design flow, The Semiconductor Economics, Challenges in SoC design	03
	1.2	Hardware system structure, Software structure, Accelerating Processors for traditional software task, System Design with multiple processor design	05
2		**System Level Design**	**05**
	2.1	Complex SoC system architecture, Processor centric SoC organization, Communication Design – Hardware and Software interconnects	03
	2.2	Balancing computation and Communication, SoC Design flow, Non-processor building block in SoC design	02
3		**RTL Synthesis**	**08**
	3.1	Review of Verilog - RTL Coding and RTL Synthesis RTL coding guidelines, Synthesizable coding style, FSM Coding style, Memory Modelling.	08
4		**SoC Verification**	**08**
	4.1	Verification technology options, Verification methodology. System level verification, block-level verification. Timing verification.	08
5		**Physical Design**	**06**
	5.1	Partitioning, Floor Planning, Placement, Routing, Goals of routing, Global routing, Physical verification and design sign-off.	06
6		**Reconfigurable SoC Arithmetic: Case Study**	**04**
	6.1	16 bit Carry Skip Adder on FPGA using LUT, 16 bit Carry Select Adder on FPGA using LUT, Divide-and-conquer 4 × 4 multiplier design using LUT	04
		Total	**39**

Textbooks:

1. Engineering the Complex SOC: Fast, Flexible Design with Configurable Processors-Chris Rowen, Pesrson, 2004.
2. System on a chip verification: Methodology and Verification-Second edition, Prakash Rashinkar, Peter Paterson, Leena Singh, Kluwer Academic Publishers
3. Digital Design with RTL Design, VHDL and VERILOG- Frank Vahid, John Wiley and Sons Publisher, 2010

Reference Books:

1. System-on-a-Chip: Design and Test- Rochit Rajsuman-Artech house-2002
2. VLSI Physical design Automation: Theory and Practice, Sadiq Sait, Habib Youssef, World Scientific Publishing, 1999
3. Surviving the SoC revolution- Henry Chang, Larry Cooke, Grant Martin, Kluwer Academic Publishers-2002

E-Resources:

1. https://nptel.ac.in/content/storage2/courses/117101058/downloads/Lec-2.pdf

2. https://www.btechguru.com/engineering-videos--electrical-engineering--circuit-theory--system-on-chip-(soc)-video-lecture--1790--4--21.html

3. http://www.asic.co.in/DesignGuidlinesRTLcoding.htm#:~:text=1.1%20STYLE%20AND%20NAMING%20GUIDELINES&text=WHY%3A%20Readability%20is%20required%20to,well%20as%20transferability%20between%20designers.&text=WHY%3A%20To%20avoid%20conflict%2C%20module,%E2%80%9Ccontrol%E2%80%9D%20are%20too%20generic

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8012	Natural Language Processing	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCDLO 8012	Natural Language Processing	20	20	20	80	03	--	--	100

Course Pre-requisite:

-

Course Objectives:

1. To understand natural language processing and to learn how to apply basic algorithms in this field.
2. To get acquainted with the basic concepts and algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.
3. To design and implement applications based on natural language processing

Course Outcomes:

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

1. Have a broad understanding of the field of natural language processing.
2. Understand the mathematical and linguistic preliminaries necessary for various processes in NLP
3. Be able to Design, implement and test algorithms for NLP problems
4. Perform Word-Level, Syntax-Level and Semantic-Level Analysis
5. Develop basic understanding of Pragmatics in NLP
6. Be able to apply NLP techniques to design real world NLP applications

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction to Natural Language Processing**	**06**
	1.1	The need of NLP. Generic NLP system, Levels of NLP	02
	1.2	Stages in building a Natural Language Processing System. Challenges and ambiguities in NLP Design	04
2.0		**Mathematical and Linguistic Preliminaries**	**06**
	2.1	Probability Theory, Conditional Probability and Independence, Bayes Rule, Random Variables, Probability Distributions, Statistics, Counting, Frequency, Mean and Variance	04
	2.2	English Grammar, Parts of Speech, Phrase Structures	02
3.0		**Word Level Analysis**	**06**
	3.1	Tokenization, Segmentation, Lemmatization, Edit Distance, Collocations, Porter Stemmer, N-gram Language Model	04
	3.2	Morphological Analysis, Derivational and Reflectional Morphology	02
4.0		**Syntax-Analysis**	**08**
	4.1	Tag set for English, Penn Tree bank, Introduction to Parts of Speech Tagging (POST)	02
	4.2	Markov Processes, Hidden Markov Models (HMM)	02
	4.2	Parts of Speech Tagging using Hidden Markov Models, Viterbi Algorithm	04
5.0		**Semantic Analysis**	**08**
	4.1	Lexical Semantics, ambiguous words, word senses, Relations between senses: synonym, antonym, reversives, hyponym, hypernym, meronym, structured polysemy, metonymy, zeugma	04
	4.2	Introduction to WordNet, gloss, synset, sense relations in WordNet. Cosine distance between documents. Word sense disambiguation.	04
6.0		**Pragmatics and applications of NLP**	**05**
	6.1	Reference resolution: Discourse model, Reference Phenomenon, Syntactic and Semantic Constraints on co reference	03
	6.2	Applications of NLP: Categorization, Summarization, Sentiment Analysis, Named Entity Recognition, Machine Translation, Information Retrieval, Question Answer System	02
		Total	**39**

Text Books:

1. Daniel Jurafsky, James H. Martin, Speech and Language Processing‖ Second Edition, Prentice Hall.
2. Christopher D. Manning and Hinrich Schutze, Foundations of Statistical Natural Language Processing, MIT Press.

Reference books

1. Steven Bird, Ewan Klein, Natural Language Processing with Python, O'Reilly
2. Alexander Clark (Editor), Chris Fox (Editor), Shalom Lappin (Editor), The Handbook of Computational Linguistics and Natural Language Processing

NPTEL / Swayam Course:

1. Course: Natural Language Processing By Prof. Pawan Goyal, IIT Kharagpur
   https://onlinecourses.nptel.ac.in/noc21_cs102/preview
2. Course: Applied Natural Language Processing By Prof. Ramaseshan R, CMI
   https://onlinecourses.nptel.ac.in/noc20_cs87/preview

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDL OC8013	Wireless Networks	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCDL OC8013	Wireless Networks	20	20	20	80	03	--	--	100

Course Pre-requisite:

ECC602 - Computer Communication and Networks
ECC702 - Mobile Communication System

Course Objectives:

1. To analyze the fundamental architecture, design issues and standards of wireless networks.
2. To compare Personal Area Network (PAN) technologies such as ZigBee, Bluetooth, UWB, NFC and 6LoWPAN.
3. To classify different LAN topologies and technologies and ad hoc networks.
4. To classify network protocols, ad hoc vehicle networks and Wireless MANs.
5. To understand planning and design of GSM and CDMA system in Wireless WANs.
6. To apply Wireless sensor networks concepts to develop an IoT applications.

