Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11HS211	**Semester : ODD (specify Odd/Even)**	**Semester** : III **Session 2019-20** Month from: July-December
Course Name	Economics		
Credits	03	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Praveen Sharma, Sakshi Varshney
	Teacher(s) (Alphabetically)	Amba Agarwal, Anshu Banwari, Kanupriya MisraBakhru, Manas Ranjan Behra, Mukta Mani, Praveen Sharma, Sakshi Varshney, Shirin Alavi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C206-1.1	*Explain* the basic micro and macro economics concepts.	Understanding (Level 2)
C206-1.2	*Analyze* the theories of demand, supply, elasticity and consumer choice in the market.	Analyzing (Level 4)
C206-1.3	*Analyze* the theories of production, cost, profit and break even analysis	Analyzing (Level 4)
C206-1.4	*Evaluate* the different market structures and their implications for the behavior of the firm.	Evaluating (Level 5)
C206-1.5	*Examine* the various business forecasting methods.	Analyzing (Level 4)
C206-1.6	*Apply* the basics of national income accounting and business cycles to Indian economy.	Applying (Level 3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Economics Definition, Basic economic problems, Resource constraints and welfare maximization. Micro and Macro economics. Production Possibility Curve. Circular flow of economic activities.	2
2.	Basics of Demand, Supply and Equilibrium	Demand side and supply side of the market. Factors affecting demand & supply. Elasticity of demand & supply – price, income and cross-price elasticity. Market equilibrium price.	3
3.	Theory of Consumer Choice	Theory of Utility and consumer's equilibrium. Indifference Curve analysis, Budget Constraints, Consumer Equilibrium.	2
4.	Demand forecasting	Regression Technique, Time-series Smoothing Techniques: Exponential, Moving Averages Method	6
5.	Production theory and analysis	Production function. Isoquants, Isocostlines, Optimal combination of inputs. Stages of production, Law of returns, Return to scale.	3
6.	Cost Theory and Analysis	Nature and types of cost. Cost functions- short run and long run Economies and diseconomies of scale	3
7.	Market Structure	Market structure and degree of competition Perfect competition, Monopoly, Monopolistic competition,	5

		Oligopoly	
8	National Income Accounting	Overview of Macroeconomics, Basic concepts of National Income Accounting,	3
9	Macro Economics Issues	Introduction to Business Cycle, Inflation-causes, consequences and remedies: Monetary and Fiscal policy.	3
		Total number of Lectures	30

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Test +Quiz+ 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.	H.C. Petersen, W.C. Lewis, *Managerial Economics*, 4th ed., Pearson Education 2001.
2.	D. Salvatore, Managerial Economics in a Global Economy, 8th ed., Thomson Asia, 2015.
3.	S. Damodaran, Managerial Economics, 2nd ed., Oxford University Press, 2010.
4.	M. Hirschey, Managerial Economics, 15th ed., Thomson Asia, 2019.
5.	P.A. Samuelson, W.D. Nordhaus, Economics, 19th ed., Tata Mc-Graw Hill, 2010.
6.	S.K. Misra & V. K. Puri, Indian Economy, 37th ed., Himalaya Publishing House, 2019.

Detailed Syllabus

Lecture-wise Breakup

Course Code	15B11MA301	**Semester** Even	**Semester** III **Session** 2019 -2020 **Month from** July 2019 to Dec 2019	
Course Name	Probability and Random Processes			
Credits	4	**Contact Hours**	3-1-0	
Faculty (Names)	**Coordinator(s)**	B.P. Chamola, Pinkey Chauhan		
	Teacher(s) (Alphabetically)	Amit Srivastava, B.P. Chamola, Himanshu Agarwal, Lakhveer Kaur, Lokendra Kumar, Neha Singhal, Pankaj Srivastava, Pinkey Chauhan, Priyanka Sangal, Puneet Rana, Yogesh Gupta		

