NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus

For

Bachelor of Technology
Electronics and Communication Engineering

Second Year

(Effective from the Session: 2024-25)

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)
Bachelor of Technology
Electronics and Communication Engineering
Evaluation Scheme
SEMESTER-III

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM														
1	BAS0301B	Engineering Mathematics III	Mandatory	3	1	0	30	20	50		100		150	4
2	BEC0302	Analog Circuits	Mandatory	3	1	0	30	20	50		100		150	4
3	BEC0301	Digital System Design	Mandatory	3	0	0	30	20	50		100		150	3
4	BEC0303	Signals, systems and networks	Mandatory	3	0	0	30	20	50		100		150	3
5	BEC0304	Computational Intelligence	Mandatory	3	0	0	30	20	50		100		150	3
6	BEC0355	IoT Workshop -I	Mandatory	0	0	6				50		100	150	3
7	BEC0352	Analog Circuits Lab	Mandatory	0	0	4				50		50	100	2
8	BEC0351	Digital System Design Lab	Mandatory	0	0	2				25		25	50	1
9	BEC0359	Internship Assessment	Mandatory	0	0	2				50			50	1
10	BNC0301/ BNC0302	AI & Cyber Ethics/ Environmental Science	Compulsory Audit	2	0	0	30	20	50		50		100	NA
11		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL											**1100**	**24**

*** List of MOOCs (Infosys Springboard) Based Recommended Courses for Second year (Semester-III) B. Tech Students**

S.No.	Subject Code	Course Name	University/Industry Partner Name	No of Hours	Credits
1	BMC0020	Express PCB Training	Infosys Wingspan (Infosys Springboard)	15h 6m	1
2	BMC0012	Data Structures and Algorithms using Python - Part 1	Infosys Wingspan (Infosys Springboard)	29h 27m	2

PLEASE NOTE: -

- **A 3-4 weeks Internship shall be conducted during summer break after semester-IV and will be assessed during Semester-V**
- **Compulsory Audit (CA) Courses (Non-Credit - BNC0401/BNC0402)**
  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - The Total and obtained marks are not added in the Grand Total.

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
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Bachelor of Technology
Electronics and Communication Engineering
Evaluation Scheme
SEMESTER-IV

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	BAS0402	Engineering Mathematics -IV	Mandatory	3	1	0	30	20	50		100		150	4
2	BASL0401	Technical Communication	Mandatory	2	1	0	30	20	50		50		100	3
3	BEC0401	Analog and Digital Communication	Mandatory	3	0	0	30	20	50		100		150	3
4	BEC0403	CMOS Digital Integrated Circuit	Mandatory	3	0	0	30	20	50		100		150	3
5	BEC0402	Microprocessor and Microcontroller	Mandatory	2	0	0	30	20	50		50		100	2
6	BEC0454	Verilog - HDL Simulation and Synthesis	Mandatory	0	0	6				50		100	150	3
7	BEC0452	Microprocessor & Microcontroller workshop	Mandatory	0	0	4				50		50	100	2
8	BEC0451	Analog & Digital Communication Lab	Mandatory	0	0	4				50		50	100	2
9	BASL0451	Technical Communication Lab	Mandatory	0	0	2				25		25	50	1
10	BEC0459	Mini Project	Mandatory	0	0	2				50			50	1
11	BNC0402/ BNC0401	Environmental Science/ AI & Cyber Ethics	Compulsory Audit	2	0	0	30	20	50		50		100	NA
12		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL											1100	24

*** List of MOOCs (Infosys Springboard) Based Recommended Courses for Second year (Semester-IV) B. Tech Students**

S. No.	Subject Code	Course Name	University/ Industry Partner Name	No of Hours	Credits
1	BMC0021	IoT Raspberry Pi with Projects	Infosys Wingspan (Infosys Springboard)	12h 25m	0.5
2	BMC0022	Mobile Apps Development - Advanced Applications	Infosys Wingspan (Infosys Springboard)	14h23m	1
3	BMC0023	Internet of Things 201	Infosys Wingspan (Infosys Springboard)	15h 59m	1

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  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - The Total and obtained marks are not added in the Grand Total.

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L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

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A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA

(AN AUTONOMOUS INSTITUTE)

SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Name: Engineering Mathematics-III **L-T-P [3-1-0]** **Credit: 4**

Subject Code: BAS0301B **Applicable in Department: ECE**

Pre-requisites of the Subject: Knowledge of Mathematics I and II of B. Tech or equivalent.

Course Objective- Concept of function of complex variables, Partial differential equations & their applications, Numerical techniques for various mathematical tasks and numerical aptitude. It aims to show case the students with standard concepts and tools from B. Tech to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course outcome (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Apply the concept of partial differential equation to solve partial differential Equations and problems concerned with partial differential equations	K_3
CO 2	Apply the concept of Fourier Transform and Z-transform to solve difference equations.	K_3
CO3	Apply the working methods of complex functions for finding analytic functions.	K_3
CO 4	Apply the concepts of complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals	K_3
CO 5	Solve the problems of Number System, Permutation & Combination, Probability, Set theory, Function, Data Interpretation, Syllogism.	K_3

Syllabus

Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Requi**	**Practical/ Assignment/ Lab Nos**	**CO Mapping**

				red (L+P)		
Unit 1	**Partial Differential Equation and its Applications**	Introduction of partial differential equations, Second order linear partial differential equations with constant coefficients. Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one-dimensional wave and heat equations	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment 1.1**	CO1
Unit 2	**Integral Transforms**	Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one-dimensional heat transfer equations and wave equations, Z- transform and its application to solve difference equations.	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-2.1**	CO2
Unit 3	**Complex Variable – Differentiation**	Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Mobius transformation and their properties.	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-3.1**	CO3
Unit 4	**Complex Variable –Integration**	Complex integrals, Contour integrals, Cauchy-Goursat theorem (Statement), Cauchy integral formula (Statement), Taylor's series, Laurent's series, Liouvilles's theorem(Statement), Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(sin\theta, cos\theta)$ and $\int_{-\infty}^{\infty} f(x)dx$.	Classroom Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-4.1**	CO4
Unit 5	**Aptitude-III**	Number System, Permutation & Combination, Probability, Set theory, Function, Non Verbal Reasoning. Data Interpretation, Syllogism.	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-5.1**	CO5
Total				**40**		
Textbooks						

B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.
E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
Reference Books
Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.
Links (Only Verified links should be pasted here)
Unit 1: https://archive.nptel.ac.in/courses/111/101/111101153/
Unit 2: https://archive.nptel.ac.in/courses/111/102/111102129/
Unit 3: https://archive.nptel.ac.in/courses/111/107/111107056/
Unit 4: https://archive.nptel.ac.in/courses/111/103/111103070/
Unit 5: https://nptel.ac.in/courses/111107058

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Subject Name: Analog Circuits **L-T-P [3-1-0]** **Credit: 4**

Subject Code: BEC0302 **Applicable in Department: ECE**

Pre-requisites of the Subject:

Course Objective- Students will learn about AC analysis of Transistors amplifiers, Power and Negative feedback amplifiers. Operational Amplifier and its applications, Different types of current mirrors, Sinusoidal and non-sinusoidal oscillators.

Course Outcome (CO):

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Design and analyze the different transistor amplifier circuits.	K_4
CO 2	Analyze the different power and negative feedback amplifiers.	K_4
CO 3	Design and Explain the applications of Operational amplifier required in electronic systems.	K_3
CO 4	Understand and explain different types of current mirrors used in designing of analog circuits.	K_4
CO 5	Explain and analyze the different types of sinusoidal and non- sinusoidal oscillators.	K_4

Course Content:-						
Unit	**Module**	**Topics Covered**	**Pedagogy**	**Lecture Required (T=L+P)**	**Aligned Practical/Assignment/Lab**	**CO Mapping**
Unit 1	**AC Analysis of Small Signal Amplifier**	Review of BJT and FET, low frequency transistor models, estimation of voltage gain, current gain, input resistance, output resistance of single stage CE and CS amplifier, low frequency response of single and multistage amplifiers. High frequency transistor models, high frequency response of single stage and multistage amplifiers, cascode amplifier.	PPT/ White board	12=8+4	Assignment-1 Experiments – 1 to 3 and 16 to 17	CO1
Unit 2	**Large Signal and Negative Feedback Amplifiers**	***Power Amplifier:*** Various classes of operation (Class A, B, AB, C), Figure of merits, power efficiency and linearity issues. ***Negative Feedback Amplifiers*****:** Block diagram, Advantages, Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.	PPT/ White board	12=8+4	Assignment-2 Experiments – 4 to 5 and 18 to 19	CO2
Unit 3	**Operational Amplifier Applications**	Review of op-amp, Inverting and Non-inverting amplifiers, Voltage follower, Adder, Subtractor, Integrator, Differentiator, Log–Anti Log Amplifiers, Precision rectifier, Comparator, Schmitt trigger. ***Active Filters:*** Frequency response of ***Low*** Pass, High Pass, Band Pass, Band Stop, and	PPT/ White board	12=8+4	Assignment-3 Experiment – 6 to 11 and 20 to 21	CO3

		All Pass Filters, advantages over passive filter, Design guidelines.				
Unit 4	**Current Mirrors**	***Current Mirrors:*** Simple current mirror, Base current compensation current mirror, Wilson and Improved Wilson current mirrors, Widlar current source and Cascode current mirror. Design of various stages of operational amplifier.	PPT/ White board	12=8+4	Assignment-4	CO4
Unit 5	**Oscillators**	***Sinusoidal oscillators (Op-Amp Based)*:** Concept of positive feedback, Barkhausen criterion, RC oscillators (Phase shift, Wien bridge), LC oscillators (Hartley, Colpitt, Clapp). ***Non-sinusoidal oscillators:*** Square wave generator, Triangular wave generator, Astable multivibrator using Op-amp and IC 555.	PPT/ White board	12=8+4	**Assignment-5** Experiment – 12 to 15	CO5

References-

Text Books:

1. A.S. Sedra and K.C. Smith, "Microelectronic Circuits," Saunder's College11 Publishing, 4th Edition.
2. Robert L. Boylestad Louis Nashelsky," Electronic Devices and Circuit Theory ," Pearson, 11th Edition.
3. R. A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Pearson Publication, 4th edition.

Reference Books:

1. R S Tomar, "Analog integrated Circuits," Umesh Publications.1st Edition.
2. Paul R. Gray & Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley,3rd Edition
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.

