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

Affiliated to

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

Evaluation Scheme & Syllabus

For

Bachelor of Technology

Electronics and Communication Engineering

Second Year

(Effective from the Session: 2023-24)

NOIDA INSTITUTE OF ENGG. & 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	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	AAS0301B	Engineering Mathematics-III	3	1	0	30	20	50		100		150	4
2	ACSE0303	Design Thinking-I	3	0	0	30	20	50		100		150	3
3	AEC0302N	Electronic Devices	3	0	0	30	20	50		100		150	3
4	AEC0301	Digital System Design	3	0	0	30	20	50		100		150	3
5	AEC0303	Signals, Systems and Networks	3	1	0	30	20	50		100		150	4
6	ACSE0307	Soft Computing	3	0	0	30	20	50		100		150	3
7	AEC0352	Electronic Devices Lab	0	0	2				25		25	50	1
8	AEC0351	Digital System Design Lab	0	0	2				25		25	50	1
9	AEC0353	Signals, Systems and Networks Lab	0	0	2				25		25	50	1
10	AEC0359	Internship Assessment-I	0	0	2				50			50	1
11	ANC0301 / ANC0302	Cyber Security / Environmental Science	2	0	0	30	20	50		50		100	
		MOOCs (For B.Tech. Hons. Degree)											
		GRAND TOTAL										**1100**	**24**

List of MOOCs (Coursera) 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	AMC0031	Data Structures	University of California San Diego	25	2
2	AMC0026	Design-Led Strategy: Design thinking for business strategy and entrepreneurship	The University of Sydney	20	1.5

PLEASE NOTE:-

- **Internship (3-4 weeks) shall be conducted during summer break after semester-II and will be assessed during semester-III**

- **Compulsory Audit Courses (Non Credit - ANC0301/ANC0302)**
  - All Compulsory Audit Courses (a qualifying exam) has no credit.
  - 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.

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Bachelor of Technology
Electronics and Communication Engineering
EVALUATION SCHEME
SEMESTER-IV

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	TOTAL	PS	TE	PE		
1.	AAS0402	Engineering Mathematics-IV	3	1	0	30	20	50		100		150	4
2.	AASL0401	Technical Communication	2	1	0	30	20	50		100		150	3
3.	AEC0401	Analog and Digital Communication	3	1	0	30	20	50		100		150	4
4.	AEC0402	Analog Circuits	3	0	0	30	20	50		100		150	3
5.	AEC0403	Internet of Things	3	0	0	30	20	50		100		150	3
6.	AEC0404	Microprocessor and Microcontroller	3	0	0	30	20	50		100		150	3
7.	AEC0451	Analog and Digital Communication Lab	0	0	2				25		25	50	1
8.	AEC0452	Analog Circuits Lab	0	0	2				25		25	50	1
9.	AEC0454	Microprocessor and Microcontroller Lab	0	0	2				25		25	50	1
10.	AEC0459	IoT Lab with Mini Project	0	0	2				50			50	1
11.	ANC0402 / ANC0401	Environmental Science/ Cyber Security	2	0	0	30	20	50		50		100	
12.		MOOCs (For B.Tech. Hons. Degree)											
		GRAND TOTAL										**1100**	**24**

List of MOOCs (Coursera) 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	AMC0009	The Arduino Platform and C Programming	University of California, Irvine	13	1
2	AMC0037	The Raspberry Pi Platform and Python Programming for the Raspberry Pi	University of California, Irvine	11	0.5

PLEASE NOTE:-

- **Compulsory Audit Courses (Non Credit - ANC0401/ANC0402)**
  - All Compulsory Audit Courses (a qualifying exam) has no credit.
  - 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.

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AICTE Guidelines in Model Curriculum:

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.

B.TECH. SECOND YEAR			
Course Code	**AAS0301B**	**L T P**	**Credits**
Course Title	**Engineering Mathematics-III**	**3 1 0**	**4**

Course Objective: The student will learn about

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.

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

Course Contents / Syllabus

UNIT-I	**Complex Variable – Differentiation**	**8 Hours**

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties.

UNIT-II	**Complex Variable –Integration**	**8 Hours**

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\sin\theta, \cos\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$.

UNIT-III	**Partial Differential Equation and its Applications**	**8 Hours**

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 and two dimensional wave and heat conduction equations.

UNIT- IV	**Integral Transforms**	**8 Hours**

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.

UNIT-V	**Aptitude-III**	**8 Hours**

Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat & Stream, Sitting Arrangement, Clock & Calendar.

Course Outcomes: After completion of this course students will be able to

CO 1	Apply the working methods of complex functions for finding analytic functions.	K_3
CO 2	Apply the concepts of complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals	K_3
CO 3	Apply the concept of partial differential equation to solve partial differential Equations and problems concerned with partial differential equations	K_4
CO 4	Apply the concept of fourier transform and Z-transform to solve difference equations.	K_3
CO 5	Solve the problems of Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat & Stream, Sitting Arrangement , Clock & Calendar.	K_3

Text Books:

(1) B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.

(2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.