COURSE OUTCOMES:		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C201.1	explain the basic concepts of probability, conditional probability and Bayes' theorem	Understanding Level (C2)
C201.2	identify and explain one and two dimensional random variables along with their distributions and statistical averages	Applying Level (C3)
C201.3	apply some probability distributions to various discrete and continuous problems.	Applying Level (C3)
C201.4	solve the problems related to the component and system reliabilities.	Applying Level (C3)
C201.5	identify the random processes and compute their averages.	Applying Level (C3)
C201.6	solve the problems on Ergodic process, Poisson process and Markov chain.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Probability	Three basic approaches to probability, conditional probability, total probability theorem, Bayes' theorem.	5
2.	Random Variables	One dimensional random variables (discrete and continuous), distribution of a random variable (density function and cdf). MGF and characteristic function of a random variable and its utility. Bivariate random variable, joint, marginal and conditional distributions, covariance and correlation.	8
3.	Probability Distributions	Bernoulli, binomial, Poisson, negative binomial, geometric distributions. Uniform, exponential, normal, gamma, Earlang and Weibull distributions.	8
4.	Reliability	Concept of reliability, reliability function, hazard rate function, mean time to failure (MTTF). Reliability of series, parallel, series-parallel, parallel-series systems.	6
5.	Random Processes I	Introduction, Statistical description of random processes, Markov processes, processes with independent increments. Average values of random processes. Strict	7

		sense and wide sense stationary processes, their averages. Random walk, Wiener process. Semi-random telegraph signal and random telegraph signal process. Properties of autocorrelation function.	
6.	Random Processes II	Ergodic processes. Power spectral density function and its properties. Poisson processes. Markov chains and their transition probability matrix (TPM).	8
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutorials)
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.	**Veerarajan, T.,** Probability, Statistics and Random Processes, Tata McGraw-Hill, 2002.
2.	**Papoulis, A. & Pillai, S.U.,**Probability, Random Variables and Stochastic Processes, Tata McGraw-Hill, 2002.
3.	**Ross, S. M.,**Introduction to Probability and Statistics for Engineers and Scientists, 4th Ed., Elsevier, 2004.
4.	**Palaniammal, S.,**Probability and Random Processes, PHI Learning Private Limited, 2012.
5.	**Prabha, B. and Sujata, R.,**Statistics, Random Processes and Queuing Theory, 3rd Ed., Scitech, 2009.

Course Description

Course Code	15B17EC271	**Semester -:** Odd (specify Odd/Even)	**Semester-:** III, **Session** 2019 -2020 **Month- :** July - December
Course Name	Electrical Science-2 Lab for Electronics & Communication Engineering		
Credits	2	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Kaushal Nigam, Mandeep Narula
	Teacher(s)	Amit Goyal, Ankur Bhardwaj, Atul Srivastava, Alok Joshi, Abhishek Kashyap, Bhagirath Sahu, Bajrang Bansal Dhiksha Chandola, Gaurav Verma, Jyoti Vyas, Jasmine Saini, Monika, Madhu Jain, Priyanka Kwatra, Rachna Singh, Ruby Beniwal, Shruti Kalra, Sajai Vir Singh, Satyendra Kumar, Shradha Saxena, Shamim Akhtar, Vishal Saxena, Vijay Khare, Vimal Kumar Mishra, Vinay Aaand Tikkiwal, and Vivek Dwivedi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C204.1	Understand Transient analysis and steady state response of series RC circuit.	Understanding (Level II)
C204.2	Acquire the knowledge of circuits like Adder, Subtractor, Integrator, differentiator; inverting and non inverting amplifier circuits realized using Op-amp IC-741.	Analyzing (Level IV)
C204.3	Study and Implementation of the different logic gates.	Remembering (Level I)
C204.4	Construct Adder, Subtractor and Multiplexer circuits using logic gates.	Applying (Level III)

Module No.	**Title of the Module**	**List of Experiments**	**COs**
1.	Study of Transient Analysis in the Network Circuit	Transient analysis of a series RC circuit for a given time constant.	C204.1
2.	Study and Analysis of Parallel Resonance Circuits	Analysis of Parallel Resonance circuits	C204.1
3.	Study and Analysis of Series Resonance Circuits	Analysis of Series Resonance circuits.	C204.1