Course Outcomes:

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

1. Explain fundamental architecture, design issues and standards of wireless networks.
2. Compare different types of Personal Area Network (PAN) technologies such as ZigBee, Bluetooth, UWB, NFC and 6LoWPAN.
3. Analyze different LAN topologies and technologies and ad hoc networks.
4. Compare various types of network protocols, ad hoc vehicle networks and Wireless MANs.
5. Evaluate the planning and design of performance of GSM and CDMA system in Wireless WANs.
6. Understand the basic network architecture of Wireless sensor networks concepts to develop an IoT applications.

Module No.	Unit No.	Topics	Hrs.
1.0		**Overview of wireless networks**	**04**
	1.1	**Wireless Networks**: Architecture, Classifications, Switching technology, Communication Problems, Reference Models. Networking issues and Networking Standard.	02
	1.2	**Wireless Body Area Networks:** Properties, Network Architecture, Network components and Applications	02
2.0		**Wireless Personal Area Networks**	**10**
	2.1	**WPAN:** Bluetooth (802.15.1): Radio Specifications, Protocol Stack, Link Types, Security, Topologies, Applications.	02
	2.2	**ZigBee (802.15.4):** Radio Specifications, Components, Topologies, Protocol Stack, Applications.	02
	2.3	**RFID:** Radio Specifications, Architecture, Types and applications.	02
	2.4	**Near Field Communication & UWB (802.15.3 a):** Introduction and working.	02
	2.5	**6LoWPAN:** Features, Architecture, protocol stack and applications	02
3.0		**Wireless Local Area Network & Wireless Adhoc Networks**	**06**
	3.1	**Wireless Local Area Network:** Equipment, Topologies, Technologies, Applications, Main features of IEEE802.11a,b, i and n, Protocol Architecture of WLAN	03
	3.2	**Wireless Adhoc Networks**: Features, advantages & Applications **Mobile Adhoc Networks:** Network Architecture, MAC Protocol.	03
4.0		**Wireless Metropolitan & Vehicular Adhoc Networks**	**05**
	4.1	**WMAN(IEEE802.16):**Introduction, WMAN Network Architecture, Network Protocols, Broadband Wireless Networks, Applications	03
	4.2	**Vehicular Adhoc Networks (VANETs):** Characteristics, Protocols & Applications	02
5.0		**Wireless Wide Area Networks**	**06**
	5.1	Planning and design of Wireless Networks, Radio design for a cellular Network	04
	5.2	Receiver sensitivity, Link budget for GSM and CDMA Systems, HSDPA	02
6.0		**Advanced Technologies of Wireless Networks**	**08**
	6.1	**Wireless Sensor Networks:** Network Architecture, Design Considerations, Network Protocol Stack, and Applications	04

	6.2	**Wireless Mesh Network:** Network architecture, Protocols, technologies & Applications	02
	6.3	**Internet of Things:** IoT Conceptual Frame work, Architecture, Technology & Examples. M2M Communication	02
		Total	**39**

Text Books & References:

1. Vijay K. Garg, "Wireless Communication and Networking", Morgan -Kaufmann Series in Networking—Elsevier
2. Kazem Sohraby, Daniel Minoli, and Taieb Znati, "Wireless Sensor Networks: Technology, Protocols, and Applications", Wiley Student Edition
3. Dr SunilkumarS. Manvi, Mahabaleshwar S. Kakkasageri, "Wireless and Mobile Networks Concepts and Protocol"Wiley India Pvt Ltd
4. Raj Kamal, "Internet of Things Architecture & Design Principles" Mcgraw Hill

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus completed and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. Weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
5. **Total 04 questions** need to be solved.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8014	Web Design	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCDLO 8014	Web Design	20	20	20	80	03	--	--	100

Course pre-requisite:

ETS: 305 – Skill development lab Java
ETC: 405 - Skill development lab Python

Course Objectives:
1. To design and create web pages using HTML5 and CSS3.
2. To implement client-side scripting to static web pages.
3. To create dynamic web pages using server-side scripting.
4. To use MVC framework for web application development.
5. To use web services in web application development

Course Outcome:
After successful completion of the course students will be able to:
1. Design web pages using HTML5 and CSS3.
2. Apply the concepts of client-side validation and scripts to static web pages using JavaScript and its framework.
3. Build responsive web pages using front-end framework Bootstrap.
4. Develop a web application using appropriate web development framework.
5. Understand working of web services

Module No.	Unit No.	Topics	Hrs.
1.0		**INTRODUCTION TO WWW**	**03**
	1.1	Understanding web system architecture, understanding 3 - tier web architecture. Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web, HTTP Request Message, HTTP Response Message, Web Clients, Web Servers	
2.0		**CLIENTSIDE PROGRAMMING PART I**	**05**
	2.1	**HTML:** Basic structure of an HTML5 document, Creating an HTML5 document, Markup Tags, Heading-Paragraphs, line Breaks HTML5 Tags - Introduction to elements of HTML, Working with Text, Lists, Tables and Frames, Hyperlinks, Images and Multimedia, Forms and other HTML5 controls	
	2.2	**CSS:** Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling 4 (Background, Text Format, Controlling Fonts), Working with block elements and objects, Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector)	
3.0		**CLIENTSIDE PROGRAMMING PART II**	**03**
	3.1	**Bootstrap** Introduction to Bootstrap, downloading and installing Bootstrap. The Grid System: Introducing the Grid, Offsetting and Nesting, Responsive Features, Utility Classes, and Supported Devices. CSS Foundations: Typography in Bootstrap, Styling Tables, Styling Forms, Styling Buttons, Images, icons, and Thumbnails. Navigation Systems: Tabs, Pills, and Lists, Breadcrumbs and Pagination, Navigation Bar, Making the Navigation Bar Responsive.	
4.0		**WEB DEVELOPMENT WITH JAVA**	**12**
	4.1	**Server-side programming Java Servlets**: Java Servlet Architecture, Servlet Life Cycle, Form GET and POST actions, Session Handling, Understanding Cookies,	
	4.2	**Client-side programming: JavaScript** Introduction to JavaScript, Lexical Structure, Types, Values, Variables, Expressions and Operators, Statements, Objects, Arrays, Functions, Pattern matching with regular expressions, JavaScript in Web Browsers, The Window object, Scripting Documents, Handling Events.	
	4.3	**Client-side programming: JavaScript framework jQuery** jQuery: jQuery Basics, jQuery Getters and Setters, Altering Document Structure, Handling events with jQuery, Animated Effects, Utility functions, jQuery Selectors and Selection Methods,	
5.0		**SERVERSIDE PROGRAMMING**	**12**
	5.1	MVC architecture - Introduction and applications, Server side-scripting – Laravel Framework Managing Your Project Controllers, Layout, Views, and Other Assets.	
	5.2	Introduction to PHP, PHP Tags, Adding Dynamic content, accessing form variables, identifiers, user-declared variables, Data types, Constants, Operators, Control structures, Conditionals, Iteration constructs, using arrays, string manipulation and regular expressions, reusing code and writing functions.	
	5.3	Designing and creating your web database, Accessing MySQL database from the Web with PHP, Session Control in PHP	
	5.4	Introduction to AJAX: AJAX design basics, AJAX vs Traditional Approach, Rich User Interface using Ajax	

