Detailed Syllabus

Lecture-wise Breakup

Course Code	15B11EC211	**Semester** Odd	**Semester** 3rd **Session** 2024 -2025 **Month from** July to December
Course Name	Electrical Science-2		
Credits	4	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Pimmy Gandotra, Abhijeet Upadhya
	Teacher(s) (Alphabetically)	Atul Kumar, Astha Sharma, Amrita Kaul, Aanchal Agarwal, Bhartendu Chaturvedi, Bhuvaneshwari S, Gaurav Verma, Jyoti Deshwal Yadav, Megha Agarwal, Manika Jha, Nidhi Tewari , Ravi, Rishibrind Upadhyay, Sajai Vir Singh, Shradha Saxena, Saurabh Chaturvedi, Vaishali Sharma, Vivek K. Dwivedi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C203.1	Remember the complete response of the first order and second order circuits with energy storage and/or non-storage elements.	Remembering Level (C1)
C203.2	Understand two-port network parameters and operational amplifier, first-order & second-order filters.	Understanding Level (C2)
C203.3	Applying the concept of semiconductors in PN junction diode, Zener diode and its various applications.	Applying Level (C3)
C203.4	Analyzing the characteristics and operation of bipolar junction transistor (BJT) and its biasing, stability aspects.	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Transient Analysis	First-order RC/RL circuit analysis, sequential switching, differential equation approach for solving 1st and 2nd order network containing DC and Non constant source.	10
2.	Two Port Network Parameters	Introduction to Z, Y, h and Transmission two-port parameters and their conversions.	5
3.	Operational Amplifier and Filters	Introduction to Operational Amplifier and its applications, First-order and Second-order (Low Pass, High Pass, Band pass and Band Stop) Filters.	5

4.	Introduction to Semiconductor	Semiconductor Physics-Energy Band Model, Types of semiconductors, Drift Current, conductivity equations and Hall Effect.	6
5.	Diodes & it's Applications	P-N Junction diode, Biasing the PN Junction diode, Current–Voltage Characteristics of a P-N Junction, Half Wave Rectifier &Full Wave Rectifier, Clipper &Clamper Circuits, Zener Diode and its application as voltage regulator	8
6.	Introduction to Bipolar Junction Transistor	Transistor Construction and Basic Transistor Operation, Transistor Characteristics in different configuration (CE, CB, CC), Transistor Biasing & Stability.	8
		Total number of Lectures	**42**

Evaluation Criteria

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

Project Based Learning: Students will learn about the transient responses of the first/second order circuits, which is the utmost requirement for electronic circuit design. Also, the students with the knowledge of OP-AMP and filters, can design and analyse the circuits for the signal processing applications.

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.	R. C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 9thed, John Wiley & Sons, 2013.
2.	Charles K. Alexander, Matthew N.O. Sadiku, "Fundamentals of Electric Circuits", 6th Edition, Tata McGraw Hill, 2019.
3.	Abhijit Chakrabarti, Circuit Theory Analysis and Synthesis, 7thed, Dhanpat Rai &Co. 2018.
4.	Robert L.Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 11thed, Prentice Hall of India, 2014.
5.	Jacob Millman, Millman's Electronic Devices and Circuits (SIE), 4thed, McGraw Hill Education, 2015.

Course Description
Lecture wise Breakup

Course Code	15B17EC271	**Semester :** Odd	**Semester :** III **Session :** 2024-2025 **Month :** July- December
Course Name	Electrical Science Lab-2		
Credits	1	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Atul Kumar, K. Nisha
	Teacher(s)	Abhijeet Upadhya, Bajrang Bansal, Bhartendu Chaturvedi, Megha Agarwal, Monika, Neetu Joshi, Pimmi Gandotra, Prabhanshu, Ravi Kumar, Rishibrind Upadhaya, Sajai Vir Singh, Saurabh Chaturvedi, Shraddha Saxena, Smriti Bhatnagar, Vishal N Saxena