4.	Study and Analysis of Inverting and Non-inverting by Op-Amp	To realize inverting and non inverting amplifier configuration using Op-Amp IC-741.	C204.2
5.	Study and Analysis of Adder and Substractor by Op-Amp	To realize adder and substractor circuits using Op-Amp IC-741	C204.2
6.	Study and Analysis of Differentiator and Integrator by Op-Amp	To realize differentiator and integrator circuits using Op-Amp IC-741.	C204.2
7.	Study of Logic Gates and Verification of Boolean Laws	Verification of the truth tables of logic gates using ICs	C204.3
8.	Study and Implement of Basics Logics Gates using Universal Logic Gates	To implement basic logic gates AND, OR, NOT using NAND and NOR gates.	C204.3
9.	Perform the Boolean Expression using Universal Gates	To implement the Boolean expressions using NAND gates only: $(i)X = \overline{\overline{A} + \overline{B}}$ $(ii)Y = \bar{A}B + C\overline{D}$ $(iii)Z = \overline{(A + \bar{B})(C + \bar{A})}$	C204.3
10.	Design and Implementation of Adders	To realize a Half Adder, Full Adder using logic gates.	C204.4
11.	Design and Implementation of Subtractors	To realize a Half Subtractor , Full Subtractor using logic gates.	C204.4
12.	Design and Implementation of Multiplexer	To realize 4:1 Multiplexer using NAND gates.	C204.4
13.	Study and Implement of Voltage Comparator using Op-Amp	To implement a Voltage Comparator circuit using Op-Amp	C204.2
14.	Study of Square Waveform	To generate a Square Waveform using Op-Amp	C204.2

	using Op-Amp		
15.	Study and Analysis of Filter in Op-Amp	To design a First Order Low Pass Filter	C204.2

Evaluation Criteria

Components	**Maximum Marks**
Viva1	20
Viva2	20
Report file, Attendance, and D2D	60 (15+15+30)
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.	Richard C. Dorf, James A. Svoboda, "Introduction to Electric Circuits," Wiley; 7 Edition, 2006
2.	M. Morris Mano, "Digital Design," 3rd Edition, PHI, 2002
3.	A. A. Kumar, "Fundamentals of Digital Circuits," 3rd Edition, PHI Learning Pvt. Limited, 2014
4.	D. Roy Choudhary and Shail B. Jain, " Linear Integrated Circuit," 2nd Edition, NAILP, 20 03

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B11EC214	**Semester : ODD (specify Odd/Even)**	**Semester 3rd Session** 2019 -2020 **Month from:** June 19 **to** Dec 19
Course Name	Signals and Systems		
Credits	**4**	**Contact Hours**	**3+1**

Faculty (Names)	**Coordinator(s)**	Kuldeep Baderia, Ritesh Kumar Sharma
	Teacher(s) (Alphabetically)	Ekta Goel, Smriti Bhatnagar, Varun Goel

COURSE OUTCOMES		**COGNITIVE LEVELS**
C210.1	Understand the mathematical representation, classification, applications and analyze both continuous and discrete time signals and systems.	Understanding [Level 2]
C210.2	Analyze and interpret the response of continuous and discrete time LTI system in time domain	Evaluating [Level 5]
C210.3	Choose and demonstrate the use of different frequency domain transforms to examine and explain the spectral representation of the CT and DT signals and systems.	Evaluating [Level 5]
C210.4	Apply Laplace and Z transform to analyze and examine the response and behavior of the CT and DT system.	Analyzing [Level 4]

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Signals and their classifications	Signal:- definition, Classifications of Signals (Continuous-time & Discrete-time, Analog & Digital, Energy & Power, Deterministic & Random, Periodic & Aperiodic, Even and Odd etc.)	4
2.	System and their classifications	Classifications of Systems Classifications of Systems (Linear & Nonlinear, Time invariant & Time varying, Causal & Non- causal, Memory & Memory less, Stable & unstable system), LTI Systems (continuous-time and discrete time).	5
3.	Response of LTI system	Impulse response of a system, Response of LTI system, Convolution (Integral and Sum).	5
4.	Fourier analysis of Continuous time signal and system	Continuous Transforms Fourier series, Convergence of Fourier series, Continuous-time Fourier Transform, properties of Fourier series and Transform, Frequency domain analysis of continuous time LTI system	7
5.	Fourier analysis of Discrete time signal and system	Discrete Transforms Fourier series, Convergence of Fourier series, Discrete-time Fourier Transform, properties of Discrete-time Fourier series and Transform, Frequency domain analysis of discrete-time LTI system	7