(3) R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

(4) 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.	
NPTEL/ YouTube/ Faculty Video Link:	
Unit 1	https://www.youtube.com/playlist?list=PLzJaFd3A7DZuyLLbmVpb9e9VLf3Q9cYBL https://www.youtube.com/playlist?list=PLbMVogVj5nJS_i8vfVWJG16mPcoEKMuWT https://youtu.be/b5VUnapu-qs https://youtu.be/yV_v6zxADgY https://youtu.be/2ZBcbFhrfOg https://youtu.be/dlK0E0OG39k https://youtu.be/qjpLIlVo_6E
Unit 2	https://youtu.be/bkzKVsIEjxk https://youtu.be/nDD16hiutdc https://youtu.be/2kyBOVfflHw https://youtu.be/uliv9TzeD6o https://youtu.be/pulsluT8Uwk https://youtu.be/VBAeogiKH2A https://youtu.be/Mpmlk1H1aQo https://youtu.be/z03usEpsHRU https://youtu.be/fXybLUFmQBQ
Unit 3	https://youtu.be/kZ7Oa7iMiCs https://youtu.be/rj2Mb7JGyHk https://youtu.be/zpxe5yoB0xg https://youtu.be/MN4gUtsr0e8 https://youtu.be/GmIcbqdvIgc https://youtu.be/eSKz2N0tKaA https://youtu.be/iiTOw0JqQFc https://youtu.be/M4U-T9jsNKQ
Unit 4	https://youtu.be/QH2WL92bzLs https://youtu.be/DGmNbs5Cywo https://youtu.be/FliKUWUVrEI https://youtu.be/7eHuQXMCOvA https://youtu.be/ZkvQR3ajm3k https://youtu.be/zdyUwzOm1zw https://youtu.be/BBuV14-isyU https://youtu.be/xPr7YFSnmiQ https://youtu.be/ajJD0Df5CsY https://youtu.be/iviiGB5vxLA https://youtu.be/Ym1EUjTWMnE
Unit 5	https://www.youtube.com/playlist?list=PLFqNfk5W2ZuzjUsRqDp1Zj3S8n9yfdmN9 https://youtu.be/x3SEYdBUGaA

B.TECH. SECOND YEAR			
Course Code	**ACSE0303**	**L T P**	**Credits**
Course Title	**Design Thinking-I**	**3 0 0**	**3**

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems

Pre-requisites: None

Course Contents / Syllabus

UNIT-I Introduction — 8 HOURS

Introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environments, design mindset. Introduction to elements and principles of design, 13 Musical Notes for Design Mindset, Examples of Great Design, Design Approaches across the world

UNIT-II Ethical Values and Empathy — 8 HOURS

Understanding humans as a combination of I (self) and body, basic physical needs up to actualization, prosperity, the gap between desires and actualization. Understanding culture in family, society, institution, startup, socialization process. Ethical behavior: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy, and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools- Interviews, empathy maps, emotional mapping, immersion and observations, customer journey maps, and brainstorming, Classifying insights after Observations, Classifying Stakeholders, Do's &Don'ts for Brainstorming, Individual activity- 'Moccasin walk'

UNIT-III Problem Statement and Ideation — 10 HOURS

Defining the problem statement, creating personas, Point of View (POV) statements. Research- identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation-basic design directions, Themes of Thinking, inspirations and references, brainstorming, inclusion, sketching and presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea, introduction to visual collaboration and brainstorming tools - Mural, JamBoard

UNIT-IV Critical Thinking — 6 HOURS

Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills- linking ideas, structuring arguments, recognizing incongruences, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism, and politics. Case study on applying critical thinking on different scenarios.

UNIT-V Logic and Argumentation — 8 HOURS

The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams, logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking. Group activity/role plays on evaluating arguments

Course outcome: After completion of this course, students will be able to

CO 1	Develop a strong understanding of the design process and apply it in a variety of business settings	K2,K3
CO 2	Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior	K3
CO 3	Formulate specific problem statements of real time issues and generate innovative ideasusing design tools	K3,K6

CO 4	Apply critical thinking skills in order to arrive at the root cause from a set of likely causes	K3
CO 5	Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments	K3,K4

Textbooks

1. Arun Jain, UnMukt : Science & Art of Design Thinking, 2020, Polaris
2. Jeanne Liedta, Andrew King and Kevin Benett, Solving Problems with Design Thinking – Ten Stories of What Works,2013,Columbia Business School Publishing
3. RR Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, First Edition, 2009, Excel Books: New Delhi

Reference Books

1. Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey
2. BP Banerjee, Foundations of Ethics and Management, 2005, Excel Books
3. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA
4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA

NPTEL/ YouTube/ Web Link

Unit I

https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://designthinking.ideo.com/
https://blog.hypeinnovation.com/an-introduction-to-design-thinking-for-innovation-managers
https://www.creativityatwork.com/design-thinking-strategy-for-innovation/
https://www.youtube.com/watch?v=GFffb2H-gK0

Unit II

https://aktu.ac.in/hvpe/
http://aktu.uhv.org.in/
https://nptel.ac.in/courses/110/106/110106124/
https://swayam.gov.in/nd1_noc19_mg60/preview

Unit III

https://nptel.ac.in/courses/110/106/110106124/
https://swayam.gov.in/nd1_noc19_mg60/preview
https://www.udemy.com/course/design-thinking-for-beginners/
https://www.designthinking-methods.com/en/
https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them

Unit IV

https://www.forbes.com/sites/sap/2016/08/25/innovation-with-design-thinking-demands-critical-thinking/#340511486908
https://www.criticalthinking.org/pages/defining-critical-thinking/766

Unit V

https://www.udemy.com/course/critical-thinker-academy/
https://swayam.gov.in/nd2_aic19_ma06/preview

Course Code	AEC0302N	L T P	Credits
Course Title	Electronic Devices	3 0 0	3

Course Objective: The student will learn about

1	Principle and applications of P-N Junction diode and special diodes.
2	Principle of operation, analysis and design of BJT
3	Principle of operation, analysis and design of FET transistors.
4	AC analysis of BJT and FET.
5	Principle and Applications of Special Diodes.

