Detailed Syllabus
Lab-wise Breakup

Course Code	17M15EC114	**Semester** Summer	**Semester** Summer **Session** 2018 - 2019 **Month from:** June 2019 – July 2019
Course Name	ECE DESIGN AND SIMULATION LAB -2		
Credits	1	**Contact Hours**	

Faculty (Names)	**Coordinator(s)**	Dr Neetu Singh, Dr Amit Kumar Goyal,
	Teacher(s) (Alphabetically)	Dr Amit Kr Goyal, Dr. Ankit Garg, Dr Neetu Singh, Dr Shruti Kalra

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Design and Analysis of Microelectronic Devices and Circuits Using Eldo Circuit Simulator.	Evaluate (Level V)
CO2	Simulation of Digital Image Arithmetic, Analysis and Enhancement operations.	Analyzing (IV)
CO3	Modeling and Analysis of wireless channel models and transmission techniques	Applying (Level III)
CO4	Simulate the various performance metrics of the wireless communication system over multiple antennas	Analyzing (IV)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Microelectronics	1. Introduction to Mentor Graphics Design environment: a. Design Architect (DA) for schematic entry. b. Design Viewpoint Editor (DVE) for creating design view point of the circuit. **c.** Eldo Simulator for circuit simulation	**CO1**
		2. Implementation of CMOS based NAND and NOR gates (Transient Analysis) with W=10u and L=1u at 500nm technology node.	
		3. Implementation of CMOS based half adder (Transient Analysis) with W=10u and L=1u at 500nm technology node.	
		4. Implementation of transmission gate based half adder (Transient Analysis) with W=10u and L=1u at 500nm technology node.	

		5. Implementation of CMOS based master slave T flip flop using the DVE of NAND gate (Transient Analysis) with W=10u and L=1u at 500nm technology node	
2.	Digital Image Processing	1. Introduction to Digital Image Processing a. To perform image arithmetic such as addition, subtraction, multiplication and division.	**CO2**
		2. Image Enhancement a. To apply blurring and de-blurring on the images. b. To apply global contrast enhancement to enhance images.	
		3. Geometric transformations a. To apply translation, rotation, and scaling on images.	
		4. Image Filtering a. To filter images using Gaussian, Laplacian, and Median filters. b. To apply image filtering in frequency domain.	
		5. Image Transforms a. To apply Fourier transforms on images. b. To find two-dimensional DCT and DWT coefficients of an image.	
3.	Introduction to Modeling of Wireless Channel Models	1. Introduction to MATLAB for communications	**CO3**
		a) Introduction to basic communication commands	**CO3**
		b) To study and simulate Gaussian distribution using two signal that follow normal distribution.	**CO3**
		2. To study and simulate Rayleigh Distribution using two signal that follow normal distribution.	
		3. To study and simulate Rician Distribution using two signal that follow normal distribution.	
4.	Set-up the simulation code of multiple antenna based Wireless transmission techniques	1. To study and simulate Beamforming technique for 2x1 MISO wireless communication system.	**CO3**
		2. To study and simulate Maximal Ration Combining (MRC) for 1x2 SIMO wireless communication system.	**CO3**
5.	Analysis of various performance metrics of the wireless communication systems over multiple antennas.	1. To obtain the BER versus SNR performance of following: a) AWGN Channel b) Rayleigh Fading	**CO4**
		2. To analyze and simulate the outage probability of wireless communication system for 2x1 MISO, and 4x1 MISO.	**CO4**

		3. To simulate the channel capacity of SISO, MISO, SIMO and MIMO communication systems	

Evaluation Criteria

Components	**Maximum Marks**
Mid Viva	20
End Viva	20
TA	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	ELDO User Manual--- http://web.engr.uky.edu/~elias/tutorials/Eldo/eldo_ur.pdf
2.	https://in.mathworks.com/discovery/digital-image-processing.html
3.	Gerd Keiser, Optical Fiber Communications, 3rd Edition, McGraw-Hill International edition, 2000.
4.	John M. Senior, Optical Fiber Communications, 2nd Edition, PHI, 2002.
5.	D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Fiber Optic Communications, Pearson Education, 2005.
6.	Journal articles i.e. IEEE, Springer, IOPscience, Elsevier and Video lectures from nanohub, NPTEL, MIT video lectures

Lecture-wise Breakup

Course Code	**18M11GE111**	**Semester** Odd	**Semester I** **Session** 2018 -2019 Month from July to December
Course Name	Research Methodology & Intellectual Property Rights		
Credits	2	**Contact Hours**	2-0-0
Faculty (Names)	**Coordinator(s)**	Prof. B. P. Chamola	
	Teacher(s) (Alphabetically)	Prof. B. P. Chamola	

