Integral University, Lucknow

Effective from Session: 2016-2017							
Course Code	EC208	**Title of the Course**	Programming Concepts	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	**3**	**1**	**0**	**4**
Pre-Requisite	CS101	**Co-requisite**					
Course Objectives	To understand the concepts of problem solving and its application in real world scenarios for problem solving. To practice the fundamental programming methodologies in the C/C++ programming language via laboratory experiences. To learn the analysis of a problem in daily life and brainstorm solutions for the same. To understand the basic concepts of different types of loops in C/C++ and their application in achieving desired solutions to problems. To develop, understand, test, and evolve substantial programs using a modern IDE and use programming approaches to avoid common coding errors; practice fundamental defensive programming and perform individual or team program reviews. To utilize, implement, and evaluate fundamental data structures like arrays and associated algorithms; create, implement, debug, and evaluate algorithms for solving substantial problems. To understand the concept of functions and modular programming in C/C++ and design recursive function to solve critical problems.						

Course Outcomes	
CO1	Given a problem, students shall be able to identify various solutions in a step-by-step form through rigorous brainstorming, apply the principles of problem solving techniques to rule out the best solution, and formulate mathematical approaches to solve simple programs like factorial of a number, find prime numbers, etc
CO2	Understand the concepts of various Programming Language tools like compiler and interpreter and apply it to compile and debug programs and learn to develop error free codes to produce desired results.
CO3	For a given problem, student shall be able to analyze and evaluate solution in a compiler based IDE like turbo C++ and apply the concept of loops to simplify large chunks of programs that estimate the best solution. The student shall also be able to demonstrate the ability to correct, test and debug programs.
CO4	For a given problem, apply the concept of arrays and develop associated algorithms that will eventually inculcate problem solving skills to create, implement, debug, and evaluate algorithms for solving substantial problems for real world scenarios.
CO5	Understand the concept of modular programming with C and develop associated algorithms incorporating the use of functions to solve substantial problems

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction to Problem Solving**	Problem Identification, Problem Definition, Goals and Objectives, Program Design and Implementation issues: Algorithm, Algorithm generalization, Algorithm representation: Flow Chart, Program, Pseudo code. Program writing using: sequence logic, selection logic, iterative logic, functions. Types of programming languages, Machine level, assembly level, high level, scripting language.	8	CO-1
2	**Programming Language Tools**	Programming Language Tools, Compiler, linker, interpreter, editor, GUI (Graphic user interface), IDE (Integrated development environment), Testing and debugging: difference between testing and debugging, types of program errors, testing a program, debugging a program for syntax error/logic errors. Program documentation: Need for documenting programs and software, system documentation, user manual and comments.	8	CO-2
3	**Conditional statements and loops**	Decision making within a program, conditions, relational operators, logical connectives, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, structured programming.	8	CO-3
4	**Arrays**	One dimensional array and two dimensional arrays: flowchart and algorithm for finding the maximum/ minimum of a matrix, sorting in ascending and descending order, addition/subtraction of two matrices, element to element multiplication of matrices, transpose of a square matrix; low pass and high pass filtering, convolution and correlation.	8	CO-4
5	**Functions**	Functions: modular programming and need of functions, passing arguments to a function: call by reference and call by value; recursive functions.	8	CO-5

Reference Books:

Schilling, Applied Numerical Methods for Engineers using MatLab and C, Cengage Learning-I Edition

Stephen J. Chapman, MatLab Programming for Engineers, Cengage Learing, IV Edition.

Ritchie Kernighan, the C Programming Language, Prentice Hall of India.

Carlo Ghezi, Mehdi Jazayeri, Programming Language Concepts, Wiley India.

e-Learning Source:

https://nptel.ac.in/courses/106102067

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1	3	1	1	1	1		2	1	3	3	2	1
CO2	3	3	3	2	2	2			1		2	1	3	2	2	1
CO3	3	3	3	2	2	2			1			1	3	2		2
CO4	3	3	3	2	1				1			1	3	2		
CO5	3	3	2	2	1				1			1	3	2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	EC209	**Title of the Course**	Digital Electronics	**L**	**T**	**P**	**C**
Year	II	**Semester**	III/IV	**3**	**0**	**2**	**4**
Pre-Requisite		**Co-requisite**					
Course Objectives	● To understand the concepts of digital electronics and their applications. To provide a conversion in mathematical form. Can identify type of complements, can apply 1's and 2's complements. ● To learn the Boolean Expression, K- Map method. To understand the basic concepts of various combinational circuit including gates, adders, subtractor, multiplexer and encoders. ● To learn the analysis of various sequential circuits, flip flops, counters and various shift register. ● To understand the concept and design of asynchronous sequential logic. ● To understand the concepts of various logic devices programming logic array, programming array logic PROM and various memories.						