Pre-requisites: Basic fundamental of Physics and Electronics

Course Contents / Syllabus

UNIT-I	Introduction to Semiconductor Physics	8 Hours

Energy bands, Fermi Level, E- K diagrams, Carrier Transport mechanism: Diffusion and Drift Current, Mobility and Resistivity, Direct and Indirect Band Gap Semiconductors, Junction characteristics, P-N Junction Diode, Diode Equation, Volt-Ampere Characteristics.

UNIT-II	BJT and Transistor Biasing	8 Hours

Bipolar Junction Transistor: Transistor, Transistor Action, Transistor Construction, BJT Operation, Common Base, Common Emitter and Common Collector Configurations.
Transistor Biasing and Stabilization: Operating Point, The DC load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector-Emitter Feedback Bias, Voltage Divider Bias, Bias Stabilization, Thermal Runway, BJT applications: Switch and amplifier.

UNIT-III	FET & MOSFET	8 Hours

Field Effect Transistor: Comparison of BJT and FET, The Junction Field Effect Transistor- Construction, Principle of operation, symbol, Pinch-off Voltage - Volt-Ampere characteristics, DC biasing.
MOSFET: Construction, principle of operation, symbol, MOSFET Characteristics in Enhancement and Depletion modes, MOS Capacitor.

UNIT- IV	AC analysis	8 Hours

AC analysis of Transistors: Single stage CE amplifier (re Model), Calculations of Z_{in}, Z_o, A_v and A_i for CE amplifier, JFET CS amplifier
MOS Amplifiers: MOS Common Source Amplifier, Calculation of AC parameters

UNIT-V	Special Diodes	8 Hours

Zener Diode, Varactor Diode Schottky Diode, Tunnel Diode, LED, Photodiode and Solar Cell, Industrial Applications of Special Diodes.

Course Outcomes: After completion of this course students will be able to

CO 1	Explain the operation and applications of P-N junction diode and special diodes.	K1, K2
CO 2	Explain the operation of BJT and its DC analysis.	K1, K2, K3, K4
CO 3	Explain the principle of operation and characteristics of JFET and MOSFET.	K1, K2, K3, K4

CO 4	Analyze and design amplifier circuits.	K1, K2
CO 5	Explain the Working and Applications of Special Diodes.	K1, K2, K3

Text Books:	
1. Electronic Devices and Circuits – R.L. Boylestadand Louis Nashelsky	
2. Electronic Devices and Circuits – J. Millman	
3. Microelectronic Circuits - A. S. Sedra and K.C. Smith Saunder's College 11 Publishing	
4. Surface Mount Technology: Principles and Practice-Ray Prasad, Second Edition, Chapman and Hall, 1997, New York	
Reference Books:	
1. Electronic Devices and Circuits – Mohammad Rashid	
2. Electronic Devices and Circuits – David A. Bell	
3. Integrated Electronics – J. Millman and Christos C. Halkias	
NPTEL/ YouTube/ Faculty Video Link:	
Unit 1	https://youtu.be/k6ZxP9Yr02E https://nptel.ac.in/courses/117/106/117106091/
Unit 2	https://youtu.be/0C4uxtS-tlQ
Unit 3	https://youtu.be/Q0nhtmYT6uA
Unit 4	https://youtu.be/RnClfkGvk_c
Unit 5	https://www.youtube.com/watch?v=PJ1ptIeqw6I, https://www.youtube.com/watch?v=yxMO0jvyQ8Q

B.TECH. SECOND YEAR			
Course Code	**AEC0301**	**L T P**	**Credits**
Course Title	**Digital System Design**	**3 0 0**	**3**
Course Objective: The student will learn about			
1	The concept of number representation and various logic circuit optimization techniques.		K_1, K_2
2	The fundamental concepts used in digital systems and basic techniques for the design of combinational and sequential circuits.		K_3, K_4
3	The realization of logic gates using diodes & transistors.		K_2
4	The fundamental concepts of logic families and implementation of circuits on PLD architecture.		K_1, K_3
Course Contents / Syllabus			
UNIT-I	**Number Systems and Boolean Algebra**		**8 hours**
Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code. **Boolean Algebra:** Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.			
UNIT-II	**Minimization of Boolean functions and Combinational Logic**		**8 hours**
Minimization of Boolean functions: Karnaugh Map Method - Up to Six Variables, Don't Care Map Entries, Quine McCluskey (Tabular) Method. **Combinational Logic Circuits:** Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards.			
UNIT-III	**Sequential Circuits**		**8 hours**
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, Design and Operation of Asynchronous Counters, Ring and Twisted Ring Counter. **Sequential Machines:** Finite State Machines- Mealy and Moore, Synthesis of Synchronous Sequential Circuits- Synchronous Modulo N –Counters.			
UNIT-IV	**Logic Families**		**8 hours**
Logic Families: Introduction of Logic families, Specifications, Noise margin, Propagation delay, fan-in, fan-out, TTL, ECL, CMOS, families and their interfacing, Introduction to BiCMOS.			
UNIT-V	**Programmable Logic Devices**		**8 hours**
Semiconductor Memories: Memory elements-ROM, RAM, Concept of Programmable logic devices: PLA, PAL, CPLD- Altera Flex10K series CPLDs, FPGA-CLB, IO block programmable interconnect, LUT based, Multiplexer based Technology mapping, Xilinx XC3000, XC4000, XE-Board (SPARTAN and VIRTEX). Logic implementation using Programmable Devices.			
Course Outcomes: At the end of this course students will demonstrate the ability to			