COURSE OUTCOMES		**COGNITIVE LEVELS**
C204.1	Recall the basic concepts and terms about different equipment like CRO, function generator, multi meter, and components like resistor, capacitor, inductor, breadboard, diode, and transistor.	Remembering Level (C1)
C204.2	Illustrate the transient analysis of first order series RC circuits.	Understanding Level (C2)
C204.3	Experiment with different types of two-port network models and Op-amp configurations.	Applying Level (C3)
C204.4	Examine the characteristics of PN junction and Zener diodes and analyze their applications.	Analyzing Level (C4)
C204.5	Explain the characteristics of a BJT in different configurations like common emitter and common base.	Evaluating Level (C5)

Module No.	**Title of the Module**	**List of Experiments**	**COs**
1.	Introduction: Basic equipment & first order passive circuits	To study the basic concepts and terms about different equipment like CRO, function generator, Regulated D.C. power supply and multimeter.	C204.1
		To study the transient response of a series RC circuit and the time constant concept using pulse waveforms.	C204.2
2.	Two port resistive networks	To determine the Z-parameters of a two- port resistive network.	C204.3
		To determine the h-parameters of a two-port resistive network.	C204.3
3.	Operational amplifier and its applications	To realize inverting and non inverting configurations using Op-Amp IC 741 amplifier.	C204.3
		To realize an adder and subtractor circuits using Op-Amp IC 741 amplifier.	C204.3
4.	PN junction and Zener diodes	To study the forward and reverse bias (volt-ampere) characteristics of a simple p-n junction diode. Also determine the forward resistance of the diode.	C204.4
		To study the forward and reverse bias volt-ampere characteristics of a Zener diode. Also determine the breakdown voltage, static and dynamic resistances.	C204.4

5.	Diode applications	To observe the output waveform of half/full wave rectifiers and calculate its ripple factor and efficiency.	C204.4
		Realization of desired wave shapes using clipper and clamper circuits.	C204.4
		To study Zener voltage regulator and calculate percentage regulation for line regulation and load regulation.	C204.4
6.	Bipolar Junction Transistor	To plot input characteristics of a common emitter npn BJT.	C204.5
		To plot output characteristics of a common emitter npn BJT.	C204.5
		To plot input characteristic of a BJT in Common Base Configuration.	C204.5
		To plot output characteristic of a BJT in Common Base Configuration.	C204.5
7.	First order filters	To plot frequency and phase response of First order low pass and high pass filters.	C204.5

Evaluation Criteria

Components	**Maximum Marks**
Viva1	20
Viva2	20
Attendance and D2D	60 (15+45)
Total	**100**

Project Based Learning: Students will learn about the transient response of first and second order passive circuits. Also, students will learn about Op-amp and its applications like adder and subtractor circuits. This course also gives the understanding of semiconductor diode and Bipolar Junction Transistor. These concepts are required for Electronic circuits design.

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.	R.C.Dorf, A. Svoboda, "Introduction to Electric Circuits",9th ed, John Wiley & Sons, 2013.
2.	D. Roy Choudhary and Shail B. Jain, "Linear Integrated Circuit," 2nd Edition, NAILP, 2003
3.	A.S .Sedra & K.C.Smith, Microelectronic Circuits Theory and Application, 6th Edition, Oxford University Press, 2015(Text Book)

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B11EC214	**Semester** Odd **(specify Odd/Even)**	**Semester** III **Session**2024-25 **Month from** July. to December
Course Name	Signals & Systems		
Credits	4	**Contact Hours**	3+1

Faculty (Names)	**Coordinator(s)**	Dr. Parul Arora, Dr. Rahul Kaushik
	Teacher(s) (Alphabetically)	Dr. Ajay Kumar, Dr. Kuldeep Baderia, Dr. Madhu Jain, Dr Vineet Khandelwal

COURSE OUTCOMES: At the end of the course, students will be able to		**COGNITIVE LEVELS**
C210.1	Recall the mathematical representation, classification, applications and analyze both continuous-time (CT) and discrete-time (DT) signals and systems.	Remembering Level (C1)
C210.2	Interpret the response of CT and DT LTI systems in time domain.	Understanding Level (C2)
C210.3	Apply the use of different frequency domain transforms to examine and explain the spectral representation of the CT and DT signals and systems.	Applying Level (C3)
C210.4	Analyze Laplace transform and Z-transform for the response and behavior of the CT and DT systems.	Analyzing Level (C4)

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.	Systems 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**

Project Based Learning: This course's primary learning purpose is for students to be able to analyze various signal types, their transformations, and their implementation. This course also covers the design and response of several types of signal transform. The opinions of students were acquired through a course exit survey conducted at the completion of the course.