COURSE OUTCOMES:		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
CO111.1	understand the basic concepts and types of research	Understanding Level (C2)
CO111.2	define a research problem, its formulation, methodologies and analyze research related information	Analyzing Level (C4)
CO111.3	follow research ethics, understand IPR, patents and their filing related to their innovative works.	Understanding Level (C2)
CO111.4	understand and analyze the statistical data and apply the relevant test of hypothesis in their research problems	Analyzing Level (C4)

Module No.	Title of the Module	**Topics in the Module**	**No. of Lectures for the module**
1.	Research	What is research? Types of research. What is not research? How to read a Journal paper?	3
2.	Report writing	How to write report? Use of Mendeley in report writing. How to write a research paper? Problem identification and solving.	4
3.	Ethics, IPR and Research methodologies	Research ethics, patents, intellectual property rights, plagiarism regulation 2018. Steps in research process and common methodologies to attempt solution to research paper.	8

4.	Basics of statistics and probability distributions	Basic statistical concepts. Handling of raw data, Some common probability distributions.	7
5.	Test of hypothesis and regression analysis	Hypothesis testing. Parametric and non-parametric data, Introduction to regression analysis.	8
		Total number of Lectures (Course delivery method: open ended discussion, guided self-study, lectures)	**30**

Evaluation Criteria

Components	**Maximum Marks**
Mid Term Examination	30
End Semester Examination	40
Assignments	30 (Viva, Quiz, Assignments)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	**Stuart Melville and Wayne Goddard**, Research methodology: An Introduction for Science & Engineering Students, Kenwyn, South Africa : Juta& Co. Ltd., 1996.
2.	**Kothari, C.R.,** Research Methodology: Methods and Techniques, New Age International, New Delhi, 2009.
3.	**Kumar, Ranjit,** Research Methodology: A Step by Step Guide for Beginners, 2nd Edition, Sage Publications Ltd., 2005.
4.	**Ramappa, T.,** Intellectual Property Rights Under WTO, S. Chand, New Delhi, 2008.
5.	**Wayne Goddard and Stuart Melville,** Research Methodology: An Introduction, Kenwyn, South Africa : Juta& Co, 2001.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12EC411	**Semester** Even **(specify Odd/Even)**	**Semester** IX **Session** 2018 -2019 **Month from** June to July
Course Name	Introduction to IOT		
Credits	4	**Contact Hours**	3L

Faculty (Names)	**Coordinator(s)**	Dr. Gaurav Verma (62)
	Teacher(s) (Alphabetically)	Mr. Abhay Kumar (128)

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	**Outline the basic concepts of IOT with networking and protocol considerations in IOT scenario.**	Understanding Level (C2)
CO2	**Identify various IOT hardware platforms and their utilization with various sensors and actuators.**	Applying Level (C3)
CO3	**Experiment the basic concepts of python programming and make use of them in image processing, data analytics and machine learning applications.**	Applying Level (C3)
CO4	**Examine various case studies and cloud platforms in an IOT scenario for monitoring, control and analysis.**	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	IOT Basics and its Importance	Introduction to IOT (People Connecting to Things, Things Connecting to Things, Definition of IOT, History of IOT), IOT Components (Sensors & Actuators, Things, Communications, Networks, The Internet, Protocol Stack), Evolution of Connected Devices, IOT Applications, IOT Companies, Baseline Technologies (Machine to Machine (M2M) Communication, Cyber Physical Systems (CPS), Web of Things (WOT)), Address Crunch in IOT, IOT Terminologies (IOT Node, LAN, MAN & WAN, IOT Gateway & Proxy), IOT Network Configuration (Gateway Prefix Allotment, Impact of Mobility on Addressing, Concept of Tunneling, Multi-homing), IPv4 Versus IPv6.	6
2.	Basics of IOT Networking	Introduction to IOT Networking, Networking Standards and Technologies (Network Access & Physical Layer, Internet Layer, Transport Layer, The application layer), IOT Networking Protocols, Network Access and Physical layer IoT Network Technologies ((LPWAN (Low Power Wide Area Network), Cellular, Bluetooth Low Energy (BLE), RFID, NFC, Zigbee, Wifi, Ethernet), Internet layer IoT network technologies (IPv6, 6LoWPAN, and RPL), Application layer IoT network technologies (HTTP, HTTPS, MQTT, AMQP, and XMPP), IoT networking considerations and challenges, IoT Platforms Capabilities.	6
3.	IoT supported	Introduction to Arduino (Different Arduino boards, Arduino	12