CO 1	Explain the different Number System and apply the optimization techniques to implement logic functions.	K_1, K_2
CO 2	Design and analyze combinational logic circuits	K_3, K_4
CO 3	Design & analyze synchronous sequential logic circuits using Moore and Mealy Finite State Machine.	K_3, K_4
CO 4	Explain the concept of Logic Families and their performance parameters.	K_1, K_2
CO 5	Explain the concept of Semiconductor Memories and implementation of logic functions using PLD architectures	K_1, K_3

Text books

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
3. Arimathea S and S. Salivahanan," Digital Circuits and Design"
4. Morris Mano," Digital Design, 3/E" Prentice Hall India

Reference Books

1. John F Wakerly, Digital Design: Principles and Practices, Pearson, (2000).
2. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
3. Fundamentals of Logic Design", Cengage Learning, 5th, Edition, 2004.
4. A. Anand Kumar," Theory and Logic Design", PHI, 2013.

MOOCs Course: https://nptel.ac.in/courses/106/102/106102181/ by IIT Delhi.

NPTEL Link: https://nptel.ac.in/courses/117/105/117105080/

Unit I	https://www.youtube.com/watch?v=juJR_JDJRa0 https://www.youtube.com/watch?v=2cpl_HjcI3A https://www.youtube.com/watch?v=KergVtV3SxU
Unit II	https://www.youtube.com/watch?v=EznCqZ1eh5Q https://www.youtube.com/watch?v=S6ZVUXWsVPc https://www.youtube.com/watch?v=sUutDs7FFeA
Unit III	https://www.youtube.com/watch?v=ibQBb5yEDlQ https://www.youtube.com/watch?v=LHAbLXfRYXk https://www.youtube.com/watch?v=Gc3DL-tmr-g
Unit IV	https://www.youtube.com/watch?v=Gc3DL-tmr-g https://www.youtube.com/watch?v=ow_gCaxPnmc
Unit V	https://www.youtube.com/watch?v=IZDgIg6cllw&list=PL3pGy4HtqwD0KKIYOPxOsWl32T9k0PdBr&index=4

B.TECH. SECOND YEAR			
Course Code	**AEC0303**	**L T P**	**Credits**
Course Title	**Signals, Systems And Networks**	**3 1 0**	**4**
Course Objective: The student will be able			
1	To identify various signals and systems.		K_1
2	To apply Fourier transform and convolution integral for Network analysis.		K_2, K_3
3	To apply Laplace transform for Network analysis.		K_1, K_2, K_4
4	To identify and analyze two-port network parameters.		K_1, K_2, K_4
5	To synthesize the one port and two port networks.		K_1, K_2, K_4
Pre-requisites: Basics of applied mathematics and electrical engineering.			
Course Contents / Syllabus			
UNIT-I	**Signal and System**		**8 hours**
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 and Power 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.			
UNIT-II	**LTI Systems and Fourier Analysis**		**8 hours**
Linear time-invariant (LTI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, 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. Steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values.			
UNIT-III	**Laplace transforms and its application to network analysis**		**8 hours**
Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms. Concept of complex frequency, Poles and Zeroes, Application of Laplace Transformation to the first order circuit and second order circuit analysis.			
UNIT-IV	**Two-port networks**		**8 hours**
Parameters of Two Port Networks, Relation between Parameters, Transfer Functions using Two Port network Parameters, Interconnection of Two Port Networks, Reciprocal and Symmetric Networks, Terminated Two Port Networks.			
UNIT-V	**Realizability Theory and Synthesis of Networks**		**8 hours**
Properties of immitance functions, realizability theory: Hurwitz polynomial and positive real function one port network synthesis (Foster's and Cauer's form synthesis). Zeroes of transmission, Synthesis of Y_{21} and Z_{21} with 1Ω terminations.			
Course Outcomes: After successful completion of the course, the student will be able to:			**Bloom's Level**
CO 1	Identify various signals and systems.		K_1, K_4
CO 2	Apply Fourier transform and convolution integral for Network analysis.		K_1, K_4

CO 3	Apply Laplace transform for Network analysis.	K_3, K_4
CO 4	Identify and analyze two-port network parameters.	K_4
CO 5	Synthesize the one port and two port networks.	K_3, K_4

Text Books:

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

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

NPTEL/ YouTube/ Faculty Video Link:

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/

B.TECH. SECOND YEAR			
Course Code	**ACSE0307**	**L T P**	**Credits**
Course Title	**Soft Computing**	**3 0 0**	**3**

Course Objective: Students will learn about

The basic principles, techniques, and applications of soft computing and techniques for designing intelligent systems having an understanding of the basic areas of Soft Computing including Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms.