Course Outcomes	
CO1	Given a number, students shall be able to represent various conversion in mathematical form, identify type of complements, apply 1's and 2's complements and formulate conversion of any radix to decimal and decimal to any radix and solve 1's, 2's, 9's and 10's complements.
CO2	Given a Boolean Expression, student shall be able to analyze and evaluate various axioms and theorems also K- Map method. For a given Combinational circuit, student shall be able to understand its various building blocks and examine, analyze and evaluate various gates, adders, subtractor, multiplexer and encoders.
CO3	Given concept of sequential logic would be able to select suitable design of various flip flops, shift registers and counters.
CO4	Given concept of asynchronous sequential logic would be able to understand and analyze transition table, flow table, reduction of states and circuit with latches.
CO5	Given a AND and OR array, student shall be able to define various logic devices. Solve, analyze, and modify different PLD based design.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Boolean algebra and Number System	Digital System and Binary Numbers: Singed binary numbers, fixed and floating point numbers, binary codes, cyclic codes, gray codes, error detecting and correcting codes, ASCII, EBCDIC codes. parity check and Hamming codes Boolean algebra and logic gates: Basic definition, basic theorem and properties of Boolean algebra, canonical and standard forms, other logic expressions.	8	1
2	Combinational Logic	Gate- Level Minimization: K-Map, don't care conditions, NAND and NOR implementation, Quine Mc-Clusky method (Tabular Method) Combinational Logic: Combinational circuits, Analysis procedure, design procedure, binary adder subtractor, decimal adder, binary multiplier, magnitude comparator, decoder (BCD to seven segment Decoder), encoder.	8	2
3	Sequential Circuits	Latches, Flip-Flop, Shift Registers, Counters: Synchronous and Asynchronous sequential circuits. Bi-directional register	8	3
4	Asynchronous Sequential Logic	Logic: Analysis Procedure: circuit with latches, design procedure, reduction of state and flow table, race Free State assignment.	8	4
5	Memory	Introduction to digital logic family such as RTL, DTL, TTL, ECL, CMOS etc., ROM: PROM, EPROM & EEPROM RAM: SRAM & DRAM PLD: PLA, PAL & FPGA	8	5

Reference Books:

- Mano M Morris / Digital Design / Person Education India

• Mano M Morris/ Digital Logic and Computer Design/ Person Education India
• G. K Kharate / Digital Electronics/ Oxford University Press India
• Gopalan, K Gopal/ Introduction to Digital Microelectronics Circuits/ Mc Graw- Hill Education India
• Jacob Millman and Herbett Taub/ Pulse, Digital & Switching wave forms/ Mc- Graw- Hill Education India
• Bignell James/ Digital Electronics: Logic and Systems/ Cengage Learning
e-Learning Source:
https://onlinecourses.nptel.ac.in/noc21_ee75/preview
https://youtu.be/X7M3rUxUpOc
https://onlinecourses.nptel.ac.in/noc22_ee55/preview
https://youtu.be/oNh6V91zdPY

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1		1			1			2	3	2		1
CO2	3	3	3	1		1	1		1			1	3		1	
CO3	3	2	3	2	1	1			2			2	3		1	
CO4	3	3	2	2	1				1			2	3	2		
CO5	3	3	2	1					1			2	3		1	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2023-2024							
Course Code	**EC210**	**Title of the Course**	**Signals & Systems**	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	0	0	3
Pre-Requisite	NA	**Co-requisite**	NA				
Course Objectives	• State the basics of signal analysis and processing for communication engineering • Apply the basic tools of continuous time signals analysis such as Fourier series and Fourier transform • Apply the basic tools of discrete time signals analysis such as discrete time Fourier series (DTFS), discrete time Fourier transform (DTFT) and Z transform						