Links:

Unit 1

1. BJT- Multistage Amplifier Explained (with Example)
2. https://www.youtube.com/watch?v=PoPBaoS-qQU
3. Small Signal BJT Amplifier / Single Stage Transistor Amplifier
4. https://www.youtube.com/watch?v=5MLVr9r6Vzk&list=PL-IC1WV1OE4kRdcpTfgtNjFpR8XEpDu7O
5. BJT Small Signal Analysis: Common Emitter Fixed Bias and Voltage Divider Bias
   https://www.youtube.com/watch?v=wbDUDRlmUuM&t=372s

Unit 2:

1. Principle of Feedback Amplifiers - Feedback Amplifiers - Applied Electronics
   https://www.youtube.com/watch?v=O_pqCNPs6xw&list=PLkwqJ3VB2IQ2LVf9g6NY0SNBFA2ips4ca
2. FEEDBACK IN AMPLIFIER | POSITIVE & NEGATIVE FEEDBACK | VOLTAGE GAIN OF A FEEDBACK AMPLIFIER | NOTES
   https://www.youtube.com/watch?v=GAFwUegUvNI
3. Types of Feedback Amplifier
   https://www.youtube.com/watch?v=2fcd4jj3X2I&list=PL00WWA9f-4c-yc9uMFw7G5kKVMLCoSQp2

Unit 3:

1. Introduction to Operational Amplifier: Characteristics of Ideal Op-Amp
   https://www.youtube.com/watch?v=kiiA6WTCQn0&list=PLwjK_iyK4LLDBB1E9MFbxGCEnmMMOAXOH
2. Op-Amp Integrator (with Derivation and Solved Examples) https://www.youtube.com/watch?v=OPvs7A554Rw
3. Op-Amp Slew Rate Explained (with Examples)
   https://www.youtube.com/watch?v=2DFIr6t1hbc&list=PLwjK_iyK4LLDBB1E9MFbxGCEnmMMOAXOH&index=9

4.Op-Amp: CMRR (Common Mode Rejection Ratio)
https://www.youtube.com/watch?v=hpCu3HbAiWg&list=PLwjK_iyK4LLDBB1E9MFbxGCEnmMMOAXOH&index=10

Unit 4:

1. Concept of Current Mirror Circuit | Analog Electronics
2. https://www.youtube.com/watch?v=QET5DHMYPXc
3. BJT- Current Mirror
   https://www.youtube.com/watch?v=VnJHXQCPIvs
4. Working and design of Cascode current mirror
   https://www.youtube.com/watch?v=qrqp1J149o0

Unit 5:

1. How Oscillator Works ? The Working Principle of the Oscillator Explained
2. https://www.youtube.com/watch?v=XVS8Puf4tiw
3. RC Phase Shift Oscillator (using Op-Amp) Explained
   https://www.youtube.com/watch?v=Gvb4GIV5ig8
4. Wien Bridge Oscillator (using op-amp) Explained
   https://www.youtube.com/watch?v=gbUXbaxvX94

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA

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SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Name:	**Digital System Design**	**L-T-P [3-0-0]** **Credit: 3**
Subject Code:	**BEC0301**	**Applicable in Department: ECE**

Pre-requisite of Subject: Basic concept of number systems, Boolean Algebra, Digital logic families, BJT & MOSFET.

Course Objective: The student will learn about Boolean algebra, logic function minimization by K map, binary codes, Designing and analysis of combinational and sequential circuits, Synchronous & Asynchronous Sequential Circuits, Semiconductor memories and programmable logic devices.

Course Outcomes (COs)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Verify the logic operations and apply the optimization techniques to implement logic functions.	K3
CO2	Design and analyze combinational logic circuits.	K4
CO3	Apply different types of flip-flops to implement sequential circuits.	K4
CO4	Design and analyze Synchronous & Asynchronous Sequential Circuits.	K4
CO5	Explain the concept of Semiconductor Memories and implement the digital logic functions using PLDs.	K4

Syllabus

Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical/ Assignment/ Lab Nos**	**CO Mapping**

Unit 1	**Logic Simplification and Binary Codes**	**Logic Simplification and Binary Codes** **N**umber Systems, Complements of Numbers, Boolean Algebra, De Morgan's Theorem, Logic Gates, SOP & POS Forms, Canonical Forms, Karnaugh Maps upto 5 Variables, Multilevel NAND/NOR realizations, Binary Codes.	PPT/ White board	12=8+4	Assignment-1 Experiments – 1 to 3	CO1
Unit 2	**Combinational Logic Circuits**	**Combinational Logic Circuits** Code Conversion, Comparators, Adders: Half Adder, Full Adder, Carry Look Ahead Adder, Subtractors: Half Subtractor, Full Subtractor, Serial And Parallel Adders, BCD Adder, Multiplexers, Demultiplexers, Encoders, and Decoders.	PPT/ White board	16=8+8	Assignment-2 Experiments – 4 to 11	CO2
Unit 3	**Sequential Logic and Its Applications**	Sequential Circuits Fundamentals: Basic Building Blocks of Sequential circuits like SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation and characteristics Table of all Flip Flops, Conversion from one type of Flip-Flop to another. Shift Registers, Ring and Twisted Ring Counter.	PPT/ White board	14=8+6	Assignment-3 Experiment – 12 to 14	CO3
Unit 4	**Synchronous & Asynchronous Sequential Circuits**	Synchronous Sequential Circuits: Design and analysis of clocked sequential circuits, state reduction and assignments, Design of sequence detector and Counter Asynchronous Sequential Circuits: Design and **a**nalysis of asynchronous sequential circuits, circuit with latches, reduction of state and flow table, race-free state assignment, hazards.	PPT/ White board	14=8+6	Assignment-4 Experiment – 15 to 18	CO4
Unit 5	**Programmable Logic Devices**	Semiconductor Memories: Basic concepts and hierarchy of Memory**,** Memory elements-ROM, RAM, comparison, Designing and circuit implementation using programmable logic devices: PROM, PAL, PLA, Introduction of CPLD and FPGA.	PPT/ White board	12=12+0	Assignment-5	CO5
Total				68=44+24		

Textbooks

Sr No	Book Details
1.	M. Morris Mano and Michael D. Ciletti," Digital Design, 6th Edition" Pearson India 2018.
2.	R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009
3.	Arimathea S and S. Salivahanan," Digital Circuits and Design"

Reference Books

Sr No	Book Details
1.	John F Wakerly, Digital Design: Principles and Practices, Pearson, (2000).
2.	Fundamentals of Logic Design", Cengage Learning, 5th, Edition, 2004.
3.	A. Anand Kumar," Theory and Logic Design", PHI, 2013

Links (Only Verified links should be pasted here)

Unit 1 https://www.youtube.com/watch?v=juJR_JDJRa0

https://www.youtube.com/watch?v=2cpl_HjcI3A

https://www.youtube.com/watch?v=KergVtV3SxU

https://www.youtube.com/watch?v=kgL5UaSVuro

Unit 2: https://www.youtube.com/watch?v=sUutDs7FFeA

https://www.youtube.com/watch?v=XCiLHOZsQl8

Unit 3: https://www.youtube.com/watch?v=ibQBb5yEDlQ

https://www.youtube.com/watch?v=LHAbLXfRYXk https://www.youtube.com/watch?v=Gc3DL-tmr-g https://www.youtube.com/watch?v=8S1kvCJRfvc
Unit 4: https://www.youtube.com/watch?v=ntiv1g7G_C4 https://www.youtube.com/watch?v=Qe_9CPac23c
Unit 5: https://www.youtube.com/watch?v=4GpWA_hmRhw https://www.youtube.com/watch?v=p4R0Ej6FCn0&list=PLAuW6sm6dy0yRMXL47Kz4nfhB7tURK88p https://www.youtube.com/watch?v=jrQ1YYgiOTo

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Subject Name: Signals, Systems and Networks (SSN)	**L-T-P [3-0-0]**	**Credit: 3**
Subject Code: BEC0303	**Applicable in Department: ECE**	

Pre-requisite of Subject:

Application of Differential and Integral Relations.
Basic Knowledge of mathematics.

Course Objective: This course is introducing the fundamental principles of signals and system analysis. These concepts form the building blocks of modern digital signal processing, communication and control systems. The course will cover various basic tools of signal and system analysis such as signal classification, LTI systems, Properties of LTI Systems, Frequency Response, Laplace Transform, Z-Transform, Fourier Transform, Fourier Series, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Cascade/ Parallel structures and their various practical applications. Various concepts such as convolution, impulse/ frequency response, causality, stability of systems will be especially emphasized.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Identify various signals and systems.	K1
CO2	Apply Fourier transform and convolution integral for Network analysis.	K2, K3
CO3	Apply Laplace transform for Network analysis.	K3, K4
CO4	Identify and analyze two-port network parameters.	K3, K4
CO5	Synthesize the one port and two port networks.	K3, K4

Syllabus						
Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical/ Assignment/ Lab Nos**	**CO Mapping**
1	**Signal and System**	Introduction, Classification of Signals; Transformation of independent variables: Time-shifting, time-scaling, time-reversal and combined operations; Singularity functions: Unit step, Unit impulse and Unit ramp functions; Exponential and sinusoidal signals; Periodic and Aperiodic Signals, Energy andPower Signals, Even and Odd Signals, Causal, Anti-causal and Non-Causal Signals; Continuous- Time and Discrete-Time System; Linear and Nonlinear systems, Time varying and Time-invariant systems, causal system, stable system, System with and without memory.	Lecture, Numerical Discussion	**8**	Assignment 1	**CO1**
2	**LTI Systems and Fourier Analysis**	Linear time-invariant (LTI) systems, characterization of causality and stability of linear shift invariant systems. Fourier series representation of signals, Fourier Transforms, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Properties and Significance of CTFT,CTFT of Common Signals, Inverse CTFT. Z-Transform: Definition, Convergence of Z-transform and Properties.	Lecture, Numerical Discussion	**8**	Assignment 2	**CO2**
3	**Laplace transforms and its application to network analysis**	Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms. Analysis of RC, RL and RLC network with and without initial conditions with Laplace transforms.	Lecture, Numerical Discussion	**8**	Assignment 3	**CO3**
4	**Two-port networks**	Parameters of Two Port Networks, Relation between Parameters, Transfer Functions using Two Portnetwork Parameters, Interconnection of Two Port Networks, Reciprocal and Symmetric Networks, terminated Two Port Networks.	Lecture, Numerical Discussion	**8**	Assignment 4	**CO4**
5	**Realizability Theory and Synthesis of Networks**	Properties of immitance functions, realizability theory: Hurwitz polynomial and positive realfunction one port network synthesis (Foster's and Cauer's form synthesis). Zeroes of transmission, Synthesis of Y_{21} and Z_{21} with 1Ω terminations.	Lecture, Numerical Discussion	**8**	Assignment 5	**CO5**

Total		**40**
Textbooks		
Sr No	**Book Details**	
1.	A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Pearson, 2015.	
2.	Tarun Kumar Rawat, “Signals and Systems”, Oxford University Press, 2010.	
3.	Franklin F. Kuo, “Network Analysis and synthesis”, 2nd Edition, Wiley India Pvt. Ltd.	
4.	Charles Alexander, Matthew Sadiku, “Fundamentals of Electric Circuits” 5th edition McGraw-Hill Education	
Reference Books		
Sr No	**Book Details**	
1.	Roberts, M.J., “Fundamentals of Signals & Systems”, Tata McGraw.	
2.	R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems.	
3.	M. E. Van Valkenberg, “Network Analysis”, 2nd Edition, Prentice Hall of India Ltd.	
4.	William H. Hayt, Jack Kemmerly, Engineering Circuit Analysis, McGraw Hill Education;Eighth edition.	
Links (Only Verified links should be pasted here)		
Unit 1 https://nptel.ac.in/courses/117/104/117104074/		
Unit 2: https://nptel.ac.in/courses/117/104/117104074/ https://nptel.ac.in/courses/108/102/108102042/		

Unit 3: https://nptel.ac.in/courses/117/104/117104074/ https://nptel.ac.in/courses/108/102/108102042/
Unit 4: https://nptel.ac.in/courses/117/104/117104074/ https://nptel.ac.in/courses/108/102/108102042/
Unit 5: https://nptel.ac.in/courses/117/104/117104074/ https://nptel.ac.in/courses/108/102/108102042/

NIET Greater Noida Autonomous Institute	**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA** **(AN AUTONOMOUS INSTITUTE)** **SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING**

Subject Name: Computational Intelligence **L-T-P [3-0-0]** **Credit: 3**

Subject Code: BEC 0304 **Applicable in Department: ECE**

Pre-requisite of Subject: Students must have logical and practical skill set towards analyzing various problems related to algorithms.