6.0		WEBSERVICES	03
	6.1	Introduction to Web Services: The definition of web services, basic operational model of web services (SOAP and REST), tools and technologies enabling web services, benefits and challenges of using web services.	
	6.2	Web Services Architecture: Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services	
		Total	**39**

Text Books :

1. "Web Technology Black Book", Dreamtech Press, First Edition, 978-7722- 97
2. WEB TECHNOLOGIES A Computer Science Perspective Jeffrey C. Jackson Duquesne University
3 Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India, rp 2008
4. Learning Bootstrap Aravind Shenoy Ulrich Sossou PACKT PUBLISHING

Reference Books

1. Ralph Moseley, M.T. Savliya , "Developing Web Applications", Willy India, Second Edition,
2. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY,2014. (http://www.ebooksbucket.com/uploads/itprogramming/javascript/Learning_PHP_MySQL_Javascript_CSS_HTML5__Robin_Nixon_3e.pdf)
3. Professional Rich Internet Applications: AJAX and Beyond, Dana Moore, Raymond Budd, Edward Benson, Wiley publications. https://ebooks-it.org/0470082801-ebook.htm
4. Jennifer Kyrnin, "SAMS Teach Yourself Bootstrap in 24 hours", 1st edition, Pearson Education.
5. Martin Bean, "Laravel 5 Essentials", PACKT Publishing Ltd
6. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.
7. Achyut S Godbole and Atul Kahate, "Web Technologies", Second Edition, Tata McGraw Hill, 2012.
8. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
9. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
10. Steven Holzner, "The Complete Reference – PHP", Tata McGraw Hill, 2008
11. Mike Mcgrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.
12. J. Millman and A. Grabel, "Head First HTML and CSS", 2nd edition, O" Reilly..
13. Ben Frain, "Responsive Web design with HTML5 and CSS3", PACKT Publishing Ltd.
14. L. Welling and L. Thomson, "PHP and MySQL Web Development", 4th edition, Adison Wesley Professional.

Digital Material:

1. www.w3schools.com

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8015	RF Design	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCDLO 8015	RF Design	20	20	20	80	03	--	--	100

Course Pre-requisite:

1. Electromagnetic and Antenna
2. Principles of Communication Engineering
3. Microwave Engineering

Course Objectives: The course should enable the students to:

1. To learn RF circuit fundamentals for designing various circuit building blocks in a typical RF transceiver
2. To learn importance of EMI/EMC

Course Outcomes:

1. Design impedance matching networks and passive RF filters
2. Design and appraise the RF amplifiers
3. Design and appraise the RF oscillators
4. Differentiate the RF mixers
5. Analyze EMI and EMC in RF circuits
6. Analyze stability of RF trans-receiver

Module No.	Unit No.	Topics	Hrs.
1.0		**RF Filter Design**	**08**
	1.1	Introduction to Periodic Structure	
	1.2	Filter design using Image parameter method (Theory and Numerical)	
	1.3	**Filter design using Insertion loss method-** Maximally flat low pass prototype, Equal ripple low pass prototype, Filter transformation and filter implementation. (Theory and Numerical)	
2.0		**Microwave Amplifier Design**	**10**
	2.1	Two-port power gain derivation, signal flow graph(SFG) and stability criterion (Theory and Numerical)	
	2.2	**Single stage amplifier design**: Design for maximum gain, design for specified gain, low noise amplifier design (Theory and Numerical)	
	2.3	**Power amplifier design**: Characteristics of power amplifier and classes of amplifiers, design of class A power amplifier. (Theory and Numerical)	
3.0		**Microwave Oscillator**	**06**
	3.1	One-port microwave oscillator design. (Theory and Numerical)	
	3.2	One-port microwave oscillator design. (Theory and Numerical)	
	3.3	Analysis of phase noise in oscillators	
4.0		**Microwave Mixer**	**05**
	4.1	**Mixers:** Characteristics, Various types of Mixers: Single ended diode mixers, FET mixers, Balanced mixers, Image reject mixers and other types of mixers	
5.0		**Electromagnetic Interference in RF circuits**	**04**
	5.1	**Introduction**: Natural and Nuclear Sources of EMI, EMI From Apparatus and Circuits. Quantification of Communication System EMI	
	5.2	**Elements of Interference** Including Antennas, Transmitters, Receivers and Propagation. Electronic Equipment And System EMI Concepts. Examples Of EMI Coupling Modes	
	5.3	**Mode of coupling**: Common-Mode coupling , Differential mode coupling, and other coupling mechanisms (Power supply and victim amplifiers)	
6.0		**Electromagnetic Compatibility**	**06**
	6.1	**For Achieving EMC**: Grounding, Bonding, Shielding Effectiveness, EMI Diagnostics And Fixes: Techniques Used In EMI Diagnostics Fixes, troubleshooting.	
	6.2	**Instruments, Tools, used to measure Electromagnetic Field (Radiated and Conducted Emission)**: voltage and current probe, LISN, CDN, Clamp, Field probes, Spectrum analyzer, Oscilloscope, EMI Receiver	
	6.3	**Electromagnetic Noise specification**: Surge, EFT (Electrical Fast transients), PFMF, Radiated and conducted susceptibility, Voltage and dips interruption, Ring wave, Damped oscillatory wave	
	6.4	**EMC Specifications, Standards And Measurements**: A Discussion of the Genesis of EMC documentation including a historical Summary, The Rationale, and A Review of MIL-Std., FCC And CISPR Requirements	
		Total	**39**

Text Books:

1. David Pozar, “Microwave Engineering”, Wiley Publication (Fourth Edition)
2. Ludwig R. and Bogdanov G., “RF Circuit Design”, Prentice Hall