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, Pearson New International Edition, 2/e, 2015.
2.	H.P. Hsu, Schaum's outlines of signals and systems, 2nd edition, McGraw Hill; 2011.
3.	S. Haykin& B. Van Veen, Signals and Systems, 2nd edition, John Wiley & sons, 2004.
4.	M. Mandal, Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge, 2007.
5.	M. J. Roberts, Signals and Systems, Tata Mcraw-Hill, 2003.
6.	TarunRawat, Signals and Systems, Oxford University Press, 2010.
7.	J. G. Proakis & D. G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, Fourth edition, PHI, 2007.
8.	Kumar, A. Anand. Signals and systems. PHI Learning Pvt. Ltd., 2013.

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15EC214	**Semester** ODD **(specify Odd/Even)**	**Semester:** III **Session:** 2024-2025 **Month:** July to December
Course Name	Signals and Systems Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	B. Suresh, Saurabh Chaturvedi
	Teacher(s) (Alphabetically)	Bhawna Gupta, Kuldeep Baderia, Madhu Jain, Rahul Kaushik, Vijay Khare, Ritesh Sharma, Ritu Raj, Saurabh Chaturvedi, Megha Agarwal,Bajrang Bansal,

COURSE OUTCOMES: At the end of the course, students will be able to		**COGNITIVE LEVELS**
C270.1	Demonstrate MATLAB for generation of continuous time signals & discrete time signals and SIMULINK for realization of systems described by differential & difference equations	Understanding Level (C2)
C270.2	Apply the coding skills of MATLAB for convolution of continuous time signals and discrete time signals for DFT and IDFT.	Applying Level (C3)
C270.3	Analyze different LTI systems with frequency domain representation of continuous time and discrete time periodic and aperiodic signals.	Analyzing Level (C4)
C270.4	Determine Laplace transform of continuous time signals and Z-transform of discrete time signals.	Evaluating Level (C5)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Understanding of MATLAB and its use in continuous time 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 (CT) signals.	C270.1
3.	Study and classification of discrete time signals	Introduction to discrete time (DT) signals.	C270.1
4.	Study of parts ofsignals	Introduction to even and odd parts of signals.	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	Write MATLAB codes for finding the signal energy and power of signals.	C270.1

	signals using MATLAB		
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 convolution sum of signals	To calculate the convolution integral of two continuous time signals.	C270.2
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 discrete Fourier transform (DFT) and inverse discrete Fourier transform (IDFT) for the spectral analysis of signals.	C270.3
13.	Determine Laplace 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 their properties	C270.1
17.	Understanding of MATLAB and its use in systems	Virtual Lab: 2. System and their properties	C270.3
18.	Understanding of MATLAB and its use in frequency domain	Virtual Lab: 3. Fourier analysis of signals	C270.3

	representation of signals		

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 Experiments	10
Total	**100**

Project-Based Learning: Every Student will learn analyzing different LTI systems with frequency domain representation of continuous time and discrete time periodic and aperiodic signals. Moreover, small groups of students are required to develop one Simulink model to realize systems described by differential anddifference equations.

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, Prentice Hall, 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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B15EC215	**Semester:** Odd **(specify Odd/Even)**	**Semester:** 3rd **Session** 2024-25 **Month from:** July to December
Course Name	Digital Circuit Design		
Credits	4	**Contact Hours**	3 + 1

Faculty (Names)	**Coordinator(s)**	Prof. Ashish Goel and Dr. Priyanka Gandhi
	Teacher(s) (Alphabetically)	Mr. Atul Kr. Shrivastava, Dr. Gaurav Khanna, Dr. Hemant Kumar, Prof. Jasmine Saini,