Course Outcomes	
CO1	Students will be able to identify the different types of signals and systems and able to apply the different operations on signals and also able analyze the LTI system and its characteristic
CO2	Students will be able to determine the Fourier series and Fourier transform of continuous and discrete signals.
CO3	Students will be able to do determine the frequency response and able to understand the concept of ideal filters.
CO4	Students will be able to obtain the sampling frequency and Nyquist rate of low pass and band pass signals.
CO5	Students will be able to determine the Z-transform, inverse Z-transform and able to get the analysis and characterization of discrete LTI systems.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Basics of Signals & Systems	Signal Classification: continuous time versus discrete time, periodic versus not periodic, analog versus digital, deterministic versus random. Basic Signals, Signal Operations: transformation of the independent variable, Convolution, Basic system properties: Static and dynamic systems, time invariant and time variant, linear and nonlinear systems, causal and non-causal systems, stable and unstable systems, Impulse response, Step response.	8	1
2	Fourier Transform	Fourier series representation of periodic signal, Fourier Transform, properties, Basic of Laplace Transform. Relation between Laplace transform and Fourier transform, Fourier transform application to LTI systems, Discrete time Fourier transform: representation of non periodic signals, properties of discrete Fourier transform.	8	2
3	Time and frequency characterization	Magnitude- phase representation of Fourier transform, frequency response of LTI systems, first order and second order continuous and discrete systems, Frequency Domain Characterization through multiplication of Fourier Transform of input signal and system frequency response.	8	3
4	Sampling	Sampling theorem, ideal sampling, flat top sampling, natural sampling, reconstruction of signals from samples, aliasing effect, up-sampling and down-sampling, discrete time processing of continuous time signals, and sampling of band pass signals.	8	4
5	Z-Transform	Introduction to Z- transform, properties, inverse Z- transform, analysis and characterization of discrete LTI systems, realization of discrete time systems.	8	5

Reference Books:

V Oppenheim, A.S Willsky and S. H Nawab/ Signals and Systems/PHI/Second Edition

Haykins/ Signals and Systems/Wiley India.

H.P.Psu/Signals and Systems Schaums outline/McGraw-Hill Education India.

Kallappan Gopalan/Signals and Systems/Cengage Learning India/Second Edition.

B.P. Lathi, "Signal Processing and Linear Systems," Oxford University Press, 1998.

R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete," 4th edition, Prentice Hall.

Douglas K. Lindner, "Introduction to Signals and Systems," McGraw Hill International Edition: 1999.

V. Krishnaveni, A. Rajeswari, ""Signals and Systems," Wiley India Private Limited, 2012.

Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems," John Wiley and Sons, 1995.

J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems," TMH New Delhi, 2001.

A. Anand Kumar, "Signals and Systems," PHI 3rd edition, 2018.

D. Ganesh Rao, K.N. Hari Bhat, K. Anitha Sheela, "Signal, Systems, and Stochastic Processes," Cengage publication, 2018.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO - PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	3	1	2	1		1	1		2	1		3	3	3	2		3	3
CO2	3	1	3			1			1	1		3	3	3	2		3	3
CO3	3	1	2	1		1	1		1			3	3	3	2		3	3
CO4	3	1	2	1		1	1		2	1		3	3	3	2		3	3
CO5	3	1	3	1		1			1			3	3	3	2		3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**EC211**	**Title of the Course**	**Measurement and Sensors**	**L**	**T**	**P**	**C**
Year	**II Year**	**Semester**	IV	3	0	2	4
Pre-Requisite	Basics of Electronics	**Co-requisite**	Electronics Measurements				
Course Objectives	**1.** To explain the basic concepts and definitions in measurement. **2.** To describe the bridge configurations and their applications. **3.** To explain the measurement of non-electrical quantity, their working principle and construction. **4.** To elaborate the discussion about the importance of signal generators and analyzers in Measurement.						