3. Jack Smith, "Modern Communication circuits", Tata McGraw Hill
4. W. Prasad Kodali, "Engineering Electromagnetic Compatibility: Principles, Measurements, Technologies, and Computer Models", Wiley-IEEE Press (Second Edition)
5. David. A. Weston, "Electromagnetic Compatibility principles and applications", Marcel Dekker (Second Edition)
6. MARK I. MONTROSE EDWARD M. NAKAUCHI, "Testing for EMC compliance: Approaches and Techniques"

Reference books

1. Guillermo Gonzalez, "Microwave Transistor Amplifiers Analysis and Design "Prentice Hall. (Second Edition)
2. M. L. Sisodia, G. S. Raghuvanshi, " Microwave Circuits and Passive Devices", New Edge International Publisher(First Edition)
3. Clayton R. Paul, "Electromagnetic Compatibility", John Wiley & Sons. (Second Edition)

Useful Links:

1. www.nptelvideos.in
2. https://nptel.ac.in/courses/108/106/108106138/
3. https://freevideolectures.com/course/4367/nptel-microwave-theory-techniques

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-1). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. 4.**Total 04 questions** need to be attempted.

Subject Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8021	Autonomous Vehicles	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Exam Duration (in Hrs.)	Term Work	Practical And Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of Test 1 and Test 2					
ECCDLO 8021	Autonomous Vehicles	20	20	20	80	03	--	--	100

Course Pre-requisite:
ECCDLO5015 : Sensor Technology
ECC603 : IPMV
ECC604 : ANNFL
ECCDLO7012 : Deep Learning

Course Objectives:
1. Introduction to Autonomous vehicles/SDC (Self Driving Cars), advantages and challenges in SDC's.
2. Gain Knowledge about the Sensors in SDC's.
3. Understand the in- vehicle communication aspects in SDC's
4. Understand perception and localization in SDC.
5. Get to grips with planning and control in SDC.
6. To know the various applications of SDC's.

Course Outcome:
After successful completion of the course student will be able to
1. Understand fundamentals of SDC (Self Driving Cars).
2. Compare different types of Sensors in SDC's.
3. Illustrate different protocols of In - vehicle communication for SDC's.
4. Identify perception and localization in SDC's.
5. Analyze planning and control in SDC.
6. Evaluate different applications and algorithms in SDC's.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction**	**04**
	1.1	Introduction to Autonomous Vehicles /Self Driving cars (SDC), Benefits of SDCs, Challenges in Current Deployment.	
	1.2	Levels of Autonomy	
2.0		**Sensors in Autonomous Vehicles**	**06**
	2.1	Camera (3D and stereo), LiDAR, Sensor Fusion	
	2.2	Passive Perception with Sonar and Millimeter Wave Radar	
	2.3	Vehicle-to-Everything Infrastructure	
3.0		**In-Vehicle Communication Systems**	**08**
	3.1	CAN: Introduction and architecture	
	3.2	CANopen: Introduction and architecture	
	3.3	FlexRay protocol: Introduction and architecture	
	3.4	Introduction to Operating System for SDC's.	
4.0		**Perception and Localization in SDC**	**09**
	4.1	Introduction to Computer vision in SDC. Artificial eyes VS human eyes. Four pillars of autonomous driving: Perception, Localization, Planning and Control.	
	4.2	Perception: Object Detection and Line Lane detection Object/ obstacle Detection: Comparison of 2D and 3D object detection. Overview of ML algorithms for obstacle detection-Histogram of Oriented Gradients (HOG), Support Vector Machine (SVM). Object detection using deep learning algorithm: Architecture of YOLO	
	4.3	Line Lane Detection: Introduction to Semantic Segmentation, architecture, overview of different semantic segmentation architecture.	
	4.4	Localization: Introduction to GNSS, GNSS error analysis, Visual Odometry, SLAM Self-Learning: Implementation of YOLO for object Detection, Implementation of semantic segmentation for images.	
5.0		**Planning and Control in SDC**	**06**
	5.1	Planning and Control: Architecture of planning and control, Traffic Prediction and routing.	
	5.2	Behavioral decision, Motion Planning and feedback control.	
6.0		**Applications of SDC**	**06**
	6.1	DragonFly Model: Sensor Configuration and Software Architecture	
	6.2	Enabling Commercial Autonomous Space Robotic Explorers: Sensor configuration and its working.	
	6.3	Algorithm for YOLO object detection: Detecting objects in images and Detecting objects in videos	
		Total	**39**

Textbooks:

1. Sumit Ranjan, Dr. S. Senthamilarasu - Applied Deep Learning and Computer Vision for Self-Driving Cars , Packt Publishing Ltd. 2020.
2. Shaoshan Liu, Liyun Li , Jie Tang, Shuang Wu, Jean-Luc Gaudiot - Creating Autonomous Vehicle System , Second Edition , Morgan & Claypool Publishers , 2018.
3. William Ribbens - Understanding- Automotive-Electronics , Butterworth-Heinemann Publisher , Fifth Edition, 1998.

Reference Books:

1. Markus Maurer ,J. Christian Gerdes, Barbara Lenz , Hermann Winner - Autonomous Driving Technical, Legal, Social Aspects , Springer Open, 2015.
2. Shaoshan Liu - Engineering Autonomous Vehicles and Robots, Wiley, 2020.

E-Resources:

1. Open Innovation in EVs: A case study of Tesla Motors
   https://www.diva-portal.org/smash/get/diva2:635929/FULLTEXT01.pdf

2. Autonomous vehicles Research report by MRCagney
   https://drive.google.com/drive/folders/1nxROagqwDKUpVMDLFPPgG7_DKakuyItf

3. Reinventing Safety: A Joint Approach to Automated Driving Systems Mercedes-Benz and Bosch
   https://www.daimler.com/documents/innovation/other/vssa-mercedes-benz-and-bosch.pdf

Online Courses

1. https://digitaldefynd.com/best-self-driving-cars-courses/
2. https://www.classcentral.com/course/intro-self-driving-cars-13140

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8022	Satellite and Nano Satellite Communication	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical & Oral	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test2	Avg. Of Test1 and Test 2					
ECCDLO 8022	Satellite and Nano Satellite Communication	20	20	20	80	--	--	--	100

Prerequisites:

- Analog Communication
- Digital Communication

Course objectives:

- To understand the basics of satellite communications and different satellite orbits
- Provide an in-depth understanding of satellite communication system operation, launching techniques, and earth station technology
- To Analyze and evaluate satellite link design
- To review structure design, payload and space segment related to Nano satellite.