Course Objective: The purpose of this course is to provide an introductory understanding of the fundamental principles, techniques, and applications of Computational Intelligence. By the end of the course, students will gain knowledge in designing intelligent systems and grasp the key concepts in areas such as Artificial Neural Networks, Fuzzy Logic, and Genetic Algorithms. Additionally, students will acquire the necessary mathematical skills to optimize neural network learning. Moreover, through engaging in a research or design project, students will develop familiarity with current research problems and gain experience in utilizing research methods within the field of Computational Intelligence.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(K)**
CO 1	Identify Computational Intelligence techniques and their applications.	K1
CO2	Apply neural networks using various learning techniques and Formulate the artificial neural network with their different layers.	K3
CO3	Compare the fuzzy sets and crisp sets and apply fuzzy operations in real life problems.	K2
CO4	Design fuzzy controller with the help of fuzzy rules, fuzzyfications and defuzzification.	K3
CO5	Discuss the concept of genetic algorithm and its various applications.	K4

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
Unit 1	Introduction to Computational Intelligence	Introduction to Computational Intelligence, Various types of Computational Intelligence Techniques, Characteristics of Computational Intelligence, Major Areas of Computational Intelligence, Applications of Computational Intelligence. Introduction to MATLAB / Python Environment for Computational Intelligence Techniques.	PPT, Test, Quiz	8hrs	Assignment	**CO1**
Unit 2	Neural Networks	Neuron, Biological neurons and its working, Model of Artificial Neuron, Architectures, Taxonomy of ANN Systems, Various Activation Functions, Single Layer ANN System, Multi-Layer ANN System, Recurrent networks. Supervised Learning, Unsupervised Learning, Reinforcement Learning, Perceptron, Adaline, Madaline, and Applications of ANN in research. MATLAB Neural Network Toolbox / Python.	PPT, Test, Quiz	8hrs	Assignment	**CO2**
Unit 3	Fuzzy Logic-I	Fuzzy Set theory, Operations on sets, Properties, Fuzzy versus Crisp set, Fuzzy Relation, Operations on Fuzzy Relation, Properties, Fuzzy versus Crisp Relations, Introduction & features of membership functions, Max-Min Composition	PPT, Test, Quiz	8hrs	Assignment	**CO3**
Unit 4	Fuzzy Logic-II	Introduction to Fuzzy logic, Propositions, If-Then Rules, implications and inferences. Rule based systems, Predicate logic, Fuzzy Inference Systems, Fuzzification, Defuzzification Method, logic controller design, Some applications of Fuzzy logic. Fuzzy Logic MATLAB Toolbox/Python	PPT, Test, Quiz	8hrs	Assignment	**CO4**
Unit 5	Genetic Algorithm (GA)	Fundamentals of Genetic Algorithms, Basic concepts, Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Optimization of traveling salesman problem using Genetic Algorithm, Genetic Algorithm MATLAB Toolbox/Python, Hybrid Computational Intelligence	PPT, Test, Quiz	8hrs	Assignment	**CO5**
Total				**40**		

Textbooks	
Sr No	**Book Details**

1.	Computational Intelligence: An Introduction, Andries P. Engelbrecht, Wiley Publication.
2.	S. Rajsekaran & GA Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications”, Prentice Hall of India.
3.	Siman Haykin, “Neural Netowrks”, Prentice Hall of India
4.	Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley India.
Reference Books	
Sr No	**Book Details**
1.	Kumar Satish, “Neural Networks”, Tata Mc Graw Hill
2.	Fakhreddin O. Karray, Clarence W. De Silva, “Computational Intelligence and Intelligent System Design: Theory Tools and applications”, Pearson
3.	E Horowitz, S Sahni, S Rajasekaran, Fundamentals of Computer Algorithms, Universities Press.
Links (Only Verified links should be pasted here)	
Unit 1 https://youtu.be/fgtUFzxNztA?si=DiEQ7L2PNrQvgC5y	
Unit 2: https://www.youtube.com/watch?v=xbYgKoG4x2g&list=PL53BE265CE4A6C056	
Unit 3: https://www.youtube.com/watch?v=K7S3TgfqnX0&list=PLFW6lRTa1g81F7CJ-CdlsyWKKAa43T62j	
Unit 4: https://www.youtube.com/watch?v=JrRWdPvG7yk&list=PLFW6lRTa1g81F7CJ-CdlsyWKKAa43T62j&index=2	
Unit 5: https://www.youtube.com/watch?v=d86McbWXh4E&list=PLwdnzlV3ogoWyi7exLIe26JhueiVQXq_S	

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Subject Name: IoT Workshop-I **L-T-P [0-0-6]** **Credit: 3**

Subject Code: **BEC0355** **Applicable in Department: ECE**

Pre-requisite of Subject: Basics of IoT

Course Objective- The concept of IoT and its key elements. The different IoT System Architectures and Standards including latest computing paradigms. The concepts of IoT hardware platform and the sensors. The concept of various types of IoT protocols and communication technologies. Various issues and solution related to IoT Security and future trends of IoT.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(K)**
CO 1	Explain the key elements of an IoT device along with opportunities and risk associated with IoT adoption.	K1
CO2	Describe the implementation of the different IoT System Architectures and Standards including latest computing paradigm.	K1, K2
CO3	Describe the use of various IoT hardware platforms and sensors.	K1, K2
CO4	Explain the concept and use of various IoT protocols and communication technologies.	K1, K2
CO5	Analyze challenges, and issues related to IoT Security and apply IoT on social society problems.	K1, K2, K5

Course Content:-

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping
Unit 1	Introduction to IoT and its basic fundamental	Introduction to IoT and its Characteristics, IoT Architectures and its Physical & Logical Design, Enabling Technologies in IoT, M2M Communication, Basics of Computer Networking and its Topologies, OSI Model, TCP/IP Protocol Suite. Introduction to Integrated Developed Environments	PPT, Test, Quiz	8hrs	Assignment	**CO1**
Unit 2	Hardware and Sensor Networks	Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, Raspberry Pi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.	PPT, Test, Quiz	8hrs	Assignment	**CO2**
Unit 3	Arduino and Raspberry pi Programming	Arduino IDE coding, Libraries, Arithmetic addition in IDE, Interfacing with Raspberry Pi, Node MCU, ARM Processor Families, Main Features of M4 Processor, ADC and DAC Conversion Techniques.	PPT, Test, Quiz	8hrs	Assignment	**CO3**
Unit 4	IoT Security and Protocols	Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols, IoT Security, Threat Modelling.	PPT, Test, Quiz	8hrs	Assignment	**CO4**
Total				**40hrs**		

List of Experiments:-			
S. No.	**Topic**	**Program Logic Building**	**CO Mapping**
1	Arduino IDE	Study of IDE and practice of its installation.	CO 1
2	Arduino Board	Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.	CO 2
3	Arduino Board	Simulation of 4-Way Traffic Light with Arduino	CO 2
4	Arduino Board	Working with Adafruit Libraries in Arduino.	CO 2
5	Raspberry Pi	Connect an LED to GPIO pin 25 and control it through the command line.	CO 2
6	Sensors	The state of LED should toggle with every press of the switch Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds.	CO 2
7	Libraries	To study Libraries and their installation.	CO 3
8	Actuators	To interface a servo motor with an Arduino board and control its position using PWM signals.	CO 3
9	Actuators	To learn how to interface a DC motor with an Arduino board and control its speed and direction.	CO 3
10	Actuators	To understand how to interface a relay with an Arduino board and control external devices.	CO 2
11	Actuators	To understand how to interface a stepper motor with an Arduino board and control its rotation.	CO 3
12	Sensors	To detect the presence of LPG or propane gas using the MQ-6 gas sensor and Arduino.	CO 3
13	Raspberry Pi	Study and Installation of Raspberry Pi.	CO 3
14	Raspberry Pi	Displaying different LED Patterns with Raspberry Pi.	CO 3
15	Raspberry Pi	Programming of available GPIO Pins of the corresponding device using native programming language. Interfacing LED and testing the functionality.	CO 3

16	Communication Protocols	To explore BLE communication and data exchange.	CO 4
17	Applications of IoT	Home automation system	CO 5
18	Applications of IoT	Health care system	CO 5
19	Applications of IoT	Smart Irrigation System	CO 5
20	Applications of IoT	Electric Piano	CO 5

Text Books:

Sabrie Soloman," Sensors Handbook", Second Edition Jan 2010.

A.K. Sawhney," Sensors and Instrumentation" Dhanpat Rai & Co. 2014.

Michael Miller, "The Internet of Things" Pearson. 1st Edition March 2015.

Reference Books:

Simon Monk, "Raspberry Pi Cookbook", O'Reilly, Fourth Edition 2022.

Brian Jepson, Michael Margolis, Nicholas Robert Weldin," Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects" O'Reilly, Third Edition 2020.

Links:

Unit 1

https://www.youtube.com/watch?v=APH6Nrar27w&list=PLYwpaL_SFmcB8fDd64B8SkJiPpEIzpCzC.

https://www.youtube.com/watch?v=GfaHdjApnhU&t=329s

https://www.youtube.com/watch?v=1msEo8PIcbw

Unit 2:

https://www.youtube.com/watch?v=IIf7zH5cIX8&list=PL91lquAVmESBqKLU0Tn5gRVXVyW5KLgCa

https://www.youtube.com/watch?v=99JCGjmH71o

https://www.youtube.com/watch?v=Ukfpq71BoMo&t=327s

Unit 3:

https://www.youtube.com/watch?v=nbD_V4QtNvY

https://www.youtube.com/watch?v=2HY0pkMtYek

https://www.youtube.com/watch?v=HicZcgdGxZY&list=PLwjK_iyK4LLCnW-df-_53d-6yYrGb9zZc

Unit 4: https://www.youtube.com/watch?v=Yrp4LU5n7mc https://www.youtube.com/watch?v=CR-WLHLz-es https://www.youtube.com/watch?v=byNUw43CQrU&t=3s
Unit 5: https://www.youtube.com/watch?v=-SHjXavvAZQ https://www.youtube.com/watch?v=12BiFNIVs6I https://www.youtube.com/watch?v=gguZWsR449g

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LAB NAME: Analog Circuits Lab	**L-T-P [0-0-4]**	**Credit: 2**
LAB CODE: BEC0352	**Applicable in Department: ECE**	

Lab Experiments **Credit: 2**

Course Objective: Course Objective: Students will learn about,

1. Designing, implementation and verification of various characteristics of transistor amplifiers.
2. Design and implementation of various applications of Op-amp.
3. Design and implementation of oscillators.
4. Simulation of Electronic circuits on simulation software.
5. Introduction and circuit design by PCB design software (PCB Express, Ki cad).