COURSE OUTCOMES - At the end of the course, students will be able to:		**COGNITIVE LEVELS**
C271.1	Remember conversion of various number systems and binary codes.	Remembering Level (C1)
C271.2	Understand Boolean algebra and its minimization techniques. Understand fundamentals of programmable logic devices and digital logic families.	Understanding Level (C2)
C271.3	Applying basic concepts of Boolean Algebra to construct combinational and sequential logic circuits. Applying timer IC to classify wave shaping circuits.	Applying Level (C3)
C271.4	Analysis of sequential circuits using flip- flops. Develop skills to analyze Finite state machines using logic circuits.	Analysing Level (C4)
C271.5	Design Finite state machines using concepts of combinational and sequential circuits.	Evaluating Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures
1	Introduction to Digital Systems, Binary Codes and Boolean Algebra	Digital systems, Importance, Analog vs. digital world; Conversion of bases, Representation of negative numbers, 9's and 1's complements, 10's and 2's complements, Arithmetic using 1's and 2's complements; Hexadecimal code, BCD, Excess-3 code, Gray code and Alphanumeric code; Basic theorems and properties of Boolean algebra; Digital logic gates.	4
2	Boolean Function Representation and Minimization Techniques	Canonical and standard forms; Prime implicants and essential prime implicants; Minimization of Boolean functions using Karnaugh map and Quine-McCluskey technique; Two-level gate implementation.	5
3	Combinational logic circuits	Binary adders and subtractors: Half adder, full adder, half subtractor, full subtractor, full adder using half adder, parallel adder, adder cum subtractor, look ahead carry adder; Circuit delay calculation; Magnitude comparator; Decoder and encoder; Multiplexer and demultiplexer; Binary multiplier; Code converters.	10

4	Sequential logic circuits	Latches and flip-flops: SR, JK, master-slave JK, T and D; Conversion of flip-flops; Synchronous and asynchronous counters; Registers and shift registers; Counters using shift registers; State diagram; Analysis of sequential circuits using flip- flops.	10
5	State machines	Finite state machine of sequential circuits - Moore and Mealy machines.	5
6	Programmable logic devices	RAMs- DRAM, SRAM and ROM. PLDs: PLAs, PALs and PROMs.	3
7	Introduction to digital logic families	Parameters of logic families, Types- DTL, RTL, TTL, CMOS.	3
8	Wave shaping circuits	Linear wave shaping circuits, Schmitt trigger, Square wave generator, IC-555 based Multi vibrators.	2
Total Lectures			42

Evaluation Criteria

Components	**Maximum Marks**
Test 1	20 Marks
Test 2	20 Marks
End Term	35 Marks
Teacher Assessment	25 Marks [Assignment 1: 6, Assignment 2: 9, Regularity and proficiency: 10]
Total	**100**

Project based learning: Digital Circuit Design is a fundamental course in Electronics and Communication Engineering. In this course, a description of the effective and innovative logic circuit design is presented, which can be utilized to design various logic circuits. The project-based exercises using Boolean logic functions, constructing a truth table, assembling the logic gates, counters design and FSM are also included.

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.	M. Morris Mano, “Digital logic and computer design,” 5th ed., Pearson Prentice Hall, 2013.
2.	M. Morris Mano and Michael D. Ciletti, “Digital Design with an Introduction to the Verilog Hdl,” 5th Edition, Pearson Education, 2013.
3.	R. P. Jain, “Modern Digital Electronics,” 4th Edition, Tata McGraw-Hill Education, 2009.
4.	A. Anand Kumar, “Fundamentals of Digital Circuits,” PHI; 4th Revised edition, 2016.