Course outcomes:

After successful completion of the course student will be able to

- Understand the basic concepts of satellite communication system and orbital parameters.
- Explain various satellite sub-systems, earth station technologies and launching mechanisms.
- Analyze and evaluate link budget and various performance parameters of satellite signal for proper communication.
- Understand Nano satellite's structure design, payloads, Thermal control system and space segment

Module No.	Unit No.	Topics	Hrs.
1.0		**Overview of Satellite Systems, Orbits and Launching**	**08**
	1.1	An overview of space and classification of satellite, orbital elements: apogee and perigee heights, semi-major axis, eccentricity, and mean anomaly, argument of perigee, inclination and right ascension of the ascending node, polar orbiting satellites, Kepler's first, second and third law, Orbital perturbations, effects of a non-spherical earth, atmospheric drag.	
	1.2	Sub-satellite point, predicting satellite position, antenna look angels, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage.	
	1.3	Selection of launching site, launch window, zero and non-zero degree latitude launching, sea launch, Launchers: Polar Satellite Launch Vehicle (PSLV), Geostationary Satellite Launch Vehicle (GSLV), Reusable launch vehicles (RLV),Sounding rockets, Fuels used for launch Vehicles.	
2.0		**Space Segment**	**04**
	2.1	Satellite configuration, transponder sub-system, antenna sub- system, AOC sub-system, TT&C sub-system, power sub-system,thermal sub-system.	
	2.2	Reliability and quality assurance.	
3.0		**Earth Station**	**03**
	3.1	Design consideration.	
	3.2	General configuration: block diagram, receive only type earth, transmit-receive type earth station, antenna system, feed system, tracking system, LNA and HPA.	
4.0		**Satellite Losses and Links**	**10**
	4.1	Atmospheric losses, ionospheric losses, transmission losses, feeder losses, antenna misalignment losses, rain attenuation, other impairments, antenna polarization, polarization of satellite signals, cross polarization discrimination, ionospheric depolarization, rain depolarization and ice depolarization, Isotropic radiated power and link budget.	
	4.2	System noise, antenna noise, amplifier noise temperature, amplifiers in cascade, noise factor, noise temperature of absorptive networks, overall system noise temperature and carrier to noise ratio.	
	4.3	Saturation flux density, input back off, earth station HPA, output back off and satellite TWTA output.	
	4.4	Effects of rain, uplink rain-fade margin, downlink rain-fade margin, combined uplink and downlink C/N ratio and intermodulation noise.	
5.		**Overview of nano satellite**	**06**
	5.1	Introduction: Important transformation, Review of nano satellite, Global economics related to it, Evolution of nano satellite, ISRO's small satellite program and future scenario.	
	5.2	Payloads for nano satellite: Types of payloads: Earth observation payload, communication payload and scientific payload. Design considerations for payloads.	
	5.3	Nanosatellite structures: Function of satellite structure, Types of structure designs: Skin frame structure, Truss structure, Monocoque cylinders and Skin stringer structure, Overview for building of structure and materials for structures.	

6.		Space segment for nano satellite	08
	6.1	Thermal control system (TCS) implementation in nano satellite and it's testing for verification of TCS. Power system design for nano satellite.	
	6.2	Function and design consideration of Deployment mechanisms, Critical elements in deployment mechanisms, Overview of types of deployment mechanisms.	
	6.3	On board Computer and digital electronics (OBC): Block diagram of typical OBC, Overview of OBC Software and hardware, Telemetry and telecommand, Attitude control electronics	
	6.4	Quality, Quality assurance, product assurance and reliability analysis for Nano satellite	
		Total	**39**

Text Books & References:

1. Dennis Roddy, ‒Satellite Communications‖, 4th Ed., Mc. Graw-Hill International Ed. 2009.
2. M. Richharia, ‒Satellite Communication Systems Design Principles‖, Macmillan Press Ltd. Second Edition 2003.
3. R. N. Mutangi, ― Satellite Communication‖, Oxford university press, 2016.
4. Gerard Maral and Michel Bousquet, ‒Satellite Communication Systems‖, 4th Edition Wiley Publication
5. Gerard Maral, ―VSAT Networks‖, John Willy & Sons
6. Space technology Veterans, Quintessence of Nano satellite technology (small is big), Planet aerospace India,2020.
7. Timothy Pratt, Charles Bostian, and Jeremy Allmuti, ‒Satellite Communications‖, John Willy & Sons (Asia) Pvt. Ltd. 2004
8. Wilbur L. Pritchard, Henri G. Suyderehoud, and Robert A. Nelson, ‒Satellite Communication systems Engineering‖, Pearson Publication

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8023	Network Management in Telecommunication	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCDLO 8023	Network Management in Telecommunication	20	20	20	80	03	--	--	100

Course pre-requisite:

ECC602- Computer Communication Networks

Course Objectives:

1. To understand the concepts of network management in Telecommunication (NMT), architectures and protocols.
2. To familiarize the student with the design, analysis, operation and management of modern data communications networks.
3. To provide the student with a working knowledge of the types of communication network management systems and their strengths and limitations in solving various information network management problems.

Course Outcome:

After successful completion of the course, the student will be able to:-

1. Explain the need for interoperable network management and analyze the trends and development of the Telecommunications Network Management.
2. Demonstrate broad knowledge of fundamental principles and technical standards underlying NMT.
3. Describe the concepts and architecture behind standards-based network management associated with SNMP and CMIP.
4. Apply basics of telecommunication, networking and information technologies and architect and implement networked informative systems.
5. Continuously improve their knowledge of technology and communication skills.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction of Network Management**	**6**
	1.1	Introducing Network Design Concepts: Case histories on network, system and service management, Network design based on economy and SLA-based services. Challenges of IT managers	
	1.2	Network Management: Goals, organization and functions	
	1.3	Network management architecture, organization network and management perspectives	
2.0		**OSI Network Management**	**6**
	2.1	Network Management standards	
	2.2	OSI Network Management model	
	2.3	Network Management layers	
	2.4	ISO Network Management functions	
	2.5	Communication model and functional model	
	2.6	Abstract Syntax Notation One (ASN.1): Terminology, symbols, and conventions. TLV encoding structure	
3.0		**Internet Management**	**10**
	3.1	**SNMP model**: SNMP Organizational model, System overview, Information model, Management of Information Base	
	3.2	**SNMP v1**: SNMP Communication model- SNMP architecture, Administrative model, SNMP Protocol specifications, SNMP operations, SNMP Functional model	
	3.3	**SNMPv2**: Major changes in SNMPv2, SNMPv2 architecture, SNMPv2 Management Information Base, SNMPv2 protocol, Compatibility with SNMPv1	
	3.4	**SNMPv3**:Key features, SNMPv3 architecture, SNMPv3 applications, Security, security model, message format, SNMPv3 User- based Security Model, Access control (VACM)	
	3.5	**RMON:** What is RMON? RMON 1, RMON 2	
4.0		**Telecommunication Management Networks(TMN)**	**4**
	4.1	Definition of TMN , TMN framework, TMN functional model	
	4.2	TMN Conceptual model, OSI functionality in TMN	
	4.3	TMN management services architecture and TMN implementation	
5.0		**Network Management Tools and Applications**	**9**
	5.1	System Utilities for Network Management: Basic tools, SNMP tools and Protocol analyzer	
	5.2	Network Statistics and Measurements: Traffic load, Protocol statistics, Data and Error statistics	
	5.3	NMS Design: Functional requirements, NMS Client design and NMS Server architecture, Distributed Management approaches	
	5.4	Network Management Systems: Commercial and Open-source NMSs	
	5.5	Network Management Applications: Fault, Configuration, Accounting, Performance and Security (FCAPS)	
	5.6	Event Correlation Techniques: Rule-based reasoning, Model-based reasoning, Case-based reasoning, Codebook, State Transition Graph model and Finite State Machine model	