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level (KL)**
CO 1	Design and plot frequency response of amplifiers	K4
CO2	Design and verify Op- Amp base circuits.	K4
CO3	Design and implementation of oscillators.	K4
CO4	Simulate the Electronic circuits on simulation software.	K3
CO5	Design and implement electronics circuits by PCB design software (PCB Express, Ki cad).	K4

Sr. No.	Program logic Building	CO
1	Design and implement a CE (BC-107) amplifier with potential divider biasing (for V_i = 20 mV, R_1=100KΩ R_2= 10KΩ, R_C= 4.7 KΩ, R_E= 1KΩ). Verify the following parameters with the theoretical values: (i) Voltage gain A_v (ii) Current gain A_i (iii)Input Resistance (R_i) (iv)Output Resistance (R_o)	CO1
2	Design and analysis of Single stage common source MOSFET amplifier with potential divider biasing (for V_i = 20 mV, R_1=1MΩ R_2= 1KΩ, R_D= 4.7 KΩ, Rs= 1KΩ) and Plot Gain (dB) Vs frequency curve, also measure following parameters (i) Bandwidth (ii) Input impedance (iii) Maximum signal handling capacity (MSHC).	CO1
3	Design a single-stage CE and a multistage (CE-CE) amplifiers with Voltage Divider Bias for 10 mV input ac signal and plot the Frequency Response curves using BC 547, V_{CC} = 12V, Stability factor (S) =10 and R_L= 10 KΩ. Observe the effect on gain and bandwidth.	CO1
4	Design current series/Voltage shunt Feedback amplifier with basic voltage gain 100 and feedback factor 0.1-0.2 also analyze the effect of feedback on gain, bandwidth input and output impedance.	CO1
5	Design Voltage series Feedback amplifier with basic voltage gain 100 and feedback factor 0.1-0.2 also analyze the effect of feedback on gain, bandwidth, input and output impedance.	CO1
6	Design and analyze the output voltage V_0 for OP-AMP (IC 741) as: (i) Inverting and Non-inverting amplifier for input voltage 0.5V with input Resistance (R_i) of 10 KΩ and feedback Resistance (R_f) of 100 KΩ. Voltage follower circuits for input voltage 1V.	CO2

7	Design a differential amplifier with ±12V DC power supply and calculate Common mode gain, differential mode gain, CMRR and slew-rate.	CO2
8	Design and analyze OP-AMP applications as a difference amplifier, integrator and differentiator Circuits for 1 KHz input signal.	CO2
9	Draw the input and output waveforms of a given full wave precision rectifier.	CO2
10	Design and implement of 2^{nd} order Active Low pass filter for cut-off frequency 1KHz and pass band gain of 1.586, also draw the frequency response curve and verify cutoff frequency.	CO2
11	Design and implement of 2^{nd} order Active High pass filter for cut-off frequency 1KHz and pass band gain of 1.586, also draw the frequency response curve and verify the cutoff frequency.	CO2
12	Design the following RC sinusoidal oscillators; Also verify the theoretical and practical Oscillating frequency. (i) RC phase shift oscillator, if its frequency of oscillation is 955 Hz and $R_1=R_2=R_3$ =680KΩ. Wien bridge oscillator uses R=4.7KΩ, C=0.01μF, and $R_F=2R_1$	CO3
13	Design the following LC oscillators; Also verify the theoretical and practical Oscillating frequency. (i) For a Hartley oscillator, self-inductance of the two coils are L_1=100mH, L_2=1mH and mutual inductance between the two coils is 20μH. its output for a capacitor of value 20pF. For a Colpitts oscillator in which feedback network consists of two capacitors of 100 pF and 20 pF with 100 mH coil across these capacitors.	CO3
14	Design and implement square wave generator (Astable Multivibrator) for 1 KHz using, (i) Op-amp (ii) IC 555.	CO3
15	Design and implement a triangular wave generator using dual op-amp, for oscillation frequency f_0 =1.5 KHz and Vout (P-P) =6V, use Vsat = 13.5 V.	CO3
16	Design and simulate single-stage CE amplifiers with Voltage Divider Bias for 10mV input ac signal and plot the Frequency Response curves using BC 547, V_{CC}= 12V, Stability factor (S)=10 and R_L= 10 KΩ. (*TARGET, PSPICE-1*etc.)	CO4
17	Simulation of Multistage stage (CE-CE) amplifier (designed in experiment1) using any available simulation software and also find the Voltage gain, Input impedance, Output impedance, and bandwidth. (*TARGET, PSPICE-1*etc.)	CO4
18	Design and simulate current series/Voltage shunt Feedback amplifier with basic voltage gain 100 and feedback factor 0.1-0.2 also analyze the effect of feedback on gain and bandwidth.	CO4
19	Design and simulate Voltage series Feedback amplifier with basic voltage gain 100 and feedback factor 0.1-0.2 also analyze the effect of feedback on gain and bandwidth.	CO4

20	Design and simulate of 2nd order Active Low pass filter for cut-off frequency 1KHz and pass band gain of 1.586, also draw the frequency response curve and verify the cutoff frequency.	CO4
21	Design and simulate of 2nd order Active High pass filter for cut-off frequency 1KHz and pass band gain of 1.586, also draw the frequency response curve and verify the cutoff frequency.	CO4
22	Introduction of PCB design software (PCB Express, Ki cad).	CO5
23	Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.	CO5
24	PCB Lab: Artwork & printing of a simple PCB.	CO5
25	Etching & drilling of PCB.	CO5
26	Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.	CO5
27	Mini Project: *Design a mini project using the applications of this Lab.*	CO5

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LAB NAME: Digital System Design Lab	**L-T-P [0-0-2]**	**Credit: 1**
LAB CODE: BEC0351	**Applicable in Department: ECE**	
Course Objective: The student will learn about verification of truth table, designing and verification of combinational circuits, flip-flops and sequential circuits.		
Course Outcomes (COs)		
Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Verify truth table of various type of Logic Gates.	K2
CO2	Design, implement and verify combinational logic circuits.	K4
CO3	Implement and verify truth table of various types of flip-flops.	K4
CO4	Design and implement different types of sequential logic circuits.	K4
List of Practical		
Sr No	**Program Title**	**CO Mapping**
1	Verification of the truth tables of Basic Logic Gates and Universal Logic Gates using TTL ICs. AND (7408) OR (7432) NOT (7404)	**CO1**

	NAND (7400) NOR (7402)	
2	Implementation of the given Boolean function using TTL Logic Gates (NOT, AND and OR Gates) in SOP for following Boolean expressions: Y1 = AB' + A'B Y2 = ABC + A'B'C' + A'C F(A,B,C,D)=∑(0,2,5,7,8,10,13,15)	**CO1**
3	Implementation of the given Boolean function using TTL Logic Gates (NOT, AND and OR Gates) in POS forms for following Boolean expressions: Y1 = (A'+B)(A+B') Y2 = (A+B+C)(A'+B'+C')(A'+C) F(A,B,C,D)= M(0,2,5,7,8,10,12,15)	**CO1**
4	Implement and verify 4-bit Binary to Gray code converter and 4- bit Gray to Binary code converter.	**CO 2**
5	Implementation of Half-adder, Full-adder and Full-adder using two Half-adder with TTL Logic Gates (EXOR-7486, AND-7408, OR-7432) and verify its truth table.	**CO 2**
6	Implementation of Half-subtractor, Full-subtractor and Full-subtractor using two Half-subtractor with TTL Logic Gates (EXOR-7486, AND-7408, OR-7432) and verify its truth table.	**CO 2**
7	Implementation of 4-bit Parallel adder using 7483 IC and verify the outputfor the given inputs. A = 1011, B = 1001 A = 0011, B = 0010	**CO2**
8	Implementation of 2:4 Decoder, 1:4 Demultiplexer using Logic Gates (NOT gate- 7404, AND gate- 7408) and verify its truth table.	**CO2**
9	Implementation of 4:2 Encoder , 4 : 1 multiplexer using logic gate (OR gate-7432) and verify its truth table.	**CO2**
10	Implement and verify F (A, B, C) = ∑ (3, 5, 6, 7) using 8:1 multiplexer. 4:1 multiplexer.	**CO 2**
11	Implement 2 Bit magnitude comparator using logic gates and verify the truthtable.	**CO 2**
12	Verification of truth table of flip-flop using NAND gate (7400) & NOR gates (7402).	**CO 3**

	RS Flip Flop JK Flip Flop D Flip Flop T Flip Flop	
13	Implement D flip flop using SR flip flop and verify the truth table.	**CO 3**
14	Design and implement 4-bit ring counter using D flip flop and verify the result.	**CO 3**
15	Design MOD 5 asynchronous counter using T flip flop and verify the truth table.	**CO 4**
16	Design MOD 5 synchronous counter using T flip flop and verify the truth table.	**CO 4**
17	Realize the following: Design Mod – N Synchronous Up Counter & Down Counter using 7476 JK Flip-flop Mod-N Counter using IC7490 / 7476 Synchronous counter using IC74192	**CO 4**
18	Design Pseudo Random Sequence generator using 7495.	**CO4**

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Branch- B.TECH. (CSE/IT/CSE(R)/AI/AIML/DS/CYS/IOT/CS/EC/ME/BT)/M. Tech (Int.)

L-T-P [2-0-0] **Credit: NA**

Subject Code- BNC0301/BNC0401

Subject Name- Artificial Intelligence and Cyber Ethics

Pre-requisite of Subject: Basic understanding of computer systems and ethics.

Course Objective- The course aims to foster critical thinking about ethical issues, promote responsible use of technology, and ensure students can identify, analyze, and address ethical dilemmas in AI and cyber domains.

Course Outcome – After completion of this course students are able to:

CO1 - Learn key principles of AI ethics, summarizing ethical considerations and applications in AI development and deployment.

CO2- Apply policies and framework for Fairness in AI and Machine Learning.

CO3- Apply privacy and security concepts, risk management and regulatory compliance in the field of AI and Cyber Security.

CO4- Understand the nature of cybercrimes, the principles of intellectual property rights (IPR), and the legal measures necessary to address and prevent these issues.

CO5- Describe the impact of AI in Society, employment and workforce.