6.	Laplace Transform	Laplace Transform, Concept of ROC and Transfer function, pole-Zero plot, properties Laplace Transform, solution of differential equations using Laplace Transform, System function, Laplace approach to analysis the LTI system, stability analysis	7
7.	Z-transform	Z- Transform, Concept of ROC, properties Z- Transform, solution of difference equations using Z- Transform, System function, pole-Zero plot , Z- Transform approach to analysis the Discrete-time LTI system, stability analysis of Discrete-time LTI system	6
8.	Introduction to Digital Filters: FIR & IIR	Digital filters:- definition and frequency response of basic filtering function like BP, HP, LP, BR, AP Definition and representation of IIR and FIR digital filter	1
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
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.	A.V. Oppenheim, A.S. Willsky & S.H. Nawab, Signals & Systems, 2nd edition ,PHI ,2004
2.	S. Haykin & B. Van Veen, Signals and Systems, 2nd edition, John Wiley & sons, 2004.
3.	M. Mandal, Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge, 2007
4.	M. J. Roberts, Signals and Systems, Tata Mcraw-Hill, 2003
5.	Tarun Rawat, Signals and Systems, Oxford University Press , 2010
6.	J. G. Proakis & D. G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, Fourth edition, PHI, 2007.

Detailed Syllabus

Lecture-wise Breakup

Course Code	15B11EC411	**Semester** Odd **(specify Odd/Even)**	**Semester** 3rd **Session** 2019 -2020 **Month from** July 19 to December 19
Course Name	ANALOGUE ELECTRONICS		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Jitendra Mohan, Shivaji Tyagi
	Teacher(s) (Alphabetically)	Ajay Kumar, Archana Pandey , Bhartendu Chaturvedi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C213.1	Classify the different modes of operation of a transistor and stability analysis of a transistor.	Understanding Level (C2)
C213.2	Explain and analyze the various BJT and MOS amplifier circuits for different frequency ranges.	Analyzing Level (C4)
C213.3	List and explain the building blocks of an Op-Amp and its characteristics.	Understanding Level (C2)
C213.4	Explain the effect of feedback on amplifier characteristics and design of various types of oscillators.	Evaluating Level (C5)
C213.5	Apply basic understanding of Op-Amp to design various electronics circuits for specified gain and waveform.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	BJT Amplifier	Single stage (CE, CB, CC), Small-Signal Model, Multistage: CE-CE, Darlington-pair, and Cascode, Frequency Response of CE Amplifier	10
2.	Introduction of MOSFET and analysis of MOS amplifier	Introduction of MOSFET, characteristics and basing (voltage and current), small signal models: common source, common gate and common Drain, Frequency Response of CS amplifier	8
3.	Building Blocks of Op-Amp	Basic building block of Op-Amp, Differential amplifiers, Analysis of Differential Amplifiers, Current Mirrors	9
4.	Feedback	Four basic feedback topologies: series-shunt, series-series, shunt-shunt, shunt-series, Introduction and Criterion for oscillations	5
5.	Measurement of Op-Amp Parameters	Output Offset Voltage, Input offset voltage, Input Bias Current, Input Offset current, CMRR, Slew rate, Open loop and closed loop gain, PSRR.	3
6.	Application of Op-Amp	Half wave rectifier, Full wave rectifier, Comparators, Zero Crossing Detector, Peak Detector, Log and Antilog Amplifiers, Voltage multipliers, Schmitt trigger, Waveform generator (square wave, triangular wave), Instrumentation amplifier.	7

Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
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.	A.S .Sedra & K.C.Smith, Microelectronic CIRCUITS Theory and Application, 6th Edition, Oxford University Press, 2011
2.	J.Milman & Halkias : Integrated Electronics, 2nd Edition, Tata McGraw Hill, 1991.
3.	R.A. Gayakwad: Op Amp and Linear Integrated Circuit Technology, 3rd Edition, Prentice-Hall India, 1999.