	5.7	Report Management, Policy-based Management and Service Level Management	
6.0		**Broadband Network Management**	**4**
	6.1	Broadband networks and services, ATM Technology – VP, VC, ATM Packet, Integrated service, ATM LAN emulation, Virtual LAN	
	6.2	ATM Network Management – ATM network reference model, Integrated Local Management Interface, role of SNMP and ILMI in ATM	
	6.3	ATM Management Information Base, M1, M2, M3, M4 interfaces	
		Total	**39**

Text books

1. Mani Subramaniam, *Network Management Principles and Practice*, New Delhi: Pearson, 2010.
2. Alexander Clemm, *Network Management Fundamentals*, Cisco Press, December 2006, ISBN-13: 978-158720137.
3. Benoit Claise and Ralf Wolter, *Network Management: Accounting and Performance Strategies*, CISCO Press, 2007.
4. J. Richard Burke, *Network Management: Concepts and Practice, A Hands-On Approach*,Pearson Education India, 2008, ISBN-13: 978-8131718490.
5. Salh Aiidarons, Thomas Plevoyak, *Telecommunications Network Technologies and Implementations*, Eastern Economy Edition, New Delhi:IEEE Press, 1998.
6. Henry Haojin Wang, *Telecommunication Network Management*, McGraw Hill, 1999.

Online Learning Resources:-

1. https://www.youtube.com/watch?v=liBB_Q7Go5k
2. https://www.youtube.com/watch?v=xdUjwlyyi9U
3. https://www.youtube.com/watch?v=aQGeSDauRso
4. https://nptel.ac.in/courses/117/101/117101050/
5. https://nptel.ac.in/courses/106/105/106105183/

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8024	Microstrip Antenna	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCDLO 8024	Microstrip Antenna	20	20	20	80	03	--	--	100

Course Prerequisite:

1. **Electromagnetics and Antenna**
2. **Microwave Engineering**

Course Objectives:

In the course, Students will be introduced to :

1. Fundamental parameters and characteristics of Microstrip Antennas(MSA)
2. Design and analysis of Rectangular and Circular MSA.
3. Different compact and broadband techniques of MSA.
4. Circularly Polarized MSA's and various applications in wireless communication systems.

Course Outcomes:

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

1. Apply the fundamental parameters of MSA.
2. Analyze Rectangular and Circular MSA.
3. Identify various compact and broadband methods of MSA.
4. Examine the methods of circular polarization.
5. Compare various applications of MSA.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction to Microstrip Antennas**	**05**
	1.1	Types of MSA's, Characteristics of MSA's, Advantages and Disadvantages, Applications of MSA's.	01
	1.2	Reflection coefficient, VSWR, Return loss, Impedance mismatch, VSWR Bandwidth, Gain, Directivity, Antenna efficiency, E-Plane and H-Plane radiation pattern, Co and Cross polarization, Specific absorption rate (SAR), Axial ratio.	02
	1.3	Feeding Techniques, brief introduction to Methods of Analysis, Surface waves, Various substrates with dielectric constant for MSA.	02
2.0		**Design of Rectangular Microstrip Antenna (RMSA)**	**08**
	2.1	Design considerations of RMSA: Resonant frequency, Voltage and Current variation, Radiation Pattern, Calculation of effective dielectric constant, actual and effective length, width, feed point location.	04
	2.2	Parametric Study of RMSAs : Effect of - feed point location, width of RMSA(W), height of substrate(h), dielectric constant(Ɛr), probe diameter, finite ground plane, loss tangent.	03
	2.3	Analysis of Higher order modes of RMSA	01
3.0		**Design of Circular Microstrip Antenna (CMSA)**	**08**
	3.1	Design considerations of CMSA: Resonant frequency, Input Impedance and Voltage Distribution, Radiation Pattern, Calculation of effective dielectric constant, actual and effective radius, feed point location.	06
	3.2	Parametric Study of CMSAs : Effect of loss tangent	01
	3.3	Analysis of Higher order modes of CMSA	01
4.0		**Compact and Broadband Techniques**	**08**
	4.1	Compact Techniques for RMSA and CMSA:Introduction, Compact Shorted RMSA, Partially Shorted RMSA, Effect of Dimensions of RMSA with a Single Shorting Post, Effect of the Position of the Single Shorting Post.	04
	4.2	Broadband Techniques for RMSA and CMSA: Planar Multiresonator configurations (Radiating and Non-radiating Gap coupled concept), Electromagnetically coupled MSA's, Stacked Multiresonator Rectangular Patches on Thick Substrates, U slot technique.	04
5.0		**Circularly Polarized MSAs**	**05**
	5.1	Methods to achieve Circular Polarization in MSA : single feed and dual feed.	03
	5.2	Design procedure for single feed circularly polarized MSA (RMSA & CMSA).	02
6.0		**Applications of MSA**	**05**
	6.1	Introduction: Wearable and Fractal Antennas for wireless communication systems, MIMO Patch Antenna, Reconfigurable Antenna, Implanted Antennas in the medical field.	05
		Total	**39**

Text Books:

1. Girish Kumar, K. P. Ray, Broadband Microstrip Antennas, Artech House, 2003.
2. Constantine A. Balanis, Antenna Theory: Analysis and Design, John Wiley Publication 4th Edition.
3. Sabban, Albert. Wearable Communication Systems and Antennas for Commercial, Sport and Medical Applications. IOP Publishing 2018. https://dx.doi.org/10.1088/2053-2563/aade55
4. Abed, M. J. Abu-AlShaer, and A. M. Jawad, "Fractal Antennas for Wireless Communications", in Modern Printed-Circuit Antennas. London, United Kingdom: IntechOpen, 2020 [Online]. Available: https://www.intechopen.com/chapters/71491 doi: 10.5772/intechopen.90332
5. Sharawi Mohammad S., Printed MIMO antenna engineering, Artech House Publishers, 2014.
6. J. T. Bernhard, Reconfigurable Antennas. San Rafael, CA, USA: Morgan and Claypool Publishers, 2007.