Course Content

Unit No	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping
Unit 1	**An overview to AI Ethics**	Definition of AI. Ethical principles in AI. Sources of AI data. Legal implications of AI security breaches, Privacy and AI regulations. Key Principles of responsible AI, transparency and accountability, Dual-use dilemma, Human-centric design. Introduction to Cyber Laws and Ethics, Historical development of cyber laws, Legal frameworks.	Lecture and Case studies	5	Assignment	**CO1**
Unit 2	**Fairness and Favoritism in Machine Learning**	Introduction to Fairness and Bias in AI, Types of Fairness and Bias. Impact of Bias and Fairness in AI, techniques for measuring Fairness and Bias. Techniques for mitigating bias. Current policies and frameworks for fairness in AI. Bias in data collection, Fairness in data processing. Generative AI, Types of Bias in Generative AI.	Lecture and Case studies	6	Assignment	**CO2**
Unit 3	**AI Ethics and Cybersecurity Principles**	Importance of privacy and security in AI, AI specific security tools and software, privacy-preserving machine learning (PPML) and privacy-preserving data mining (PPDM) Ethical considerations in phases of AI development life cycle, **Risk management**: Risk assessment and incident response **Regulatory compliance**: GDPR, HIPAA **Case studies:** Implementation of AI ethics guidelines and best practices in engineering projects, Ethical decision-making processes and tools for engineers working with AI technologies	Lecture and Case studies	8	Assignment	**CO3**
Unit 4	**Cybercrimes, IPR and Legal Measures**	Types of cybercrimes and their impact, Legal measures for cybercrime prevention and prosecution. IPR: Copyrights, trademarks, patents, and trade secrets, Ethical implications of intellectual property, Cyber security and privacy issues	Lecture and Case studies	5	Assignment	**CO4**

Unit 5	**AI Contribution to Social Evolution**	Positive and negative political impacts of AI, Role of AI in social media and communication platforms, AI-generated content and deepfakes, Applications of AI in addressing global challenges, Key technical stakeholders in AI deployment: developers, researchers, policymakers, Technical Impacts on Employment and Workforce: Automation technologies: robotic process automation (RPA), autonomous systems	Lecture and Case studies	6	Assignment	**CO5**

References-

Text Books:

1. Introduction to Information Security and Cyber Laws, Simplified Chinese Edition by Surya Prakash Tripathi, Ritendra Goel, 1 January ,2014

2. AI ETHICS: Paving the Path for Responsible Machine Learning, Shivanand Kumar, 2014

Reference Books:

1. AI ETHICS (The MIT Press Essential Knowledge series), by Mark Coeckelbergh, 2018

2. Computers, Internet and New Technology Laws by Karnika Seth – by Karnika

Links:

Unit 1 https://www.youtube.com/watch?v=VqFqWIqOB1g

Unit 2: https://www.youtube.com/watch?v=hVJqHgqF59A

Unit 3: https://www.youtube.com/watch?v=O5RX_T4Tg24

Unit 4: https://www.youtube.com/watch?v=RJZ0pxcZsSQ

Unit 5: https://www.youtube.com/watch?v=I9FOswjTSGg

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Subject Name: ENGINEERING MATHEMATICS-IV		**L-T-P [3-1-0] Credit: 4**
Subject Code: BAS0402	**Applicable in Department: CSE/CS/IT/CSE-R/M.Tech.(Int.)(CSE)/IOT/ECE**	
Pre-requisites of the Subject: Knowledge of Mathematics I and II of B. Tech or equivalent.		
Course Objective- The objective of this course is to familiarize the students with statistical techniques. It aims to present the students with standard concepts and tools at an intermediate to superior level that will provide them well towards undertaking a variety of problems in the discipline.		
Course Outcome (CO)		
Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting.	K1, K2
CO 2	Apply the concept of hypothesis testing and statistical quality control to create control charts.	K1, K3
CO 3	Remember the concept of probability to evaluate probability distributions.	K1
CO 4	Understand the concept of Mathematical Expectations and Probability Distribution**.**	K2
CO 5	Solve the problems of Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat & Stream, Analogy.	K3
Syllabus		

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical / Assignment/ Lab Nos	CO Mapping
Unit 1	**Statistical Techniques-I**	Introduction: Measures of central tendency: Mean, Median, Mode, Moment, Skewness, Kurtosis, Curve Fitting, Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves, Correlation and Rank correlation, Linear regression, nonlinear regression and multiple linear regression	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment -1**	CO1
Unit 2	**Statistical Techniques-II**	Testing a Hypothesis, Null hypothesis, Alternative hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, Z-test, t-test and Chi-square test, F-test, One way ANOVA. Statistical Quality Control (SQC), Control Charts, Control Charts for variables (Mean and Range Charts), Control Charts for Variables (p, np and C charts).	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-2**	CO2
Unit 3	**Probability and Random Variable**	Random Variable: Definition of a Random Variable, Discrete Random Variable, Continuous Random Variable, Probability mass function, Probability Density Function, Distribution functions. Multiple Random Variables: Joint density and distribution Function, Properties of Joint Distribution function, Marginal density Functions, Conditional Distribution and Density, Statistical Independence, Central Limit Theorem (Proof not expected).	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-3**	CO3
Unit 4	**Expectations and Probability Distribution**	Operation on One Random Variable – Expectations: Introduction, Expected Value of a Random Variable, Mean, Variance, Moment Generating Function, Binomial, Poisson, Normal, Exponential distribution.	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-4**	CO4
Unit 5	**Aptitude-IV**	Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat & Stream, Sitting arrangement, Analogy.	Class room Teaching, Smart Board, PPT, M- tutor.	8	**Assignment-5**	CO5
Total				**40**		

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA

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SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Name: Technical Communication **L-T-P [2-1-0]** **Credit: 3**

Subject Code: BASL0401

Applicable in Department: CSE, CSE (R), IT, DS, IoT, AI, AIML, CS, BT, EC, CYS, & ME

Pre-requisite of Subject: B2 (CEFR level) in the Core Skills test; B1/B2 in the Speaking and Writing tests

Course Objective: To develop communication and critical thinking skills necessary for succeeding in the diverse and ever-changing workplace of the twenty first century and help the students communicate effectively, creatively, accurately, and appropriately.

Course Outcome (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Comprehend the principles and functions of technical communication.	K2
CO2	Write for a specific audience and purpose to fulfil the provided brief.	K5
CO3	Identify and produce different kinds of technical documents.	K2, K3
CO4	Apply effective speaking skills to efficiently carry out official discourses.	K3
CO5	Demonstrate understanding of communication through digital media.	K5

Syllabus

Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical/ Assignment/ Lab Nos**	**CO Mapping**
1	**Introduction to Technical Communication**	Definition, Process, Types, Levels, Flow and Barriers to Technical Communication with emphasis on cultural differences and gender sensitivity. Gender-neutral language. Need for and Importance of Technical Communication -	Interactive & Flipped classroom method	5	Assignment 1	CO1

			Significance of audience in technical communication Tone- Formality and Informality				
Textbooks							
Sr No		**Book Details**					
2	**1**		Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, 4th Edition, Oxford University Press, 2023, New Delhi.				
	1.						
Reference Books							
Sr No		**Book Details**					
4	1		Technical Communication: A Practical Guide by William S. Pfeiffer and Kaye A. Adkins, Pearson, 2020, UK.				
	2		The Essentials of Technical Communication by Elizabeth Tebeaux and Sam Dragga, Oxford University Press, 2021, UK.				
	3		Technical Communication Today by Richard Johnson-Sheehan, Pearson, 2020, UK				
5	4		Strategic Communication in Technical Professions" by Susan K. Miller-Cochran and Jason Thaiss, Routledge, 2020, UK.				
	5		Technical Writing for Engineers & Scientists by Michelle V. Z. Holmes, McGraw Hill, 2020, US.				
Total	6		**Speaking: Second Language Acquisition, from Theory to Practice by William Littlewood, 36** Cambridge University Press, 2022, UK.				
	7		**The Writing Revolution: A Guide to Advancing Thinking Through Writing in All Subjects and Grades by Judith C. Hochman and Natalie Wexler, Jossey-Bass, 2022, USA.**				

	Technical Writing		letters/emails Types and format, Content Organization Cultural Variety, Tone, and Intention Bad news message, good news message Advertisements, Editorial press releases Notices, agenda, and minutes of meeting Job application, CV and Resume’	Interactive & Flipped classroom method	10	Assignment 2	CO2
	Technical Writing		Technical reports – types & formats Structure of a report (Lab Reports) Ethical Writing Case Editing Performance Technical/ Scientific paper writing				
	Public Speaking		Components of effective speaking, Seminar and conference presentation Conducting/ participating in meetings Appearing for a job interview	Interactive sessions, activities, mock interviews	8	Assignment 4	CO4
	Virtual/Remote Communication		Understanding remote work – using different online platforms Virtual etiquette- email ids, usernames Developing online written correspondence- blogs, WhatsApp, LinkedIn. What not to write on social media. Participating in online Conferences/seminars/meetings Mobile Etiquette	Interactive sessions, activities	8	Assignment 5	CO5

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Subject Name: Analog and Digital Communication	**L-T-P [3-0-0]**	**Credit: 3**
Subject Code: BEC0401	**Applicable in Department: ECE**	
Pre-requisite of Subject: Basis knowledge of Communication System.		
Course Objective: This course is Fundamentals of amplitude modulation (AM) and angle modulation and demodulation techniques and its application. Fundamentals of amplitude modulation (AM) and angle modulation and demodulation techniques and its application. The performance of a digital communication system in presence of noise in terms of the signal-to-noise ratio and bit-error-rate and the concept of spread spectrum communication system. The concept and basics of information theory and the basics of source and channel coding/decoding. The performance of error detection & correction using different coding schemes in digital communication.		
Course Outcome(CO):		

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level (KL)**
CO1	Explain various modulation and demodulation methods of Amplitude Modulation and Angle Modulation.	K1, K2
CO2	Implement various digital modulation techniques.	K2, K3
CO3	Analyze the effect of noise and explain the concept of spread spectrum communication system.	K2, K4
CO4	Analyze the effect of noise and explain the concept of spread spectrum communication system.	K3,K4
CO5	Characterize error-control codes and apply the encoding and decoding processes.	K4, K5