	Hardware platforms (Arduino) & data visualization using cloud.	Uno board description and its pin configuration, Arduino IDE and program uploading, different functions related to GPIOs and special functions (PWM and Serial communication), Interfacing with Arduino using processing language (LED, Switch, Seven Segment, LCD, DC Motor, Relay, IR, LDR and DHT11 sensor), Interrupts, use of simulator and compiler, basics of HTML, Arduino supported IOT modules (Ethernet & Wifi Shield) and their configuration, Monitoring of sensor data on cloud and Web based controlling of actuators.	
4.	Introduction to Python, Data Analytics, Machine Learning and Case Studies.	Introduction to python, python IDE, Data types, various programming constructs (loops, if, else etc.), operators, functions, modules, data handling (pandas), file operations, Image operations (PIL-pillow), data plotting in python (Matplotlib), basics of machine learning in python (Scikit) and related case studies.	10
5.	IoT supported Hardware platforms (Raspberry pi) & its Applications	Introduction to Raspberry pi (Raspberry pi different model comparison, Pin Configuration, Raspberry Pi operating system choices, Set up your Raspberry pi, Raspbian OS, Remote Access using SSH, Remote Access using TightVNC), Interfacing with Raspberry pi using python and use of open source libraries (LED, Switch, LCD, DC Motor, Relay, IR, LDR and DHT11 sensor), IOT Applications (Water management system, Weather monitoring station on cloud, Smart Agriculture System, Smart Energy meter, Pollution Monitoring system, Smart Dustbin management system.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments & Quiz)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2.	"Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)

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Course Code	18B12EC417	**Semester** … **(specify Odd/Even)**	**Semester** VIII **Session** 2018 - 2019 **Month from Jan to May**
Course Name	Satellite Communication		
Credits	4	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Dr. Dharmendra Kumar Jhariya
	Teacher(s) (Alphabetically)	Dr. Dharmendra Kumar Jhariya , Dr. Abhishek Kashyap

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Define Satellite and its historical background, outline the basic concepts of Satellite communications, recall the Kepler's laws of planetary motion	Remembering (Level I)
CO2	Develop the equations of the orbit, explain the satellite launching and launch vehicles and outline terminology of earth-orbiting Satellites.	Analyzing Level (IV)
CO3	Demonstrate the space segment, antenna subsystem, estimate different parameters and design uplink and downlink.	Creating (Level VI)
CO4	Apply various multiple access techniques for satellite communication and analyze Noise and Bandwidth. Also Interpret applications of various types of satellites established in different earth orbits.	Evaluating (Level V)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Introduction to the Subject and its Importance. Contents. Books and Reading References. Evaluation. Space Environment. Artificial Satellites. Communication Satellites.	4
2.	Satellite Orbits and Frequency Bands	Orbital Mechanics. Orbits Employed for Satellite Communication like LEO, MEO & GEO, their Merits and Demerits. Satellite Launching. Launch Vehicles. Radio Wave Propagation Effects. Communication Window.	8
3.	Communication Satellites and Link	Geostationary Communication Satellite-Transponder. Ground Station System. Communication Link-	10

	Design	Consideration, Calculation and Design. Power and Bandwidth Limitations and Budget.	
4.	Modulation Techniques	Modulation and Demodulation Techniques. Performance Analysis- Noise and Bandwidth.	6
5.	Multiple Access	Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA) and Code Division Multiple Access (CDMA)	8
6.	Different Communication Satellite Systems	VSAT. Navigational Satellites. Broadcasting Satellites. Remote Sensing Satellites. Low and Medium Earth Orbit Satellites. INSAT. INTELSAT.	5
7.	Some Communication Satellite Applications	DBS TV. Multimedia Transmission Related Issues, Advantages& Bit Rates for Digital TV, HDTV, Bandwidth Considerations and Introduction to Compression Standards. Convergence of Communication, Introduction to IPTV.	4
		Total number of Lectures	**45**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (15-Assignment, 5- Quiz, 5- Attendance)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	T. Pratt, C.W. Bostian and J.E. Allnut, Satellite Communications, 2 Ed, John Wiley & Sons (Asia), 2003
2.	Dennis Roddy, Satellite Communications, 4 Ed, Tata Mcgraw Hill, 2006
3.	G. Maral & M. Bousquet, Satellite Communications Systems- Systems, Techniques and Technology, 4 Ed, John Wiley and Sons, 2002.
4.	Richard Brice, Newness Guide to Digital TV, 2Ed, 2003.
5	Gerard O' Driscoll, Next Generation IPTV Services and Technologies, John Wiley & Sons, 2008