Pre-requisites: Basic fundamental of mathematics

Course Contents / Syllabus

UNIT-I	**Introduction**	**8 hours**

Introduction of Soft Computing, Soft computing vs. Hard computing, Various types of Soft Computing Techniques, Characteristics of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing. Introduction to MATLAB Environment for Soft computing Techniques.

UNIT-II	**Neural Networks**	**8 hours**

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, Perceptrons, Adaline, Madaline, and Applications of ANN in research. MATLAB Neural Network Toolbox.

UNIT-III	**Fuzzy Logic-I (Introduction)**	**8 hours**

Fuzzy Set theory, Operations on Fuzzy sets, Properties of Fuzzy sets, Fuzzy versus Crisp set, Fuzzy Relation, Operations on Fuzzy Relation, Properties of Fuzzy Relation, Fuzzy versus Crisp Relations, Introduction & features of membership functions, Max-Min Composition

UNIT-IV	**Fuzzy Logic –II**	**8 hours**

Introduction to Fuzzy logic, Fuzzy Propositions, Fuzzy If-Then Rules, implications and inferences. Fuzzy Rule based systems, Predicate logic, Fuzzy Inference Systems, Fuzzification, Defuzzification Method, Fuzzy logic controller design, Some applications of Fuzzy logic. Fuzzy Logic MATLAB Toolbox

UNIT-V	**Genetic Algorithm (GA)**	**8 hours**

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, Hybrid Soft Computing.

Course outcome: After completion of this course students will be able to

CO 1	Identify soft computing techniques and their applications	K1
CO 2	Apply neural networks using various learning techniques and Formulate the artificial neural network with their different layers	K3, K6
CO 3	Compare the fuzzy sets and crisp sets and apply fuzzy operations in real life problems.	K3, K4
CO 4	Design fuzzy controller with the help of fuzzy rules, fuzzyfications and defuzzification.	K6
CO 5	Discuss the concept of genetic algorithm and its various applications.	K2

Text books

1. S. Rajsekaran & GA Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications", Prentice Hall of India.Tata McGraw Hill.
2. Siman Haykin, "Neural Netowrks", Prentice Hall of India
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Wiley India.

4. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall

Reference Books

1. Kumar Satish, "Neural Networks", Tata Mc Graw Hill
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Wiley India.
3. Fakhreddin O. Karray, Clarence W. De Silva, "Soft Computing and Intelligent System Design: Theory Tools and applications", Pearson
4. E Horowitz, S Sahni, S Rajasekaran, Fundamentals of Computer Algorithms, Universities Press.
5. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 2000.
6. Foundations of Neural Networks, Fuzzy Systems, and Knowldge Engineering, Nikola K. Kasabov, MIT Press, 1998.

Link:

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

https://www.youtube.com/watch?v=CRSGNpZJDjw&ab_channel=IITKharagpurJuly2018IITKharagpurJuly2018

1.https://www.youtube.com/watch?v=-U-QCX2C8T8&list=PLJ5C_6qdAvBFqAYS0P9INAogIMklG8E-9&index=2&ab_channel=IntroductionToSoftComputing-IITKGPIntroductionToSoftComputing-IITKGP
2.https://www.youtube.com/watch?v=whIR88tAANE&list=PLJ5C_6qdAvBFqAYS0P9INAogIMklG8E-9&index=3&ab_channel=IntroductionToSoftComputing-IITKGPIntroductionToSoftComputing-IITKGP

https://www.youtube.com/watch?v=LZ6t6JShtKw&list=PLJ5C_6qdAvBFqAYS0P9INAogIMklG8E-9&index=4&ab_channel=IntroductionToSoftComputing-IITKGPIntroductionToSoftComputing-IITKGP

https://www.youtube.com/watch?v=-G0qHu7cHNo&list=PLJ5C_6qdAvBFqAYS0P9INAogIMklG8E9&index=15&ab_channel=IntroductionToSoftComputing-IITKGPIntroductionToSoftComputing-IITKGP

Course Code	AEC0352	LTP	Credit
Course Title	Electronic Devices Lab	002	1

Course Objectives: The student will learn about

1	Analysis and Calibration of CRO including component testing and measurement of various parameters.
2	Analysis and plot V-I Characteristics for PN Junction diode and Zener diode.
3	Design and analysis of Half wave/full wave rectifier circuits, voltage regulator (using Zener diode) for given specifications.
4	Analysis and plot V-I Characteristics of solar cell and photo diode.
5	Design and analysis of CE, CS (FET & MOSFET) amplifier circuits for given specifications.