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	**Analog Modulation**	Introduction to Communication system, Need for modulation, Amplitude Modulation and Demodulation, Angle Modulation: Frequency and Phase Modulation and Demodulation, Frequency Division Multiplexing (FDM).	Lecture, Numerical Discussion, Hands-on Exercises, Demo, Hands-on Lab	8	Assignment/Practical 1 to 2 /Quizzes	CO1
2	**Digital Modulation**	Sampling Theorem, Pulse Code Modulation (PCM), Time Division Multiplexing (TDM) **Digital Communication System:** Line coding, Binary ASK, FSK & PSK Modulation and Demodulation, Differential phase shift keying (DPSK), Quadrature phase shift keying (QPSK).	Lecture, Numerical Discussion, Hands-on Exercises, Demo, Hands-on Lab	8	Assignment/Practical 3 to 10 /Quizzes	CO2
3	**Digital Receiver**	Noise, Signal to Noise Ratio (SNR), Figure of Merit, Noise Figure. Concept of Matched Filters, BER analysis of BASK, BFSK, BPSK. **Spread Spectrum Communication**: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).	Lecture, Numerical Discussion, Hands-on Exercises, Demo, Hands-on Lab	8	Assignment/Practical11 to 13 /Quizzes	CO3
4	**Information theory**	Measure of information: Information, Entropy; Types of Channels, Source encoding: Shannon Fano Coding, Huffman Coding, Capacity of Additive White Gaussian Noise (AWGN) Channel: Shannon Hartley Law	Lecture, Numerical Discussion, Hands-on Exercises, Demo, Hands-on Lab	8	Assignment/Practical 14 to 15/Quizzes	CO4
5	**Error correcting codes**	Error Correcting codes: hamming sphere, hamming distance and hamming bound, relation between minimum distance and error detecting and correcting capability, Linear block codes: encoding and syndrome decoding. Convolution coding and decoding.	Lecture, Numerical Discussion, Hands-on Exercises, Demo, Hands-on Lab	8	Assignment/Practical 16/Quizzes	CO5
Total				**40**		

Textbooks	
Sr No	**Book Details**
1.	Herbert Taub and Donald L. Schilling, “Principles of Communication Systems”, Tata McGraw Hill.
2.	B.P. Lathi, “Modern Digital and Analog communication Systems”, 4th Edition, Oxford University Press,2010.
Reference Books	
Sr No	**Book Details**
1.	Simon Haykin, “Communication Systems”, 4th Edition, WileyIndia.
2.	H.P.Hsu& D. Mitra “Analog and Digital Communications”, 2nd Edition, Tata McGraw- Hill.
Links (Only Verified links should be pasted here)	
Unit 1	https://www.youtube.com/channel/UCnWGGUyQOZkXylsoI5w-J4Q https://youtu.be/UznnkHMisIk
Unit 2	https://nptel.ac.in/courses/117/101/117101051/ https://www.youtube.com/watch?v=m4sjTt7rhow&feature=youtu.be https://youtu.be/ZW1glqkIgcw
Unit 3	https://www.youtube.com/watch?v=DVehz1WW_dA&feature=youtu.be https://www.youtube.com/watch?v=XkpdX6j9p2I&feature=youtu.be https://youtu.be/yWWfKrbMRUs
Unit 4	https://youtu.be/7fzzg0xgNrk
Unit 5	https://youtu.be/AcgGdaRArX4

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SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Name: CMOS Digital Integrated Circuit **L-T-P [3-0-0]** **Credit: 3**

Subject Code: BEC 0403 **Applicable in Department: ECE**

Pre-requisite of Subject: Basis knowledge of MOSFET and Digital Electronics

Course Objective: The students will learn about the basics of MOS device, CMOS fabrication steps, CMOS characteristics. They will learn to apply the knowledge of basic CMOS cell to implement and design combinational and sequential circuits and will understand the concepts of dynamic CMOS logics and semiconductor memories. Students will also be introduced with the concept of FPGA implementation of all the logics covered during the full course

Course Outcome (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Use the basics of MOS device and define CMOS fabrication steps.	K1
CO2	Explain CMOS inverter and its switching characteristics.	K3
CO3	Design of Combinational and Sequential MOS logic circuits.	K4
CO4	Explain and design dynamic logic circuits.	K4
CO5	Describe the concept of semiconductor memories and ASIC.	K4

Syllabus

Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical/ Assignment/ Lab Nos**	**CO Mapping**
I	VLSI Design Flow and CMOS fabrication	VLSI Design flow: VLSI Design flow & Y-Chart, MOS Transistor Basic, MOS switch, Basic MOS Device design equation, MOSFET capacitances, Parasitic capacitances, latch-up, Second order effects. Fabrication Process Flow: Basic Steps, The CMOS n-Well Process,SOI.	TLM/Workshop/PPT	7L	Assignment	CO1

II	CMOS inverter and Switching Characteristics	**CMOS inverter:** Circuit operation, DC transfer characteristics, Noise margin: calculation of VIL, VIH, Vth, Design of CMOS inverter, Supply voltage scaling, Device sizing. **Switching characteristic:** Delay time definition, calculation of delay times, inverter design with delay constraints, Power dissipation of CMOS inverter.	TLM/Workshop/PPT	8L	Assignment	CO2
III	Combinational and sequential MOS logic circuits	**Combinational MOS Logic Circuits:** Complex Logic circuits design – Realizing Boolean expressions using CMOS gates, AOI and OAI gates, Design of Half Adder, Full Adder, Multiplexers, Demultiplexers using CMOS. **Sequential MOS Logic Circuits:** Behaviour of bi-stable elements, D latch, SR Latch, Clocked latch and flip flop circuits, CMOS, and edge triggered flip-flop.	TLM/Workshop/PPT	8L	Assignment	CO3
IV	Dynamic logic Circuits	**Dynamic Logic:** CMOS Domino Logic, Domino Logic , charge sharing problem , Pass-Transistor Logic, Synchronous dynamic circuit techniques, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS. Clocking issues, clock distribution.	TLM/Workshop/PPT	8L	Assignment	CO4
V	Introduction to Semiconductor memories and ASIC	Semiconductor Memories: Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash. Introduction of Application Specific Integrated Circuit (ASIC) Design Flow: An overview of Backend VLSI Design Flow – Libraries, Floorplanning, Placement, Routing, Verification, Testing, Design Rule, Micron Rules, Lambda rules of the design and design rule check, Fabrication methods of circuit elements, Layout design of different cells.	TLM/Workshop/PPT	9L	Assignment	CO5
Total				**40L**		

Text books	
Sr No	**Book Details**
1.	Kang, Leblebici, “CMOS Digital Integrated Circuits”, TMH, 3rd Edition.
2.	Rabat, Chandrakasan and Nikolic, “Digital Integrated Circuit: A Design Perspective”, PHI; Latest Edition.
3.	Weste and Eshraghian, “Principles of CMOS VLSI Design” Addison Wesley, Latest Edition.

Reference Books	
Sr No	**Book Details**
1.	Weste and Harris, “CMOS VLSI Design”.
2.	Bushnell and Agrawal, “Essentials of VLSI Testing for digital, memory and mixed-signal VLSI Circuits”, Kluwer Academic Publishers.

Links (Only Verified links should be pasted here)
https://onlinecourses.nptel.ac.in/noc20_ee29/preview https://www.youtube.com/watch?v=MuBiC9yz2fc https://nptel.ac.in/courses/108/106/108106158 https://www.youtube.com/watch?v=UuafwIJAKhY

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Subject Name: MICROPROCESSOR AND MICROCONTROLLER	**L-T-P [2-0-0]**	**Credit: 2**
Subject Code: BEC0402	**Applicable in Department: ECE**	
Pre-requisite of Subject: Basics of digital electronics		

Course Objective: **Students will learn about:**

- The fundamentals of general microprocessor & microcontroller.
- To Describe the architecture & organization of 8086 Microprocessor.
- The architecture of 8051 microcontrollers with real time application.
- The fundamentals of ARM Processor and embedded systems.
- The knowledge of ARM Instruction Set for programming

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO1	Explain the fundamentals of general microprocessor & microcontroller.	K2
CO2	Explain the architecture & organization of 8086 Microprocessor	K5
CO3	Implement 8051 microcontroller for designing various applications.	K3
CO4	Illustrate the fundamentals of ARM Cortex M0 Processor	K4

CO5	Apply the knowledge of ARM Instruction Set for programming					K4
Syllabus						
Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical / Assignment/ Lab Nos**	**CO Mapping**
I	**Basics of Microprocessor and microcontrollers**	History and Evolution of Microprocessor and microcontrollers, Computer architecture: Harvard & Von Neumann architecture, RISC & CISC architecture, Different Layers of computer architecture, Buses, types of buses, bus architecture, Microprocessor architecture and its operations, address and data bus Multiplexing and Demultiplexing, Instruction format and size.	Lecture, Hands-on Exercises, Demo, Hands-on Lab	8+0	Assignment/Quizzes	CO1
II	**Introduction to 8086**	Microprocessor architecture, Pipelining Concept, Memory Segmentation, General Purpose Registers, Pointer and Index Registers, Flag Register, Bus Interface Unit, 8086 Pin Description, addressing modes, Instruction set and assembler directives, 8086 Interrupt -Software and Hardware Interrupts.	Lecture, Hands-on Exercises, Demo, Hands-on Lab	8+10	Assignment/Practical 1 TO 5/Quizzes	CO2
III	**Introduction to 8051**	Overview of the 8051, Inside the 8051, Addressing modes, 8051 data types and directives, Instruction set and assembly language programming of 8051 microcontrollers, Programming the 8051 timers, Interfacing of I/O devices (keypad & display) with 8051. Application of 8051microcontroller	Lecture, Hands-on Exercises, Demo, Hands-on Lab	8+8	Assignment/Practical 6 to 9/Quizzes	CO3
IV	**ARM Processor-1**	Arm Processor Families, Arm Cortex-M Series Family, Cortex-M0 Processor: Cortex-M0 Overview, Cortex-M0 Block Diagram, Cortex-M0 Three-stage Pipeline, Cortex-M0 Registers, Cortex-M0 LR, Cortex-M0 PSRs, Cortex-M0 Memory Map, Cortex-M0 Executable Memory Space, Cortex-M0 Device Memory Space, Cortex-M0 Private Peripheral Bus, Cortex-M0 Reserved Memory Space, Cortex-M0 Memory Map Example, Cortex-M0 Endianness	Lecture, Hands-on Exercises, Demo, Hands-on Lab	8+0	Assignment/Practical /Quizzes	CO4
V	**ARM Processor-2**	Thumb Instruction Set, Thumb-2 Instruction Set, Cortex-M0 Instruction Set, Register Access: The Move Instruction, Memory Access: The LOAD Instruction, The STORE Instruction, Stack Access: PUSH and POP, Arithmetic instructions (ADD, SUB, MUL, CMP), Logic	Lecture, Hands-on Exercises, Demo, Hands-on Lab	8+4	Assignment/Practical 10to 11/Quizz	CO5

		Operation, Arithmetic Shift Operation, Logical Shift Operation, Rotate Operation, Reverse Ordering Operation, Sleep Mode Related Instructions, CortexM0 Low Power Features: Sleep Mode, Sleep-on-Exit Feature, How to Enable Sleep Features, Processor Wakeup Conditions, Wakeup Interrupt Controller, Enter and Exit Deep Sleep Mode			es	
Total				**40+22**		

Textbooks	
Sr No	**Book Details**
1.	Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2	Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill
Reference Books	
Sr No	**Book Details**
1	Ray A K , Bhurchandi K M , "Advanced Microprocessors and Peripherals", TMH.
Links (Only Verified links should be pasted here)	
Unit 1	https://www.youtube.com/watch?v=xBYhHC8_A6o
Unit 2	https://www.youtube.com/watch?v=cNN_tTXABUA
Unit 3	https://www.youtube.com/watch?v=sLW1TptEJBQ
Unit 4	https://www.youtube.com/watch?v=9zOo4JkZgSI
Unit 5	https://www.youtube.com/watch?v=pphUIgjvqJ8

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Subject Name: Verilog - HDL Simulation and Synthesis **L-T-P [0 0 6]** **Credit: 3**

Subject Code: BEC0454 **Applicable in Department: ECE**

Pre-requisite of Subject: Basics of Digital System Design and basics of any programming language.