7. Rahmat-Samii, Yahya, Kim, Jaehoon, Implanted Antennas in Medical Wireless Communications. United States: Morgan & Claypool Publishers, 2006. https://doi.org/10.2200/S00024ED1V01Y200605ANT001

Reference books

1. Ramesh Garg, Prakash Bhartia, Inder J. Bahl, A. Ittipiboon, Microstrip Antenna Design Handbook, Artech House, 2001.
2. Kin-Lu Wong, Compact and Broadband Microstrip Antennas, John Wiley & Sons Inc, United States, 2002.
3. Kai Fong Lee, Kwai Man Luk, Hau Wah Lai, Microstrip Patch Antennas, World Scientific; 2nd edition.

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of a total **of 06 questions**, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on the entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCDLO 8025	Augmented and Virtual Reality	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCDLO 8025	Augmented and Virtual Reality	20	20	20	80	03	--	--	100

Prerequisite: Programming Language, Computer Graphics

Course Objectives: The course aims:

1. To learn the underlying concepts of Augmented and Virtual Reality and primitives of computer graphics.
2. To understand the use of hardware devices in AR-VR system.
3. To understand the tracking system in AR.
4. To apply concept of calibration and registration of different components in AR system
5. To design AR-VR applications.
6. To understand the use of AR-VR in interdisciplinary immersive applications

Course Outcomes: On successful completion of this course, learner /student will be able to:

1. Identify and compare different Virtual and Augmented Reality Technologies and apply modelling techniques.
2. Identify and use AR-VR hardware components.
3. Apply concepts of Computer Vision for tracking in AR Systems.
4. Apply calibration techniques and registration for components in AR.
5. Design AR-VR application
6. Apply insights of AR-VR in different applications.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction to Augmented and Virtual Reality**	**05**
		Definition and Scope, A Brief History of Augmented and Virtual Reality, AR-VR Architecture, Challenges with AR-VR, AR-VR systems and functionality, Types of Augmented Reality Application (Location Based AR Apps Marker-Based AR Applications). Understanding Virtual Space and Geometry: coordinate systems, Geometric Modelling, 2D transformations, 3D rotation and 6 degree of freedom, View Transformation, projective transformation, Related fields: MR, XR and ubiquitous computing and their comparison.	
2.0		**Visual Physiology, perception and Interaction**	**05**
		Mechanics of Sight: the visual pathway, spatial vision and depth cues. Display fundamentals, optical architecture. Augmenting displays. Multimodal Displays; Visual Perception; Spatial Display Model; Visual Displays. Mechanics of hearing, audio displays. Augmented and Virtual reality Hardware	
3.0		**Tracking and Computer Vision for AR**	**10**
		Characteristics of Tracking Technology; Stationary Tracking Systems; Mobile Sensors; Optical Tracking; Sensor Fusion; Marker Tracking, infrared tracking, Natural feature tracking by detection.	
4.0		**Calibrations and Registration**	**06**
		Camera projection and setup for AR. Camera calibration techniques. Registration	
5.0		**AR-VR Application Development**	**07**
		AR-VR Application Requirements, Software engineering requirements, AR-VR Design Principles, Data Flow, Scene Graphs; Developer Support: Parameter Configuration, Tools used in AR-VR development.	
6.0		**Applications of AR-VR and Human Factors, Legal and Social Considerations**	**06**
		Applications of AR-VR in: Edutainment, Medical, Military, Production and Manufacturing, Navigation, Astronomical Observation, E-commerce; What are Human Factors, Physical Side Effects, Visual Side Effects, Legal Considerations, Moral and Ethical Considerations.	
		Total	**39**

Textbooks:

1. John Vince, “Virtual Reality Systems”, Pearson publication
2. Tony Parisi, “Learning Virtual Reality”, O’REILLY’
3. Dieter Schmalsteig and Tobias Hollerer, “Augmented Reality- Principles and Practice”, Pearson Education, Inc. 2016 Edition.
4. Chetankumar G Shetty, “Augmented Reality- Theory, Design and Development”, Mc Graw Hill, 2020 Edition.
5. Alan B. Craig, “Understanding Augmented Reality – Concepts and Applications”, Morgan Kaufmann, Elsevier, 2013 Edition.

References:

1. Borko Furht, “Handbook of Augmented Reality”, Springer.
2. Erin Pangilinan, Steve Lukas, and Vasanth Mohan, “Creating Augmented and Virtual Realities-Theory and Practice for Next-Generation Spatial Computing”, O’Reilly Media, Inc., 2019 Edition.
3. Jens Grubert, Dr. Raphael Grasset, “Augmented Reality for Android Application Development”, PACKT Publishing.

Online References:

1. www.nptel.ac.in
2. www.coursera.org

Internal Assessment (20-Marks):

Internal Assessment (IA) consists of two class tests of 20 marks each. IA-1 is to be conducted on approximately 40% of the syllabus and IA-2 will be based on remaining contents (approximately 40% syllabus but excluding contents covered in IA-I). Duration of each test shall be one hour. Average of the two tests will be considered as IA marks.

End Semester Examination (80-Marks):

Weightage to each of the modules in end-semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2. **Question No: 01** will be **compulsory** and based on entire syllabus wherein 4 to 5 sub-questions will be asked.
3. Remaining questions will be mixed in nature and randomly selected from all the modules.
4. **Total 04 questions** need to be attempted.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8011	Project Management	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8011	Project Management	20	20	20	80	03	--	--	100

Objectives:

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

Outcomes: Learner will be able to…

1. Apply selection criteria and select an appropriate project from different options.
2. Write work break down structure for a project and develop a schedule based on it.
3. Identify opportunities and threats to the project and decide an approach to deal with them strategically.
4. Use Earned value technique and determine & predict status of the project.
5. Capture lessons learned during project phases and document them for future reference

Module	Detailed Contents	Hrs
01	**Project Management Foundation:** Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager. Negotiations and resolving conflicts. Project management in various organization structures. PM knowledge areas as per Project Management Institute (PMI).	5
02	**Initiating Projects:** How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics.	6
03	**Project Planning and Scheduling:** Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart. Introduction to Project Management Information System (PMIS).	8
04	**Planning Projects:**	6