Course Outcomes	
CO1	To understand the different measurement standards, systems and Errors in an electronic measurement system, transducers and their classification and different types of DC and AC bridges and high frequency measurement.
CO2	To understand the sensors and transducers in different field.
CO3	To understand the measurement of non-electrical quantities along with their basic construction and working principle.
CO4	To understand the measurement of Amplifier and Receiver Characteristics, principle and working of telemetry tracking and command.
CO5	To understand the different types of Biosensors.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Instrument and Measurement Systems:	Standards of Measurement of Mass, Length, Volume, Time and Frequency, Electrical Standards, Standards of Temperature and Luminous Intensity, IEEE standards, Engineering Analysis of Instrument Systems, Experimental Errors, Minimization of Errors, Frequency Response and Calibration of Instruments systems. Bridge Measurements: Wheatstone Bridge, Kelvin Bridge, Guarded Wheatstone Bridge, AC Bridges: Maxwell Bridge, Hay Bridge, Schering Bridge, Wien Bridge.	**8**	**CO.1**
2	Introduction to sensors and transducers:	Need for sensors in the modern world. Different fields of sensors based on the stimuli - various schematics for active and passive sensors. Static and dynamic characteristics of sensors. High Frequency Measurements: RF Power and Voltage Measurements, RF Impedance Measurement, Q Meter, Digital Voltmeter, Time, Frequency and Phase Measurements, Measurement on CRO.	**8**	**CO.2**
3	Measurement of Non-Electrical Quantities:	Measurement of Temperature: Resistance Thermometer, Thermocouple, IC Sensor, Radiation Method (Pyrometer) Measurements of Pressure, Fluid Flow, Force, Torque, Displacement, Velocity and Acceleration.	**8**	**CO.3**
4	Measurement of Amplifier	Measurement of Amplifier and Receiver Characteristics, Data Distribution and Bus Structure, RS-232, IEEE488 Interface, PC Based Acquisition System, Data Transmission, Telemetry, Tracking and Command	**8**	**CO.4**
5	Introduction to biosensor:	General components of biosensor, Biomolecules in biosensors such as enzyme, DNA. Classification of biosensors based on principle: amperometric, potentiometric biosensors, optical, acoustic, piezoelectric, and calorimetric biosensors, scope of biosensors and its limitations.	**8**	**CO.5**

Text Books:

Helfric & Cooper/ Modern Electronic Instrumentation & Measurement Techniques/ PHI.

David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press

Sawhney A.K, “A Course in electrical and electronic measurements and instrumentation”, DhanpatRai & Co (P) Ltd, Educational and Technical Publishers, 19th Revised edition 2011

Reference Books:

E.O. Doeblin/ Measurement Systems/ MC Graw Hill

Oliver & J.M. Cage/Electronic Measurement And Instrumentation/ MC Graw Hill.

Ranjan C.S./Instrumentation Devices & Systems / Tata MC Graw Hill.

Patranabis D, “Sensors and transducers”, PHI, 2nd edition,2004.

R.S. Khanpur, “Handbook of Biomedical Instrumentation” Tata McGraw Hill

H.E. Thomas, “Handbook of Biomedical Instrumentation and Measurement” Restone Publishing Company

e-Learning Source:

https://nptel.ac.in/courses/108107142

https://archive.nptel.ac.in/courses/115/102/115102014/

https://nptel.ac.in/courses/115102014

https://archive.nptel.ac.in/courses/115/102/115102014/

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2		2		2	2				1	3	1	1	1
CO2	3	2	3	2		2		1		1			3	2	1	1
CO3	3	2	2		2		2		1	1		1	3	2	2	1
CO4	3	2	2	2		1		1			1		3	1	2	1
CO5	3	3		2	2	1		1	2			1	3	2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session:							
Course Code	EC 212	**Title of the Course**	**SEMICONDUCTING MATERIAL & POWER DEVICES**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	3	1	0	4
Pre-Requisite		**Co-requisite**					
Course Objectives	**An understanding of the fundamentals of material properties and the knowledge on how they can be modified.**						