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15EC215	**Semester:** Odd **(specify Odd/Even)**	**Semester:** 3rd **Session** 2024-25 **Month from:** July to December
Course Name	Digital Circuit Design Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Dr. Hemant Kumar, Dr. Priyanka Kwatra
	Teacher(s) (Alphabetically)	Dr. Jasmine Saini, Dr. Abhijeet Upadhyay, Dr. Shivani, Abhay Pratap Singh, Dr. Gaurav Khanna, Dr. Ashish Goel

COURSE OUTCOMES - At the end of the course, students will be able to:		**COGNITIVE LEVELS**
C271.1	Remember the truth tables of logic gates and verify the same using important digital ICs	Remembering Level (C1)
C271.2	Understand the universal behaviour of NAND and NOR gates and implement the basic logic gates using universal gates	Understanding Level (C2)
C271.3	Apply the concepts of logic gates to realize various combinational logic circuits such as comparator and decoders	Applying Level (C3)
C271.4	Analyze the behaviour of sequential logic circuits such as Flip-flops and counters	Analyzing Level (C4)
C271.5	Design wave shaping circuits for a given specification	Evaluating Level (C5)

Module No.	Title of the Module	List of Experiments	CO
1.	Nomenclature and specifications of digital ICs	Introduction to Digital Circuit Design Lab: Nomenclature of Digital ICs, specifications, study of the data sheet, concept of V_{CC} and ground, verification of the truth tables of logic gates using ICs.	C271.1
2.	Implementation of basic logic gates	(a) To understand and implement basic logic gates AND, OR, NOT using NAND and NOR gates (b) To implement Ex-OR gate using NOR gates only (c) To implement the Boolean expression(s) using NAND gates	C271.2
3.	Combinational Logic circuits	To realize 4-bit Binary to Gray and Gray to Binary Code Converters applying the concepts of logic gates	C271.3
4.	Combinational Logic circuits	To realize a Half Adder, Full Adder and Half Subtractor applying the concept of logic gates	C271.3
5.	Combinational Logic circuits	To realize a 2-bit Multiplier applying applying the concept of logic gates	C271.3
6.	Combinational Logic circuits	To realize and implement 2-bit Magnitude Comparator using logic gates.	C271.3
7.	Combinational Logic circuits	To realize 4:1 Multiplexer using NAND gates.	C271.3
8.	Combinational Logic circuits	To realize 2:4 Decoder using basic logic gates and to realize Half Adder using 2:4 Decoder as a block.	C271.3
9.	Seven-segment display	Display decimal digit between 0-9 on seven segment using BCD Decoder IC-7447.	C271.3
10.	Sequential Logic	To analyze and verify the truth table of SR, Gated SR, Gated D	C271.4

	circuits	Latch using logic gates and of JK flip flop using IC-74LS76.	
11.	Sequential Logic circuits	To analyze a Ripple Counter (Asynchronous) using JK flip flop IC-74LS76 and display the output on seven segment.	C271.4
12.	Sequential Logic circuits	To design and implement counting sequence 0, 7, 1, 6, 2, 5, 0, 7…. (Repeating) using IC-74LS76.	C271.5
13.	Wave shaping circuits	Using IC-555 in Astable mode to generate a rectangular pulse of 1ms period with duty cycle 75%.	C271.5

Evaluation Criteria

Components	**Maximum Marks**
Mid Sem Viva	20
End Sem Viva	20
Day-to-day performance, Lab Record	60
Total	**100**

Project Based Learning: The main learning objective of this Lab course is that students should be able to analyze and design simple combinational and sequential circuits by means of logic gates. Students' opinions have been obtained by means of course exit survey at the end of the course.

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.	M. Morris Mano, Digital logic and computer design, 5th ed., Pearson Prentice Hall, 2016.
2.	R. P. Jain, "Modern Digital Electronics," 4th Edition, Tata McGraw-Hill Education, 2022.
3.	A. Anand Kumar, "Fundamentals of Digital Circuits," PHI; 4th Revised edition, 2016.

Probability and Random Processes (15B11MA301)

Conditional probability, Bayes theorem, random variables, probability and cumulative density functions, MGF and CF, joint, marginal and conditional distributions, probability distributions, Bernoulli, Binomial, Poisson, Negative binomial, Geometric distributions. Uniform, Exponential, Normal, Gamma, Earlang, Weibull distributions, reliability, MTTF, system reliability, random processes, averages, stationary processes, random walk, Wiener process, semi-random telegraph signal process, ergodic processes, PSDF, Poisson processes, Markov chains.