List of Experiments

Sr. No.	Name of Experiments	CO
1	Analysis and Calibration of CRO and DSOand alsoperform the following task: (i) Measurement of Amplitude (V_{p-p}, V_m for 1 KHz Sinusoidal Signal) (ii) Measurement of phase and frequency using Lissajous pattern (iii) Testing of passive and active components (R, L, C, Diode) (iv) Testing of function generator (upto100 MHz) and Power Supply (fixed and variable up to 20V).	CO1
2	Draw V-I Characteristics for PN Junction diode (1N4001 - 1N4007) and determine (i) Cut-in voltage (ii) Static resistance (iii) Dynamic resistance	CO2
3	Design and draw the output waveform of Half & Full wave rectifier (with and without filter) for 5V, 7V, and 10V and also measure of I_{rms}, I_{dc}, V_{rms}, V_{dc}, and ripple factor from its output waveform.	CO3
4	Draw and analyse V-I Characteristics for Zener diode(1N751A) and determine (i) Zener breakdown voltage (ii) Reverse Static resistance (iii) Reverse Dynamic resistance	CO2
5	Plot the V-I characteristics of Solar cell and determine (i) Maximum usable power (ii) Fill factor	CO4
6	Plot the V-I characteristics of Photo diode and determine (i) Reverse resistance (ii) Its Efficiency	CO4
7	Design 5V voltage regulator circuit using Zener diode with 12 V DC variable input power supply. The maximum power rating P_z is 100mW. Calculate the following parameter for Zener diode as voltage regulator: (i) Maximum current flowing through Zener diode (ii) The minimum value of series resistance (Rs) (iii) The load current I_L and I_Z if R_L =1KΩ. (iv) Plot the Line and load regulation curve.	CO3
8	Design and analysis of 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) and plot Input & Output Characteristics also measure following using h-parameters.	CO5

	(i) Voltage gain A_v (ii) Current gain A_i (iii) Input impedance (Z_i) (iv) Output impedance (Z_o)	
9	Design and analysis of Single stage common source FET(BFW10) 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).	CO5
10	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).	CO5
11.	**Mini project:** Design a mini project using the applications of this lab.	CO3, CO5
Course Outcomes: After successful completion of this lab students will be able to		
CO 1	Analyze and Calibrate CRO including component testing and measurement of various parameters.	
CO 2	Analyze and plot V-I Characteristics for PN Junction diode and Zener diode.	
CO 3	Design and analyze Half wave/full wave rectifier circuits, voltage regulator (using Zener diode) for given specifications.	
CO 4	Analyze and plot V-I Characteristics of solar cell and photo diode.	
CO 5	Design and analyze CE, CS (FET & MOSFET) amplifier circuits for given specifications.	

B.TECH. SECOND YEAR			
Course Code	**AEC0351**	**L T P**	**Credit**
Course Title	**Digital System Design Lab**	**0 0 2**	**1**

Lab Objective: The student will learn about

1.	To verify truth table of various type of logic gates.	K1,K2,K3
2.	To design and verify different type of combinational circuits.	K2,K3
3.	To understand and verify truth table of various type of flip-flops.	K1,K3
4.	To learn and design the different type of sequential circuits.	K1,K2,K3

List of Experiments

Sr. No.	Name of Experiment	CO
1	Introduction to digital system design lab- nomenclature of digital ICs, specifications, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL Ics.	1
2	Implementation of the given Boolean function using TTL logic gates (NOT gate, AND gate and OR) in SOP and POS forms for following Boolean expressions: (i) Y1 = AB' + A'B For SOP (ii) Y2 = (A'+B).(A+B') for POS	1
3	Implementation of half adder and full adder using TTL logic gates (EXOR- 7486, AND-7408, OR-7432) and verify its truth table.	2
4	Implementation of 4-bit parallel adder using 7483 IC and verify the output for the given inputs. (i) A = 1011, B = 1001 (ii) A = 0011, B = 0010	2
5	Implementation of 2:4 Decoder using logic gates (NOT gate- 7404, AND gate-7408) and verify its truth table.	2
6	Implementation of and 4:2 Encoder using logic gate (OR gate-7432) and verify its truth table.	2
7	Implementation of 4:1 multiplexer and 1:4 demultiplexer using logic gates (AND gate-7408, NOT gate-7404 and OR gate-7432) and verify their truth table.	2
8	Verification of truth tables of RS, JK, T and D flip-flops using NAND gate (7400) & NOR gates (7402).	3
9	Design 4-bit synchronous and asynchronous counter using JK flipflops (7476) and AND gates (7408) and verify their truth table.	4
10	Design a mini project using real time digital integrated circuits and other components.	5

Lab Outcome: After successful completion of this LAB students will be able to

CO 1	Understand and verify truth table of various type of logic gates.	K1, K2, K3
CO 2	Design & analyze modular combinational circuits with MUX/DEMUX, decoder and encoder.	K2, K3
CO 3	Design & verify truth table of various types of flipflops.	K1, K3
CO 4	Design & analyze different types of sequential logic circuits	K1, K2, K3
CO 5	Design & build mini project using digital Ics.	K2, K3, K6

B.TECH. SECOND YEAR			
Course Code	**AEC0353**	**L T P**	**Credit**
Course Title	**Signals, Systems And Networks Lab**	**0 0 2**	**1**

Lab Objective: The student will learn about	
1.	Application of MATLAB in signals and systems.
2.	Analysis and plotting various signals using MATLAB.
3.	Response of LTI Systems using MATLAB
4.	Analysis and verification of network theorems.
5.	Analysis and verification of two-port parameters.