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17EC471	**Semester :** ODD **(specify Odd/Even)**	**Semester** 3rd **Session** 2019-2020 **Month from** July 19 to December 19
Course Name	Analogue Electronics Lab		
Credits	1	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Bhartendu Chaturvedi, Kirmender Singh
	Teacher(s) (Alphabetically)	Ashish Gupta, Ajay Kumar, Archana Pandey, Bhagirath Sahu, Ekta Goel, Garima Kapur, Jitendra Mohan, Saurabh Chaturvedi, Shivaji Tyagi

COURSE OUTCOMES	DESCRIPTION	COGNITIVE LEVELS
C275.1	Plot the transient, frequency response of second-order RC circuit using SPICE/MULTISIM and utilize the plot to compare 3-dB cut-off frequency with theoretical calculation.	Applying Level (C3)
C275.2	Analyze the bias point and plot frequency response of single-stage amplifiers and they will be able to build an amplifier of given specifications.	Analyzing Level (C4)
C275.3	Build a common-source amplifier for a specified gain using N-channel MOSFET.	Applying Level (C3)
C275.4	Analyze BJT based simple constant current biasing circuit and subsequently improves its specification by using modified current mirror.	Analyzing Level (C4)
C275.5	Determine differential gain, common mode gain and CMRR of BJT based differential amplifier.	Applying Level (C3)
C275.6	Simulate an operational amplifier and use it in different applications.	Analyzing Level (C4)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction and demonstration of Simulation tool with suitable example	Installation of PSPICE Light version/MULTISIM tool on GPL with operating instructions. Simulate transient and frequency response of first-order RC circuit for input of sine and square waveform.	**C275.1**
2.	Study and Analyzing Biasing Techniques	a) Use PSPICE/MULTISIM to simulate dependence of β_{dc} on collector bias current for discrete BJT transistor (BC547B/ 2N2222A/3904). b) To compare the biasing techniques such as voltage divider, collector to base bias and fixed bias for DC "Q- point" stability of a BJT (BC547B/2N2222A/3904) on PSPICE/MULTISIM and verify it on bread board.	**C275.2**
3.	Large signal and small signal analysis of CE amplifier	Use PSPICE/MULTISIM to determine instantaneous node voltages and branch currents of single stage CE amplifier for triangular input V_i = 1.6V (p-p) using discrete transistor (BC547B/2N2222A/3904). Also determine the maximum amplitude of V_i which is allowed to be used in the amplifier.	**C275.2**

4.	Large signal and small signal analysis of CE amplifier	Experimentally verify instantaneous node voltages and branch currents of CE amplifier of Exp. 3 on bread board.	**C275.2**
5.	Frequency Response of Amplifier	Simulate frequency response of CE amplifier using ±5V power supply. Determine a) Upper, lower 3-dB frequency b) Bandwidth and observe the change in bandwidth with increase and decrease in value of bypass capacitor.	**C275.2**
6	Design of BJT based amplifier	Design a single stage BJT amplifier for given specifications.	**C275.2**
7.	Frequency Response of Amplifier	Simulate frequency response of the Common source amplifier using N- channel MOSFET BS170. Determine a) Upper, lower 3-dB frequency b) Bandwidth	**C275.3**
8.	Design of MOS based amplifier	Design a single stage MOS amplifier for given specifications.	**C275.3**
9.	Current Mirror	Design a basic BJT current mirror using discrete transistor (BC547B/2N2222A/3904) for reference current of 1mA. Determine the output resistance, current gain error.	**C275.4**
10.	Current Mirror	Experimentally verify Exp. 9 on bread board.	**C275.4**
11.	Current Mirror	Design Wilson current mirror of 1mA and determine the output resistance, current gain error.	**C275.4**
12.*	Differential Amplifier	Simulate the single stage differential amplifier and determine the following: a) Frequency response of differential gain A_d. b) Frequency response of common mode gain $A_{CM.}$ c) Common Mode Rejection Ratio (CMRR).	**C275.5**
13.*	Open loop operational Amplifier	Simulate the BJT based operational amplifier circuit (OP-AMP) and determine the bias point, small signal differential gain, common mode gain A_{CM}, and CMRR.	**C275.**6
14.*	Sub circuit model of OP-AMP	An op-amp with differential resistance of 20KΩ, dc gain of 8513 and an output resistance of 75Ω. Create a sub circuit model/block for this op-amp in PSPICE/MULTISIM.	**C275.**6
15.*	Applications of OP-AMP	Simulate the closed–loop non inverting amplifier, inverting amplifier, adder, subtractor for given specifications and determine: a) Transient Response b) Its 3-dB bandwidth c) Input resistance R_i	**C275.**6