Course Outcomes	
CO1	To familiarize with the fundamental of atomic structure, bonding &properties of various materials.
CO2	To familiarize with the role of Engineering materials in product design and society.
CO3	To understand the fundamentals of material properties .
CO4	To understand the about the Power Converter Components.
CO5	To understand about the Magnetic Properties of the Materials.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Crystal Structure of Materials**	Atomic bonding, cryatallinity, structural imperfections, Structure and properties of Electrical Engineering materials; Conductors, Semiconductors and Insulators, magnetic, Ferroelectric, Piezoelectric, Ceramic, Optical and Super-conducting materials. Passive components and characteristics Resistors, Capacitors and Inductors; Ferrites, Quartz crystal Ceramic resonators, Electromagnetic. and Electromechanical components.	8	**CO1**
2	**Conductivity of Metals**	Free electron theory of metals(explanation of ohm's law ,thermal conductivity and thermionic emission),factors affecting the electrical conductivity of metals, Thermal conductivity of metals, mechanism of thermal and electrical conductivity, Thermoelectric effect(Seeback, Peltier and Thomson) and its applications, Elementary approach to Superconductivity, high Tc Superconductivity.	8	**CO2**
3	**Mechanism of Conduction in Semiconductors**	Different types of diodes and their characteristics; Semiconducting materials for LED,LASER and GUNN DIODE, Organic Semiconductors, Polarization mechanism and dielectric constant, Behavior of polarization under impulse and frequency switching, Dielectric loss, Dielectrics strength, Spontaneous polarization ,Smart material, Piezoelectricity and Pyroelectricity	8	**CO3**
4	**Power Converter Components**	Silicon Controlled Rectifier, basic operation, principle of an SCR, I-Vcharacteristics, two transistor analogy, gate characteristics of an SCR, Dynamic characteristics of an SCR ,protection of thyristor, thyristor family, GTO, IGBT, Analysis of Controlled rectifiers (half wave and full wave and bridge)with different types of load.	8	**CO4**
5	**Magnetic Properties of Materials**	Origin of permanent magnetic dipoles in materials, Classification of diamagnetic, Paramagnetic, Ferromagnetic, Antiferromagnetic and Ferrimagnetic, Magnetic anisotropy, Hysteresis loop and its applications, Magnetostriction and its applications, soft and hard magnetic materials, Langvin theory of diamagnetic and paramagnetism, Weiss theory of Ferromagnetism	8	**CO5**

Reference Books:

1. A.J.Dekker/Electrical Engineering Materials/PHI.
2. C.S.Indulkar & S.Thiruvegada/An introduction Electrical Engineering Materials,S.Chand &Co.
3. Rashid, M.H /Power electronics devices and applications/PHI.

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	3	3	2	3		1	1		2	1		2	**3**	**0**	**0**	**1**	**3**	**0**
CO2	3	3	3	3		1			1	1		2	**3**	**2**		**1**	**3**	**2**
CO3	3	3	2	3		1			1			1	**3**				**3**	
CO4	3	3	2	2			1		2	1			**3**	**1**			**3**	**1**
CO5	3	3	3	3					1			2	**3**			**3**	**3**	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

IntegralUniversity,Lucknow

EffectivefromSession:2017-18							
CourseCode	EC213	**TitleoftheCourse**	Programming Concepts Lab	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**0**	**0**	**2**	
Pre-Requisite		**Co-requisite**					
CourseObjectives	1 . To understand the concepts of problem solving and its application in real world scenarios for problem solving. To practice the fundamental programming methodologies in the C/C++ programming language via laboratory experiences. 2. To learn the analysis of a problem in daily life and brainstorm solutions for the same. To understand the basic concepts of different types of loops in C/C++ and their application in achieving desired solutions to problems. 3. To develop, understand, test, and evolve substantial programs using a modern IDE and use programming approaches to avoid common coding errors; practice fundamental defensive programming and perform individual or team program reviews. 4. To utilize, implement, and evaluate fundamental data structures like arrays and associated algorithms; create, implement, debug, and evaluate algorithms for solving substantial problems. 5. To understand the concept of functions and modular programming in C/C++ and design recursive function to solve critical problems.						

CourseOutcomes	
CO1	Given a problem, students shall be able to identify various solutions in a step-by-step form through rigorous brainstorming, apply the principles of problem solving techniques to rule out the best solution, and formulate mathematical approaches to solve simple programs like factorial of a number, find prime numbers, etc.
CO2	Understand the concepts of various Programming Language tools like compiler and interpreter and apply it to compile and debug programs and learn to develop error free codes to produce desired results.
CO3	For a given problem, student shall be able to analyze and evaluate solution in a compiler based IDE like turbo C++ and apply the concept of loops to simplify large chunks of programs that estimate the best solution. The student shall also be able to demonstrate the ability to correct, test and debug programs.
CO4	For a given problem, apply the concept of arrays and develop associated algorithms that will eventually inculcate problem solving skills to create, implement, debug, and evaluate algorithms for solving substantial problems for real world scenarios.
CO5	Understand the concept of modular programming with C and develop associated algorithms incorporating the use of functions to solve substantial problems.