List of Experiments

Sr. No.	**Name of Experiment**	**CO**
1	Introduction to MATLAB a. To define and use variables and functions in MATLAB. b. To define and use Vectors and Matrices in MATLAB. c. To study various MATLAB arithmetic operators and mathematical functions. d. To create and use m-files.	CO1
2	Basic plotting of signals a. To study various MATLAB commands for creating two and three dimensional plots. b. Write a MATLAB program to plot the following continuous time and discrete time signals. i. Step Function ii. Impulse Function iii. Exponential Function iv. Ramp Function v. Sine Function	CO1
3	Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.	CO2
4	Write a MATLAB program to obtain linear convolution of the given sequences.	CO2
5	Write a MATLAB Program a. To calculate Fourier series coefficients associated with Square Wave. b. To Sum the first 10 terms and plot the Fourier series as a function of time. c. To Sum the first 50 terms and plot the Fourier series as a function of time.	CO2
6	Calculate and plot Fourier transform of a given signal using MATLAB.	CO2
7	a. Write a MATLAB program to find the impulse response and step response of a system from its difference equation. b. Compute and plot the response of a given system to a given input.	CO3
8	Verification of Thevenin's and Maximum power transfer theorems.	CO4
9	To find and plot poles and zeros of RC, RL & LC immittance functions using MATLAB. For different values of R, L and C and find the effect of poles position.	CO3

10	Verification of y and z-parameters for a given two-port network.	CO5
11	Verification of h and T-parameters for a given two-port network.	CO5
Lab Outcome: After successful completion of this course, students will able to		**Blooms Level**
CO 1	Classify various applications of MATLAB in signals and systems.	K_3
CO 2	Analyze and plot various signals using MATLAB.	$K_{3,}$ K_4
CO 3	Apply MATLAB to find response of LTI Systems	$K_{3,}$ K_4
CO 4	Verify electrical network theorems.	K_2
CO5	Analyze and verify two-port parameters.	K_1, $K_{2,}$ K_3

B.TECH. SECOND YEAR			
Course Code	**ANC0301**	**L T P**	**Credits**
Course Title	**Cyber Security**	**2 0 0**	**0**

Course Objective: Students will learn about

Security of Information system and Risk factors and examine security threats and vulnerability in various scenarios, understand concept of cryptography and encryption technique to protect the data from cyber-attack and provide protection for software and hardware.

Pre-requisites: Basics recognition in the domain of Computer Science. Concept of network and operating system. Commands of programming language.

Course Contents / Syllabus

UNIT-I	**INTRODUCTION**	**8 hours**

Introduction to Information Systems: Types of Information Systems, Development of Information Systems, Need for Information Security, Threats to Information Systems, Information Assurance, Guidelines for Secure Password and WI-FI Security and Social Media and Windows Security, Security Risk Analysis, and Risk Management.

UNIT-II	**APPLICATION LAYER SECURITY**	**8 hours**

Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall , Intrusion Detection, Access Control, Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security, Threats to E-Commerce: Electronic Payment System, e- Cash, Issues with Credit/Debit Cards.

UNIT-III	**SECURE SYSTEM DEVELOPMENT**	**8 hours**

Application Development Security, Architecture & Design, Security Issues in Hardware: Data Storage and Downloadable Devices, Mobile Protection, Security Threats involving in Social Media, Physical Security of IT Assets, Access Control, CCTV and Intrusion Detection Systems, Backup Security Measures.

UNIT-IV	**CRYPTOGRAPHY AND NETWORK SECURITY**	**8 hours**

Public key cryptography: RSA Public Key Crypto with implementation in Python, Digital Signature Hash Functions, Public Key Distribution, Symmetric key cryptography: DES (Data Encryption Standard), AES (Advanced Encryption Standard),secure hash algorithm(SHA-1)

Real World Protocols: Basic Terminologies, VPN, Email Security Certificates, Transport Layer Security, TLS, IP security, DNS Security.

UNIT-V	**SECURITY POLICY**	**8 hours**

Policy design Task, WWW Policies, Email based Policies, Policy Revaluation Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the updated and new Policies. Recent trends in security.

Course outcome: After completion of this course students will be able to

CO 1	Analyze the cyber security needs of an organization.	K4
CO 2	Identify and examine software vulnerabilities and security solutions.	K1,K3
CO 3	Comprehend IT Assets security (hardware and Software) and performance indicators	K2
CO 4	Measure the performance and encoding strategies of security systems.	K3,k5
CO 5	Understand and apply cyber security methods and policies to enhance current scenario security.	K2, K3

Text books

1) Charles P. Pfleeger, Shari LawerancePfleeger, “Analysing Computer Security”, Pearson Education India
2) V.K.Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India
3) Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House

4) Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage
Reference Books
1) Schou, Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw Hill.
2) CHANDER, HARISH,” Cyber Laws and It Protection”, PHI Learning Private Limited,Delhi
3) V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi
4) William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010
Link:
1) https://www.youtube.com/watch?v=vv1ODDhXW8Q
2) https://www.youtube.com/watch?v=fQ3ESFfvchg&list=PLUtfVcb-iqn834VGI9faVXGIGSDXZMGp8
3) https://www.youtube.com/watch?v=iTVyKbDCJrA&list=PLgMDNELGJ1CbdGLyn7OrVAP-IKg-0q2U2
4) https://www.youtube.com/watch?v=1plMO7ChXMU&list=PLJ5C_6qdAvBFAuGoLC2wFGruY_E2gYtev
5) https://www.youtube.com/watch?v=_9QayISruzo

B. TECH. SECOND YEAR

Course Code	ANC0302	L T P	Credits
Course Title	Environmental Science	2 0 0	0

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 develop the sense of awareness among the students about environment and its various problems.
3	To create positive attitude about environment among the student.
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

Pre-requisites: Basic knowledge of nature.