Course Objective: The course will introduce the participants to the Verilog hardware description language. It will help them to learn various digital circuit modeling issues using Verilog, writing test benches, and some case studies.

:omes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Develop and identify the suitable abstraction level for a particular digital design.	K4
CO2	Develop Verilog codes in gate, dataflow (RTL) modeling levels of abstraction.	K4
CO3	Develop Verilog codes in behavioral (RTL) modeling levels of abstraction.	K4
CO4	Design and verify the functionality of digital circuit/system using test benches.	K4
CO5	Design and simulate basic modules using system Verilog.	K4

Syllabus

Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required**	**Practical/ Assignment**	**CO Mapping**

				(L+P)	**/ Lab Nos**	
1	**Overview of Digital Design with Verilog HDL** **Hierarchical Modeling Concepts** **Basic Concept** **Modules and Ports**	Evolution of CAD, emergence of HDLs, typical HDL-flow, trends in HDLs, Verilog vs VHDL, Verilog coding vs Software Programming. Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block. Lexical conventions, data types: value set, registers, vectors, arrays, strings, system tasks, compiler directives. Module definition, port declaration, connecting ports, hierarchical name referencing	Workshop/ PPT	(15=4+11)	Practical 1/Assignment	CO1
2	**Gate-Level Modeling** **Dataflow Modeling**	Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays. Continuous assignments, delay specification, expressions, operators, operands, operator types.	Workshop/ PPT	(15=4+11)	Practical 2 to 7/Assignment	CO2
3	**Behavioral Modeling**	Structured procedures, initial and always, blocking and non-blocking statements, delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks.	Workshop/ PPT	(20=8+12)	Practical 8 to 16/Assignment	CO3
4	**Advance Verilog Topic**	Timing and Delays, Switch-Level Modeling, Logic Synthesis with Verilog HDL, Specify block and Timing checks, Verification and Writing test benches, Timing Analysis of Logic circuits, Downloading of verilog code in FPGA and CPLD.	Workshop/ PPT	(20=3+17)	Practical 17 to 20 /Assignment	CO4
5	**Introduction to System Verilog**	Origins, Overview, Need and Importance, System Verilog Declaration Spaces, Data types, Arrays , structure, union, Procedural Blocks and Statements, Task and function, Introduction to Verification.	Workshop/ PPT	(20=8+12)	Practical 21 to 25/Assignment	CO5
Total				**90**	**25**	

Lab Experiments

Sr No	Program Title	CO Mapping
1	Simulate and synthesize following logic gates using gate level modeling AND Gate OR Gate NOT Gate EX-OR Gate NAND Gate NOR Gate	**CO1**
2	Simulate and synthesize following combinational circuits using gate level modeling Half adder Full adder Half subtractor Full subtractor 4:1 Multiplexer 4:2 Encoder 1:4 Demultiplexer 2:4 Decoder 1 Bit Comparator 2*2 Bit Multiplier	**CO2**
3	Simulate and synthesize binary to gray code converter using gate level modeling. Simulate and synthesize gray to binary code converter using gate level modeling.	**CO 2**
4	Simulate and synthesize following combinational circuits using data flow modeling Half adder Full adder Half subtractor Full subtractor 4:1 Multiplexer 4:2 Encoder 1:4 Demultiplexer 2:4 Decoder	**CO 2**

<table>
<tr><td></td><td>1 Bit Comparator
2*2 Bit Multiplier</td><td></td></tr>
<tr><td>5</td><td>Simulate and synthesize 4 bit parallel adder/subtractor using data flow modeling.</td><td>CO 2</td></tr>
<tr><td>6</td><td>Simulate and synthesize following ALU operations using data flow modeling

<table><tr><th>OPCODE</th><th>ALU Operation</th></tr><tr><td>1.</td><td>A+B</td></tr><tr><td>2.</td><td>A-B</td></tr><tr><td>3.</td><td>A Complement</td></tr><tr><td>4.</td><td>A*B</td></tr></table></td><td>CO 2</td></tr>
<tr><td>7</td><td>Simulate and synthesize binary to gray code converter using data flow modeling.
Simulate and synthesize gray to binary code converter using data flow modeling.</td><td>CO 2</td></tr>
<tr><td>8</td><td>Simulate and synthesize following flip flops using behavioral modeling

SR Flip Flop
JK Flip Flop
D Flip Flop

T Flip Flop</td><td>CO3</td></tr>
<tr><td>9</td><td>Simulate and synthesize flip flops using behavioral modeling

Using positive edge and negative edge.
Using synchronous and asynchronous reset</td><td>CO3</td></tr>
<tr><td>10</td><td>Simulate and synthesize following shift registers using behavioral modeling
Serial input serial output
Serial input parallel output
Parallel input serial output
Parallel input parallel output</td><td>CO3</td></tr>
<tr><td>11</td><td>Simulate and synthesize following universal shift register using behavioral modeling</td><td>CO3</td></tr>
<tr><td>12</td><td>Simulate and synthesize following counters using behavioral modeling

2 Bit Counter</td><td>CO3</td></tr>
</table>

	Mod 5 Counter Decade Counter Ring Counter Johnson Counter	
13	Simulate and synthesize array multiplier using behavioral modeling	**CO3**
14	Simulate and synthesize 4:1 MUX by using 2:1 MUX Using a wire Using a reg	**CO3**
15	Simulate and synthesize Moore sequence 1010 1011	**CO3**
16	Simulate and synthesize Mealy sequence 1010 1011	**CO3**
17	Implementation of logic gates on an FPGA and verify gates functionality.	**CO 4**
18	Implementation of 4:1 multiplexer on a FPGA	**CO 4**
19	Implementation of 2*2 multiplier on a FPGA	**CO 4**
20	Implementation of D flip flop on a FPGA	**CO 4**
21	Design and simulation of logic gates.	**CO 5**
22	Design and simulation of 2:1 MUX Using assign statement Using if statement Using case statement	**CO 5**
23	Design and simulation of priority encoder.	**CO 5**
24	Design and simulation of D latch.	**CO 5**
25	Design and verify a simple single port RAM.	**CO 5**
Required Software and Tools (Any one)		

ISE Simulator (Xilinx) / Xilinx Vivado
Verilog-XL (Cadence)
VCS ('big 3') (Synopsys)

Textbooks

Sr No	Book Details
1.	Samir Palnitkar, ―Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, Second Edition.
2.	Fundamentals of Digital Logic with Verilog Design by Stephen Brown and Zvonko Vranesic
3.	A VHDL Primer by John Bhasker.
4.	Kevin Skahill, ―VHDL for Programmable Logic‖, PHI/Pearson education, 2006.

Reference Books

Sr No	Book Details
1.	Donald E. Thomas, Philip R. Moorby, ―The Verilog Hardware Description Language‖, Springer Science+Business Media, LLC, Fifth edition.
2.	Michael D. Ciletti, ―Advanced Digital Design with the Verilog HDL‖ Pearson (Prentice Hall), Second edition.
3.	Padmanabhan, Tripura Sundari, ―Design through Verilog HDL‖, Wiley, 2016 or earlier.

Links (Only Verified links should be pasted here)

Unit 1:

https://www.youtube.com/watch?v=NCrlyaXMAn8&list=PLJ5C_6qdAvBELELTSPgzYkQg3HgclQh-5

https://www.youtube.com/watch?v=NdWTDZ7dg-8&list=PLJ5C_6qdAvBELELTSPgzYkQg3HgclQh-5&index=2 https://www.youtube.com/watch?v=9uw25PU5B3k&list=PLJ5C_6qdAvBELELTSPgzYkQg3HgclQh-5&index=3 https://www.youtube.com/watch?v=f_6fMjOI_Co&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=2 https://www.youtube.com/watch?v=ie3xUHV5Z58&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=3 https://www.youtube.com/watch?v=MNB6R6yB3M8&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=4
Unit 2: https://www.youtube.com/watch?v=twQ-KJzKZ6g&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=12 https://www.youtube.com/watch?v=nppeLcU8iZM&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=13
Unit 3: https://www.youtube.com/watch?v=jbH9Jdhr8MQ&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=14 https://www.youtube.com/watch?v=oVxnVmw7fco&list=PLFXvEi07abL3LEnEDHdC6jl3Z18Rnt8WX&index=10 https://www.youtube.com/watch?v=7rtJdRez_C8&list=PLFXvEi07abL3LEnEDHdC6jl3Z18Rnt8WX&index=11
Unit 4: https://www.youtube.com/watch?v=q3-MgvR80pU&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=15 https://www.youtube.com/watch?v=5ejRluS5YRk&list=PL_3xKnVkfI2hB9gBEsv5QGB4LRscGAQl9&index=17

NIET Greater Noida Autonomous Institute	**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA** **(AN AUTONOMOUS INSTITUTE)** **SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING**

LAB NAME: MICROPROCESSOR AND MICROCONTROLLER LAB	**L-T-P [0 0 4]**	**Credit: 2**
LAB CODE: BEC0452	**Applicable in Department: ECE**	

Lab Experiments:

Course Objective: **The students will learn about**

The Microprocessors and Microcontrollers laboratory course assists students in developing their understanding of processor architecture and programming abilities.
8086 Microprocessor for writing assembly level language.
ARM Instruction Set for writing program.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Apply the knowledge of 8086 Microprocessor for writing assembly level language.	K2
CO2	Analyze the interfacing of various I/O devices with programming.	K5
CO3	Implement timer in 8051 microcontrollers for generating waveforms.	K3
CO4	Apply the knowledge of ARM Instruction Set to write the program for given application.	K4

List of Practicals

Sr No	**Program Title**	**CO**

		Mapping
1.	To study 8086 microprocessor system.	**CO2**
2.	Write a program using 8086 Microprocessor for Hexadecimal addition of two 8-bit Numbers.	**CO2**
3.	Write a program using 8086 Microprocessor for Hexadecimal subtraction of two 8-bit Numbers.	**CO2**
4.	Write a program using 8086 Microprocessor for Hexadecimal addition/subtraction of two 16-bit Numbers.	**CO2**
5.	To perform multiplication of two 8-bit numbers using 8086.	**CO2**
6.	Write a program of flashing LED connected to port 1 of the 8051 Microcontroller.	**CO3**
7.	Write a program to generate 10 kHz square wave using 8051 Microcontroller.	**CO3**
8.	Write a program to show the use of INT0 and INT1 of 8051 Microcontroller.	**CO3**
9.	Write a program to generate a Ramp waveform of 1 KHz using DAC with 8051 micro controller.	**CO3**
10.	To write and simulate ARM assembly language programs for data transfer, arithmetic and logical operations (Demonstrate with the help of a suitable program).	**CO5**
11.	To write and simulate C Programs for ARM microprocessor using KEIL software. (Demonstrate with the help of a suitable program)	**CO5**
Required Software and Tools		
1. 8086 Microprocessor Kit 2. 8051 Microcontroller 3. KEIL software		