Experiment No.	**Title of the Experiment**	**Contentof Unit**	**Contact Hrs.**	**Mapped CO**
1	Factorial of a number	Write a program in C/C++ to accept a number and print the factorial of a number. i) for n<8 and, ii). for n>8.	2	CO1
2	Prime Numbers	Write a program in C/C++ to display Prime Numbers between 0 and 100.	2	CO1
3	Patterns	Write a program in C/C++ to display the following patterns: a. @ b. 1 c. 1 d. **** @@ 1 2 22 *** @@@ 1 2 3 333 ** @@@@ 1 2 3 4 4444 *	2	CO2
4	Swap two numbers	Write a program in C/C++ to swap two numbers using switch case: 1. with using third variable 2. without using third variable	2	CO2
5	Fibonacci series	Write a program in C/C++ to print the first 'n' terms of the Fibonacci series.	2	CO3
6	Bubble Sort	Write a program in C/C++ to sort a random list of numbers using Bubble Sort.	2	CO3
7	Product of matrix	Write a program in C/C++ to accept two NxN (Square) matrices and display their product in a third matrix.	2	CO4
8	Palindrome	Write a program in C/C++ to accept a name or string and display its reverse. Also check if it is Palindrome or not.		CO4
9	Towers of Hanoi	Write a program in C/C++ using Recursive Techniques to find the minimum number of moves to solve the classical puzzle of Towers of Hanoi.	2	CO5
10	Area of the figure	Write a program C/C++ using Functions to find the area of the figure shown below upto 2 decimal places.		**CO5**
e-LearningSource:				

https://www.vlab.co.in/

			CourseArticulationMatrix: (Mappingof COs withPOs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1	3	1	1	1	1		2	1	3	3	2	1
CO2	3	3	3	2	2	1			1		2	1	3	2	2	1
CO3	3	3	3	2	2	1			1		2	1	3	2		2
CO4	3	3	3	2	1				1			1	3	2		
CO5	3	3	2	2	1				1			1	3	2		

1-LowCorrelation;2-ModerateCorrelation;3-SubstantialCorrelation

Name& Sign of Program Coordinator	**Sign&Sealof HoD**

Integral University, Lucknow

EffectivefromSession:2022-23							
CourseCode	EC214	**Title of the Course**	Digital Electronics lab	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**0**	**0**	**2**	**1**
Pre-Requisite	EC214	**Co-requisite**					
CourseObjectives	To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.						

CourseOutcomes	
CO1	Define different types of logic gates, identify their ICs and verify truth table.
CO2	Analyze design and implement combinational logic circuit.
CO3	Analyze design and implement sequential logic circuit.
CO4	Derive basic gats, Adder and Sub tractor using universal gates.
CO5	Illustrate realization of Boolean expression in SOP and design it using logic gates.

Experiment No.	TitleoftheExperiment	Contentof Unit	Contact Hrs.	Mapped CO
1	Realize logic gates	Realize OR, NOR,XOR,XNOR gates using NAND gate and verify its truth table.	2	CO1
2	1-bit magnitude comparator	Design and study of 1-bit magnitude comparator.	2	CO1
3	Shift Registers	Design of shift registers.	2	CO2
4	CODE CONVERTER	(a) Design and test a Code Converter from decimal number to binary number. Use diode and LED′s. (b) Measure voltage drops across the diodes, LED′s and resistor R. Find the current flowing through LED.	2	CO2
5	Half Adder and Full Adder	(a) Assemble the Half Adder circuit using X-OR and AND gates. Verify the truth table for Half Adder. (b) Using two Half Adder and an OR gate, assemble Full Adder circuit. Verify truth table. (c) Express sum and carry with all the midterms in minimization possible?	2	CO3
6	7 Segment LED display	Display of decimal digits using 7 segments LED display and a suitable decoder. (a) Use a BCD to 7 segment decoder 0-9 digits. (b) Study the 7 segment LED display. Is it common anode or common cathode type? What is a suitable value of R for bright display of digit? (c) Design a BCD to 7 segment decoder using NAND gates. Use K-maps and don′t care terms to implement the design with minimum number of gates.	2	CO3
7	STUDY OF FLIP -FLOPS	STUDY OF FLIP -FLOPS (a) Design and test J-K F/F using NAND gates. (b) Study J-K Master -Slave F/F IC 74LS76. Make special observation of edge triggering, Preset and clear. (c) Make and test D-F/F and T-F/F and verify its truth table.	2	CO4
8	STUDY OF COUNTER	STUDY OF COUNTER Design Mod-10 counter using Master -Slave F/F (7476)and logic gates, (7400&7408) .Verify it′s truth table.	2	CO4