Evaluation Criteria

Components	**Maximum Marks**
Viva1	20
Viva2	20
Day to Day performance	60
Total	**100**

*** These are advanced level experiments.**

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.	A.S .Sedra & K.C.Smith, Microelectronic Circuits Theory and Application, 6th Edition, Oxford University Press, 2015(Text Book)
2.	Marc Thompson, Intuitive Analog Circuit Design, 2nd Edition, Elsevier Publication, 2013

Detailed Syllabus

Lecture-wise Breakup

Subject Code	**19B13BT211**	**Semester: ODD**	**Semester: III Session: 2019-2020 Month from: JULY to DECEMBER**
Subject Name	**Environmental Studies**		
Credits	**0**	**Contact Hours**	**3 (1 Lecture, 2 interactive sessions)**

Faculty (Names)	**Coordinator(s)**	1. Krishna Sundari S
	Teacher(s) (Alphabetically)	1. Krishna Sundari S 2. Manisha Singh 3. Neeraj Wadhwa 4. Susinjan Bhattacharya

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO205.1	Explain diversity of environment, ecosystem resources and conservation .	Understand Level (C2)
CO205.2	Identify various pollution related hazard and their safe management	Apply Level(C3)
CO205.3	Apply modern techniques for sustainable Urban planning and Disaster management	Apply Level(C3)
CO205.4	Recall Government regulations, Environmental Policies, Laws & ethics	Understand Level (C2)
CO205.5	Survey ground situation on specific environmental aspects, examine risks involved, make a field report and present the findings	Analyzing Level(C4)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	The Multidisciplinary nature of environment, Biodiversity	Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, Diversity of flora and fauna, species and wild life diversity, Biodiversity hotspots, threats to biodiversity, Case studies.	6
2.	Natural resources, Energy consumption & conservation	Water, Land, Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, & Food resources, Global Conventions on Energy, Kyoto protocol, Case studies.	10
3.	Pollution, hazardous waste management	Air, Water & Land, chemical, noise pollution, sources & causes, effects, Electronic waste, nuclear hazards, Case studies.	8
4.	Urban planning, human communities,	Sustainable building, Disaster Management and Contingency Planning, human population, resettlement,	8

	Disaster management	rehabilitation environmental movements, environmental ethics, Critical issues concerning Global environment Urbanization, population growth, global warming, climate change, acid rain, ozone depletion etc Case studies.	
5.	Environmental Policies, Laws, Regulations & ethics	Regulation of technology and innovation, Policy and laws, Different Acts such as: Environmental Protection Act, Air and Water Acts, Wildlife and Forest Acts), US-EPA, National Environmental Policy; Function of pollution control boards (SPCB and CPCB), their roles and responsibilities, Case studies.	4
6	Field Work/	Explore the current environment related occurrences at national and international level, Study of successful sustainable measures, a know-how of industries in local region and their possible effects, measure of water, air and land quality, Visit to a local polluted site-Urban/Rural /Industrial / Agricultural, Study of simple ecosystems.	6
Total number of Lectures			**42**

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.	Chiras D D.(Ed.). 2001. Environmental Science – Creating a sustainable future. 6th ed. Jones & Barlett Publishers.
2.	Joseph, B., 2005, Environmental Studies, Tata McGraw Hill, India
3.	Textbook of Environmental Studies for UG Courses - Erach Bharucha, University Press
4.	Issues of the Journal: Down to Earth, published by Centre for Science and Environment