Course Description

Course Code	15B11MA301	**Semester** Odd	**Semester** III **Session** 2024-2025 **Month from** Aug 2024 - Dec 2024
Course Name	Probability and Random Processes		
Credits	4	**Contact Hours**	3-1-0
Faculty (Names)	**Coordinator(s)**	Prof. B.P.Chamola	
	Teacher(s) (Alphabetically)	Prof. B.P.Chamola, Dr. Yogesh Gupta, Prof. Pato Kumari, Dr. Dinesh CS Bisht, Dr. Manish Kr. Bansal	

COURSE OUTCOMES:		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C201.1	recall the concepts of probability theory and probability distributions.	Remembering Level (C1)
C201.2	explain random variables, probability distributions and reliability models.	Understanding Level (C2)
C201.3	solve the problems concerning random variables, their distributions, reliability models and random processes.	Applying Level (C3)
C201.4	examine random process models and solve the related problems.	Analyzing Level (C4)

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	7

		independent increments. Average values of random processes. Strict 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**

Project based learning: Each student in a group of 4-6 will apply the concept of probability distributions of random variables and reliability models arising in different real-life situations.

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, 3rd Ed. Tata McGraw-Hill, 2008.
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.

CO-PO-PSO mapping

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
C201.1	1	2	1	1								2		
C201.2	2	2	2	1								2		
C201.3	3	2	3	2					1			2		
C201.4	3	3	3	2								2		
Avg	**2.3**	**2.3**	**2.3**	**1.5**					**1**			**2**		

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11HS211	**Semester :ODD (specify Odd/Even)**	**Semester** :III **Session 2024-25** Month from: July-December
Course Name	Economics		
Credits	03	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Dr.Amba Agarwal(Sec 128) & Dr. Amandeep Kaur(Sec 62)
	Teacher(s) (Alphabetically)	Dr.Anshu Banwari Dr. Amandeep Kaur Dr. Amba Aggarwal Dr. Kanupriya Misra Bakhru Dr. Manas Behera Dr. Mukta Mani Dr. Neha Singh Dr. Vandana Sehgal Dr. Praveen Sharma Dr.Purwa Srivastava Dr. Sakshi Varshney

COURSE OUTCOMES		**COGNITIVE LEVELS**
C206.1	*Understand* the fundamental concepts of micro and macro economics.	Understanding Level(C2)
C206.2	*Apply* the concepts of opportunity cost, national income accounting and various business forecasting methods.	Applying Level (C3)
C206.3	*Analyze* the concepts of demand, supply, market equilibrium, consumer choices and production in micro-economic decision making.	Analyzing Level (C4)
C206.4	*Evaluate* the different market structures and their implications on the behavior of the firm.	Evaluating Level(C5)

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.	6
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	4

5.	Production theory and analysis	Production function. Isoquants, Isocostlines, Optimal combination of inputs. Stages of production, Law of returns, Return to scale.	2
6.	Cost Theory and Analysis	Nature and types of cost. Cost functions- short run and long run Economies and diseconomies of scale	2
7.	Market Structure	Market structure and degree of competition Perfect competition Monopoly Monopolistic competition Oligopoly	6
8	National Income Accounting	Overview of Macroeconomics, Basic concepts of National Income Accounting,	2
9	Macro Economics Issues	Introduction to Business Cycle, Inflation-causes, consequences and remedies: Monetary and Fiscal policy.	2
		Total number of Lectures	28 (lectures)

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz+ Project+ Class Participation)
Total	**100**

Project based learning: Students have to form a group (maximum 5 students in each group) and have to do an economic analysis on the topic assigned. An economic impact analysis assesses the impact of an event on the economy in a particular area. It generally measures the effect on revenue, profits, wages and jobs. The knowledge gained in conducting economic analysis will enhance student's decision-making skills.

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., Oxford University Press, 2015.
3.	S. Damodaran, Managerial Economics, 2 nd ed., Oxford University Press, 2010.
4.	M. Hirschey, Managerial Economics, 12th ed., Cengage India, 2013.
5.	P.A. Samuelson, W.D. Nordhaus, S. Nordhaus,Economics,18th ed., Tata Mc-Graw Hill, 2006.
6.	S.K. Misra& V. K. Puri, Indian Economy, 38th ed., Himalaya Publishing House, 2020.