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LAB NAME: Analog and Digital Communication Lab	**L-T-P [0 0 4]**	**Credit: 2**
LAB CODE: BEC0451	**Applicable in Department: ECE**	

Course Objective: The student will learn about amplitude modulation (AM) and frequency modulation (FM) along with their demodulation. They will develop the skills to analyse Pulse Code Modulation (PCM) and understand line coding schemes in digital communication. Course also covers the practical aspects of digital communication systems with the learning of the MATLAB software.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Demonstrate and perform amplitude modulation (AM), frequency modulation (FM) and its demodulation.	K1, K2
CO2	Demonstrate and perform Pulse Code Modulation (PCM).	K2, K3
CO3	Encode and decode digital data into different data formats.	K2, K4
CO4	Perform digital modulation techniques.	K4, K5
CO5	Analyse convolutional code using MATLAB.	K4, K5

List of Practicals

S.No	Program Title	CO Mapping
1	Demonstrate amplitude modulation by using balance modulator (MC1496P) & demodulation by using linear diode detector with modulating frequency fm = 1 KHz - 3 KHz and carrier frequency fc = 20 KHz – 1 MHz. (i) Draw its output waveform (ii) Calculate Modulation Index (μ), Carrier Power (Pc) and Transmitted Power (Pt)	**CO1**
2	Demonstrate frequency modulation and demodulation (using PLL 565) with modulating frequency fm = 1 KHz and carrier frequency fc = 20 KHz – 1 MHz. (i) Draw its output waveform (ii) Determine frequency deviation (iii)Modulation index (β).	**CO1**
3	Perform and draw the output waveform of Pulse Code Modulation (PCM) and its demodulation with modulating frequency fm = 80 KHz.	**CO2**
4	Demonstrate and draw the output waveform with input code 10101010 for the Unipolar RZ & NRZ Line Coding.	**CO2**
5	Demonstrate and draw the output waveform with input code 10101010 for the Polar RZ & NRZ Line Coding.	**CO2**
6	Demonstrate and draw the output waveform with input code 10101010 for the Manchester line coding technique	**CO2**
7	Demonstrate Amplitude Shift Keying (ASK) modulator and demodulator using message signal 10101010 with carrier frequency fc = 20 kHz – 1MHz. (i) Draw and observe its output waveform (ii) Determine Energy per bit (Eb) (iii) Bandwidth (BW)	**CO2**
8	Demonstrate Frequency Shift Keying (FSK) modulator and demodulator for message signal 10101010 with carrier frequency fc = 940Hz. (i) Draw its output waveform (ii) Determine Energy per bit (Eb) for FSK (iii) Bandwidth (BW) for FSK	**CO2**
9	Demonstrate Phase Shift Keying (PSK) modulator and demodulator for message signal 10101010 with carrier frequency fc = 1.44MHz. (i) Draw its output waveform (ii) Determine Energy per bit (Eb) for PSK (iii)Bandwidth (BW) for PSK	**CO2**
10	Demonstrate Quadrature Phase Shift Keying (QPSK) modulator and demodulator for message signal 10101010 with carrier frequency fc = 960kHz. (i) Draw its output waveform (ii) Determine Energy per bit (Eb) for QPSK (iii) Bandwidth (BW) for QPSK	**CO2**

11	Calculation of BER of BASK using MATLAB.	**CO3**
12	Calculation of BER of BFSK using MATLAB.	**CO3**
13	Calculation of BER of BPSK using MATLAB.	**CO3**
14	Perform Huffman Coding for given symbols using MATLAB and calculate efficiency.	**CO4**
15	Perform encoder of (7, 4) Hamming code using MATLAB	**CO4**
16	Analysis and performance evaluation of convolutional codes using MATLAB for message code = [1 0 1 1]	**CO5**

Required Software and Tools

1. AM, FM, ASK, FSK, PSK Kits.

2. MATLAB software.

NIET Greater Noida	**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA** **(AN AUTONOMOUS INSTITUTE)** **SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING**

Technical Communication Lab	**L T P : [0 0 2]**	**Credit: 1**
Subject Code: BASL0451		
List of Practicals		

Lab No.	Topic	Program Logic Building	CO Mapping	Alignedwith university/industry/certifications
1	**Case Study Analysis**	The students will be able to develop their critical thinking and analytical skills.	CO1	AKTU/Industry
2	**Email Role Reversal: Writing and responding to emails in peer groups**	The students will practice writing and responding to professional emails.	CO2	AKTU/Industry
3	**Infographics – Data Analysis and Interpretation Task**	The students will develop their ability to decipher important information from charts, graphs, tables, and diagrams.	CO3	AKTU/Industry
4	**Document Redesign Challenge: Redesigning existing technical documents**	The students will develop their ability to write and edit professional documents.	CO3	AKTU/Industry

	to improve readability			
5	**Abstract Formulation and Referencing**	The students will be able to write research papers with proper source citations.	CO3	AKTU/Industry
6	**Case Study presentations**	The students will improve their analytical skills and by presenting improve their speaking skills.	CO4	AKTU/Industry
7	**Presentation on Project Report**	The students will develop professional speaking skills.	CO4	AKTU/Industry
8	**Ted talk simulation – summarising a Ted Talk**	The students improve their ability to condense speeches.	CO4	AKTU/Industry
9 & 10	**Mock Interviews**	The students will practice and enhance their interview skills.	CO4	AKTU/Industry
11 & 12	**Webinar Presentations/Online Interviews**	The students will improve their ability to make presentations in professional scenarios and perform well in online interviews.	CO5	Industry

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA

(AN AUTONOMOUS INSTITUTE)

SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Name: Environmental Science	**L-T-P [2-0-0]**	**Credit: NA**
Subject Code: BNC0302/BNC0402	**Applicable in Department: ECE/BIOTECH/CSE/IT**	

Pre-requisites of the Subject: Basic knowledge of nature.

Course Objective-

1. To help the students in realizing the inter-relationship between man and environment. and help the students in acquiring basic knowledge about environment.
2. To create positive attitude about environment among the student.
3. To develop the sense of awareness among the students about environment and its various problems.
4. To develop proper skill required for the fulfilment of the aims of environmental education and educational evaluations.
5. To develop the capability of using skills to fulfil the required aims, to realise and solve environmental problems through social, political, cultural and educational processes.

Course outcome (CO)

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level (KL)**
CO 1	Understand the basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem., food chains and food webs. Ecological pyramids	K2
CO 2	Understand the different types of natural recourses like food, forest, minerals and energy and their conservation	K2
CO3	Understand the importance of biodiversity, Threats of biodiversity and different methods of biodiversity conservation.	K2
CO 4	Understand the different types of pollution, pollutants, their sources, effects and their control methods	K3

CO 5	Understand the basic concepts of sustainable development, Environmental Impact Assessment (EIA) and different acts related to environment					K3
Syllabus						
Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical/ Assignment / Lab Nos**	**CO Mapping**
Unit 1	Basic Principle of Ecology	Definition, Scope and basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem. Food chains and food webs. Ecological pyramids, Energy flow in ecological systems, Characteristics of different ecosystems. Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Basic concepts of sustainable development, SDGs, Ecosystem services, UN Decade for Ecorestoration.	Samart Board/PPT	8	**Assignment**	CO1
Unit 2	Natural Resources and Associated Problems	Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Land resources: Land as a resource, land degradation, man induced landslides. Equitable use of resources for sustainable lifestyles. Non-Renewable Energy Resources: Fossil fuels and their reserves, Nuclear energy, types, uses and effects, Renewable Energy Resources: hydropower, Solar energy, geothermal, tidal and wind energy, Biomass energy, biogas and its advantages.	Samart Board/PPT	8	**Assignment**	CO2
Unit 3	Biodiversity Succession and Non-Renewable Energy Resources	Biodiversity and their importance, Threats to biodiversity, major causes, extinction's, vulnerability of species to extinction, IUCN threat categories, Red data book. Strategies for biodiversity conservation, principles of biodiversity conservation in-situ and ex-situ conservation strategies Mega diversity zones and Hot spots, concepts, distribution and importance. Succession: Concepts of succession, Types of Succession. Trends in succession. Climax and stability.	Samart Board/PPT	8	**Assignment**	CO3
Unit 4	Pollution and Solid Waste Management	Air pollution: sources of air pollution, Primary and secondary air pollutants. Origin and effects of SOX, NOX, Cox, CFC, Hydrocarbon, control of air pollution. Water pollution: sources and types of water pollution, Effects of	Samart Board/PPT	8	**Assignment**	CO4

		water pollution, Eutrophication, Soil pollution: Causes of soil pollution, Effects of soil pollution, Major sources of and effects of noise pollution on health, Radioactive and thermal pollution sources and their effects on surrounding environment. Solid waste disposal and its effects on surrounding environment, Climate change, global warming, acid rain, ozone layer depletion.				
Unit 5	Role of Community and Environmental Protection Acts	Role of community, women and NGOs in environmental protection, Bioindicators and their role, Natural hazards, Chemical accidents and disasters risk management, Environmental Impact Assessment (EIA), Salient features of following Acts: a. Environmental Protection Act, 1986, Wildlife (Protection) Act, 1972.b. Water (Prevention and control of pollution) Act, 1974.c. Air (Prevention and control of pollution) Act, 1981. Forest (Conservation) Act, 1980.d. Wetlands (Conservation and Management) Rules, 2017; e. Chemical safety and Disaster Management law. F. District Environmental Action Plan. Climate action plans	Samart Board/PPT	8	**Assignment**	CO5
Total				**40**		

Textbooks

1. Sodhi G.S. 2005, Fundamentals of Environmental Chemistry: Narosa Publishing House, New Delhi.

2.Dash, M.C. (1994), Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.

3.Sharma P. D. (1996). Environmental Biology, Rastogi Publications, Meerut.

4.Verma P.S. and V.K. Agarwal. (1985). Principles of Ecology. S. Chand and Company (Pub.), New Delhi

Reference Books

1.Principles of Environmental Sciences and Engineering -P. Venugoplan Rao, Prenitice Hall of India.

2.Environmental Science and Engineering Meenakshi, Prentice Hall India.

Links (Only Verified links should be pasted here)

Unit-1 https://www.youtube.com/watch?v=T21OO0sBBfc
Unit-2 https://www.youtube.com/watch?v=mOwyPENHhbc
Unit-3 https://www.youtube.com/watch?v=GK_vRtHJZu4
Unit-4 https://www.youtube.com/watch?v=7qkaz8ChelI
Unit-5 https://www.youtube.com/watch?v=ad9KhgGw5iA