EVALUATION:

Mid Semester Examination - 30 marks (To be held along with T-2 Exam)

End Semester Examination - 40 marks

Teachers Assessment (TA) - 30 marks

Structure of Grading Academic Performance: Presently: NP - Audit Pass NF - Audit Fail
May be revised to give a grade

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC211	**Semester Odd (specify Odd/Even)**	**Semester** 3rd **Session** 2019-20 **Month from** July 19 **to** December 19
Course Name	Electrical Science -2		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Ashish Goel, Satyendra Kumar
	Teacher(s) (Alphabetically)	Atul Kumar Shrivastava, Deeksha Chandola, Garima Kapur, Jyoti Vyas, Kaushal Nigam, Kirmender Singh, Madhu Jain, Mandeep Narula , Nisha Venkatesh, Priyanka Kwatra, Rachna Singh, Ruby Beniwal, Sajai Vir Singh, Shradha Saxena, Shruti Kalra, Vimal Kumar Mishra

COURSE OUTCOMES		**COGNITIVE LEVELS**
C203.1	Study and analyze the first-order and second-order passive circuits.	Analyzing Level (C4)
C203.2	Demonstrate the operational amplifier and logic gates and their applications in analog and digital system design.	Understanding Level (C2)
C203.3	Define the basics of signals, systems and communication.	Remembering Level (C1)
C203.4	Illustrate the electrical machines, transformers and analogous of electrical & mechanical systems.	Understanding Level (C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Transient Analysis	First order network analysis, sequential switching, Differential equation approach for DC and Non constant source, second order network analysis using differential equation approach for DC and non-constant source.	8
2.	Operational Amplifiers	Introduction to Operational Amplifiers, Basic Concepts and their Applications like Comparators, Inverting and Non-inverting Amplifier, Subtractor, Adder, Integrator and Differentiator circuits.	6
3.	Basics of digital electronics	Introduction to Boolean algebra, logic circuits and logic gates, multiplexers and decoders. Introduction to Flip-flops.	10
4.	Introduction of Signals and Systems	Basic overview of Signals and Systems, Signal types and their representation- Time Domain, Frequency Domain.	4
5.	Introduction of Communications	Basics of digital communication and analogue communication.	3

6.	Machines	Introduction to dc motors and dc generators, three phase and single phase induction motors.	3
7.	Single Phase Transformer	Principle of operation, construction, e.m.f. equation, equivalent circuit, power losses, efficiency (simple numerical problems), introduction to auto transformer.	4
8.	Analogous Electrical and Mechanical Systems	Analogy between mechanical and electrical quantities: Analogous quantities, Analogous equations. Conversion between systems: electrical to mechanical and mechanical to electrical systems.	3
		Total number of Lectures	41

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
Total	**100**

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

1.	Dorf, R.C. and Svoboda, J.A., Introduction to Electric Circuits. John Wiley & Sons.
2.	Mano, M.M., Digital Design. Pearson Education Asia.
3.	Oppenheim, A.V., Willsky, A.S. and Nawab, S.H., Signals and Systems. Prentice-Hall.
4.	A. Anand Kumar, Signals and Systems, PHI Learning Private Limited
5.	A.E. Fitzgerald, C. Kingsley Jr. and At. D. Umans, Electric Machinery, Fifth edition, Mc Graw Hill.
6.	D.C. Kulshreshtha, Basic Electrical Engineering, Mc Graw Hill.
7.	I. J Nagrath and M. Gopal, Control Systems Engineering, New age International, Fifth edition, Fifth edition, 2009.