9	4-Bit Adder /Sub tractor	Study and verify 4-bit adder /Sub tractor circuit using IC7483 and IC7486.	2	CO_5
10	X-OR gate Module (7486)	STUDY THE X-OR GATE IV MODULE (7486) (a) Verify the truth table and record the voltage levels. (b) Design a 3-input X-OR gate using 2-input X-OR gate. Obtain its truth table F1 =A +B +C. (c) Design a 3-input X-NOR gate using IC7486&7402.Obtainits truth table F2 =A. B. C. (d) Find the expression of F1 and F2 as sum of product (SOP) and compare F1 and F2.	2	CO_5

e-LearningSource:

https://www.vlab.co.in/

	CourseArticulationMatrix: (Mappingof COs withPOs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3			3	2		3	3	2	2
CO2	3	3	2	3	2	3			3	2		3	3	2	2
CO3	3	3	2	3	2	3			3	2		3	3	2	2
CO4	3	3	2	3	2	3			3	2		3	3	2	2
CO5	3	2	2	2	2	3			2	2		3	3	2	2

1-LowCorrelation;2-ModerateCorrelation;3-SubstantialCorrelation

Name& Sign of Program Coordinator	**Sign&Sealof HoD**

Integral University, Lucknow

Effective from Session: 2017-18							
Course Code	EC215	**Title of the Course**	Measurement and Instrumentation Lab	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**0**	**0**	**2**	**1**
Pre-Requisite		**Co-requisite**					
Course Objectives	• To understand the working of a LVDT and strain Gauge. • To understand how to obtain the value of unknown inductance using maxwell's inductance bridge, Hay's Bridge and capacitance using Schering's Bridge. • To measure accuracy and precision of analog and digital instrument. • To measure phase difference and frequency using CRO and understand the working of a Crompton's Potentiometer. • To understand and study the Square Wave generator.						

Course Outcomes	
CO1	After study, student shall be able to realize the working of a LVDT and strain Gauge.
CO2	With the help of various bridges student shall understand and obtain the value of unknown inductance.
CO3	Student shall be able to understand how to measure accuracy and precision of analog and digital instrument.
CO4	Student shall be able to understand how to measure phase difference and frequency using CRO and able to understand the working of a Crompton's Potentiometer.
CO5	Student shall be able to understand and study the Square Wave generator.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**ContactHrs.**	**Mapped CO**
1	Square Wave generator	To study the Square Wave generator.	2	CO1
2	strain Gauge	To study the working of strain Gauge.	2	CO1
3	Maxwell's inductance bridge	To obtain value of unknown inductance using Maxwell's inductance bridge.	2	CO2
4	Hay's Bridge	To obtain value of unknown inductance using Hay's Bridge.	2	CO2
5	Schering's Bridge	To obtain value of unknown capacitance using Schering's Bridge.	2	CO3
6	CRO.	Measurement of phase difference and frequency using CRO.	2	CO4
7	LVDT	To study the working of a LVDT.	2	CO5
8	Analog & digital instrument	Measurement of accuracy and precision of analog and digital instrument.	2	CO5
e-Learning Source:				
https://www.vlab.co.in/				

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	1		1		1	1			3	2	1	1
CO2	3	2	2	2		1		1			1	1	3			
CO3	3	2	2	1	1		1		1	1			3	1	1	
CO4	3	2	2	2		1		1				1	3	1		1
CO5	3	2	1	2	1	1	1	1	1	1		1	3	1	1	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**