	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	
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:** 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,	8
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
Total		39

Assessment:

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

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

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

REFERENCES:

1. Jack Meredith & Samuel Mantel, Project Management: A managerial approach, Wiley India, 7th Ed.
2. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 5th Ed, Project Management Institute PA, USA
3. Gido Clements, Project Management, Cengage Learning.
4. Gopalan, Project Management, , Wiley India
7. Dennis Lock, Project Management, Gower Publishing England, 9 th Ed.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8012	Finance Management	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8012	Finance Management	20	20	20	80	03	--	--	100

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	09

	Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.	
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 Paper; Project Finance. **Capital Structure:** Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches— Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of Optimal Capital Structure	05
06	**Dividend Policy:** Meaning and Importance of Dividend Policy; Factors Affecting an Entity's Dividend Decision; Overview of Dividend Policy Theories and Approaches—Gordon's Approach, Walter's Approach, and Modigliani-Miller Approach	03
Total		39

Assessment:

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

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

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

REFERENCES:

1. 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.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8013	Entrepreneurship Development and Management	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECC ILO 8013	Entrepreneurship Development and Management	20	20	20	80	03	--	--	100

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
Total		39

Assessment:

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

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

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

REFERENCES:

1. 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

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8014	Human Resource Management	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8014	Human Resource Management	20	20	20	80	03	--	--	100

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	7

	• 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	
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
Total		39

Assessment:

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

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

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

REFERENCES:

1. 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

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8015	Professional Ethics and CSR	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8015	Professional Ethics and CSR	20	20	20	80	03	--	--	100

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
Total		39

Assessment:

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

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

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

REFERENCES:

1. 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 Bidyut Chakrabarty, Routledge, New Delhi.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8016	Research Methodology	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8016	Research Methodology	20	20	20	80	03	--	--	100

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	**08**

	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	
05	**Formulating Research Problem** **5.1** Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis	**04**
06	**Outcome of Research** **6.1** Preparation of the report on conclusion reached **6.2** Validity Testing & Ethical Issues **6.3** Suggestions and Recommendation	**04**
Total		39

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.

REFERENCES:

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

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8017	IPR and Patenting	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8017	IPR and Patenting	20	20	20	80	03	--	--	100

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) active in 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 Publication etc, Time frame and cost, Patent Licensing, Patent Infringement **Patent databases:** Important websites, Searching international databases	07
Total		39

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.

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

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8018	Digital Business Management	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8018	Digital Business Management	20	20	20	80	03	--	--	100

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
Total		39

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.

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, Vinocenzo Morabito, 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-en OECD Publishing

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECCILO 8019	Environmental Management	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration (Hrs.)	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
ECCILO 8019	Environmental Management	20	20	20	80	03	--	--	100

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
Total		39

Assessment:

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

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

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

REFERENCES:

1. 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

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ECL801	Optical Communication and Networks Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical and Oral	Total
		Internal assessment			End Sem. Exam.			
		Test 1	Test 2	Avg.				
ECL801	Optical Communication and Networks Laboratory	--	--	--	--	25	25	50

Course Objectives:

1. To make students understand and familiarize with different types of optical fibers.
2. To enable the students to measure the fundamental parameters such as numerical aperture, losses dispersion for single mode and multimode fibers
3. Expose the students to realize the dynamic change in the network performance when various sources, Amplifiers, detectors, components and fibers are incorporated.
4. In depth exposition to the point-to-point link, metro network,WDM network and DWDM Network
5. To understand the basic concepts and challenges in free space optical systems

Course Outcome:

On completion of this lab course the students will be able to:

1. Acquire proficiency in identifying the different types of fibers and understanding their properties.
2. To measure the losses, dispersion and compensation techniques in all optical network.
3. Learn to design all optical network with amplifiers and modern lasers for error free transmission.
4. To design or implement point to point optical fiber network, WDM or DWDM Network.
5. To design free space optical system with atmospheric impairments and propose mitigation technique for minimum BER.

Suggested Experiment List

- Calculation of Numerical aperture for SMF and MMF
- Calculation of dispersion for given fiber and its measurement
- Calculation of link Loss for given link
- Performance analysis of Single mode fiber
- Performance analysis of multimode fiber
- Performance Analysis of Optical Link with Different Sources
- Performance Analysis of Optical Link with Different Detectors
- Performance Analysis of Optical Amplifier

- Designing of point-to-point optical network using tools or software
- Designing of Metro network/WAN using tools or software
- Designing of WDM network using tools or software
- Designing of FSO using tools or software

Note: Small Project on implementation of indoor fiber optical network or free space optical network can be considered as a part of term-work.

Term Work:

At least 08 Experiments including 02 simulations covering entire syllabus must be given during the "Laboratory session batch wise". Computation/simulation-based experiments are also encouraged. The experiments should be students centric and attempt should be made to make experiments more meaningful, interesting and innovative. Application oriented one mini-project can be conducted for maximum batch of four students.

Term work assessment must be based on the overall performance of the student with every experiments/tutorials and mini-projects (if included) are graded from time to time. The grades will be converted to marks as per "Choice Based Credit and Grading System" manual and should be added and averaged. Based on above scheme grading and term work assessment should be done.

The practical and oral examination will be based on entire syllabus.

Subject Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/Pracs	Tutorial	Total
ECP 801	Major Project-II	--	12	--	--	6	--	6

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical & Oral	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test2	Avg. Of Test 1 and Test 2					
ECP 801	Major Project-II	--	--	--	--	50	100	--	150

Objective: The primary objective is to meet the milestones formed in the overall project plan decided in Project - I. The idea presented in Project -I should be implemented in Project -II with results, conclusion and future work. The project will culminate in the production of a thesis by each individual student.

Guidelines:

Project Report Format:

At the end of the semester the student needs to prepare a project report which should be prepared as per the guidelines issued by the University of Mumbai. Along with the project report a CD containing: project documentation, Implementation code, required utilities, Software_s and user Manuals need to be attached.

Term Work:

Student has to submit weekly progress report to the internal guide and the internal guide has to keep a track on the progress of the project and also has to maintain the attendance report. This progress report can be used for awarding the term work marks. In case of industry projects, visit by internal guide will be preferred to get the status of project. Distribution of marks for term work shall be as follows:

a) Weekly Attendance on Project Day
b) Project work contributions as per objective
c) Project Report (Hard Bound)
d) Term End Presentation (Internal)

The final certification and acceptance of TW ensures the satisfactory performance on the above aspects.

Oral & Practical:

Oral & Practical examination of Project- II should be conducted by Internal and External examiners approved by University of Mumbai. Students have to give presentation and demonstration on the Project-II.