Detailed Syllabus Signals and Systems Lab (18B15EC214)
Lab-wise Breakup

Course Code	(18B15EC214)	**Semester** Odd **(specify Odd/Even)**	**Semester** 3rd **Session** 2019 -2020 **Month from** July- December
Course Name	Signals and Systems Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Smriti Bhatnagar, Varun Goel
	Teacher(s) (Alphabetically)	Abhay Kumar, Kuldeep Baderia, Neetu Singh, Rahul Kaushik, Ritesh Sharma

COURSE OUTCOMES		**COGNITIVE LEVELS**
C270.1	Understanding of MATLAB and its various applications, Classification of continuous time signals and discrete time signals.	Understanding (C2)
C270.2	Apply the coding skills of MATLAB for Convolution of continuous time signals and discrete time signals, for DFT and IDFT.	Applying (C3)
C270.3	Analyze different LTI systems with Frequency domain representation of continuous time and discrete time periodic and aperiodic signals.	Analyzing (C4)
C270.4	Determine Laplace Transform of continuous time signals and Z-Transform of discrete time signals. Introduction to SIMULINK and to realize systems described by differential and difference equations	Evaluating (C5)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Understanding of MATLAB and its use in signals and discrete time signals.	Introduction to MATLAB and its various applications.	C270.1
2.	Study and Classification of continuous time signals	Introduction to continuous time signals.	C270.1
3.	Study and Classification of Discrete time signals	Introduction to Discrete time signals..	C270.1
4.	Study of parts of signals	Introduction to even and odd parts of signal.	C270.1
5.	Study of plotting of different signals using MATLAB	Write MATLAB Codes for generating and plotting various combinations of the two signals and perform time scaling, time shifting, time reversal and multiple transformations.	C270.1
6.	Study and calculation of Power and energy of signals using MATLAB	Write MATLAB codes for finding the Signal Energy or power of signals.	C270.1
7.	Apply the concepts of MATLAB in finding the Convolution sum of signals	To calculate the convolution sum of two discrete time signals.	C270.2
8.	Apply the concepts of MATLAB in finding the	To calculate the convolution integral of two continuous - time signals.	C270.2

	Convolution sum of signals		
9.	Analyze different LTI systems with Frequency domain representation	Realization of LTI system and verify it.	C270.3
10.	Analyze Frequency domain representation of continuous time and discrete time periodic signals.	Determine frequency domain representation of CT and DT periodic signals.	C270.3
11.	Analyze different LTI systems with Frequency domain representation of continuous time and aperiodic signals.	Determine frequency domain representation of CT and DT aperiodic signals.	C270.3
12.	Analyze and realize Discrete Fourier Transform and Inverse Discrete Fourier Transform	Write your own MATLAB function to compute DFT (Discrete Fourier Transform) and IDFT (Inverse Discrete Fourier Transform) for the spectral analysis of signals.	C270.3
13.	DetermineLaplace Transform of continuous time signals	Find out output y (t) of the system where input is x (t) and impulse response is h (t) using Laplace Transform. Also, find the ROC of the transform.	C270.4
14.	Determine Z-Transform of discrete time signals.	Find out output y [n] of the system where input is x[n] and impulse response is h[n] using Z-Transform. Also, find the ROC of the transform. Verify answer using MATLAB commands, ztrans‟ and iztrans‟. Check stability of the system using MATLAB	C270.4
15.	Introduction to SIMULINK	Introduction to SIMULINK and to realize systems described by differential and difference equations.	C270.4
16.	Understanding of MATLAB and its use in signals	Virtual Lab: 1. Signals and its properties	C270.1
17.	Understanding of MATLAB and its use in systems	Virtual Lab: 2. System and their properties	C270.2
18.	Understanding of MATLAB and its use in Frequency Domain Representation of signals	Virtual Lab: 3. Fourier analysis of signals	C270.3

Evaluation Criteria

Components	**Maximum Marks**
Viva 1(Mid Sem Viva)	20
Viva 2(End Sem Viva)	20
Assessment Components	20
Attendance	15
Lab Record	15
Virtual Lab Exps.	10
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.	J.G.Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, Third Edition, PrenticeHall, 1999.

2.	A.V.Oppenheim and R.W. Schafer, Discrete-Time Signal Processing, Second Edition, Prentice Hall, 1999.
3.	Sanjit K. Mitra, Digital Signal Processing: With DSP Laboratory Using MATLAB : A Computer-Based Approach, Second Revised Edition, TMH, 2001.