Course Contents / Syllabus

UNIT-I Basic Principle of Ecology — 8 Hours

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.

UNIT-II Natural Resources and Associated Problems — 8 Hours

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.

UNIT-III Biodiversity Succession and Non-Renewable Energy Resources — 8 Hours

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.

UNIT-IV Pollution and Solid Waste Management — 8 Hours

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 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-V Role of Community and Environmental Protection Acts — 8 Hours

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.

Course outcome: After completion of this course students will be able to

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
CO 3	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

Text books:

1. Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York.
2. Botkin, D.B and Kodler E.A., 2000, Environmental Studies: The earth as a living planet. John Wiley and Sons Inc.
3. Rao M.N. and H.V.N. Rao, 1989: Air Pollution, Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Singh J.S., Singh S.P. and Gupta S.R., 2006, Ecology Environment and Resource Conservation, Anamaya Publishers, New Delhi.
5.Environmental Studies -Benny Joseph-Tata McgrawHill-2005
6. Environmental Studies- Dr. D.L. Manjunath, Pearson Education-2006.
7. Environmental studies- R, Rajagopalan -Oxford Pubtiotion2005.

Reference Books:

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.
5.Principles of Environmental Sciences and Engineering -P. Venugoplan Rao, Prenitice Hall of India.
6. Environmental Science and Engineering Meenakshi, Prentice Hall India.

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=T21OO0sBBfc, https://www.youtube.com/watch?v=qt8AMjKKPDohttps://www.youtube.com/watch?v=yAK-m91Nxrshttps://www.youtube.com/watch?v=ha_O-1uOWkk, https://www.youtube.com/watch?v=brF0RWJyx9w
Unit 2	https://www.youtube.com/watch?v=mOwyPENHhbc, https://www.youtube.com/watch?v=yqev1G2iy20, https://www.youtube.com/watch?v=_74S3z3IO_I, https://www.youtube.com/watch?v=jXVw6M6m2g0
Unit 3	https://www.youtube.com/watch?v=GK_vRtHJZu4, https://www.youtube.com/watch?v=b6Ua_zWDH6U, https://www.youtube.com/watch?v=7tgNamjTRkk, https://www.youtube.com/watch?v=ErATB1aMiSU, https://www.khanacademy.org/science/high-school-biology/hs-ecology/hs-human-impact-on-ecosystems/v/conservation-and-the-race-to-save-biodiversity
Unit 4	https://www.youtube.com/watch?v=7qkaz8ChelI, https://www.youtube.com/watch?v=NuQE5fKmfME, https://www.youtube.com/watch?v=9CpAjOVLHII, https://www.youtube.com/watch?v=yEci6iDkXYw, https://www.youtube.com/watch?v=yEci6iDkXYw
Unit 5	https://www.youtube.com/watch?v=ad9KhgGw5iA, https://www.youtube.com/watch?v=nW5g83NSH9M, https://www.youtube.com/watch?v=xqSZL4Ka8xo, https://www.youtube.com/watch?v=WAI-hPRoBqs, https://www.youtube.com/watch?v=o-WpeyGlV9Y, https://www.youtube.com/watch?v=EDmtawhADnY

B.TECH. SECOND YEAR			
Course Code	**AAS0402**	**L T P**	**Credits**
Course Title	**Engineering Mathematics-IV**	**3 1 0**	**4**

Course Objective: Students will learn about

Familiarization 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.

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

Course Contents / Syllabus

UNIT-I	**Statistical Techniques-I**	**8 hours**

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

UNIT-II	**Statistical Techniques-II**	**8 hours**

Testing a Hypothesis, Null hypothesis, Alternative hypothesis, Level of significance, Confidence limits, p-value, Test of significance of difference of means, Z-test, t-test and Chi-square test, F-test, ANOVA: One way and Two way Statistical Quality Control (SQC), Control Charts, Control Charts for variables (Mean and Range Charts), Control Charts for Variables (p, np and C charts).

UNIT-III	**Probability and Random Variable**	**8 hours**

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).

UNIT-IV	**Expectations and Probability Distribution**	**8 hours**

Operation on One Random Variable – Expectations: Introduction, Expected Value of a Random Variable, Mean, Variance, Moment Generating Function, Binomial, Poisson, Normal, Exponential distribution.

UNIT-V	**Wavelets and applications and Aptitude-IV**	**8 hours**

Wavelet Transform, wavelet series. Basic wavelets (Haar/Shannon/Daubechies), orthogonal wavelets, multi-resolution analysis, reconstruction of wavelets and applications.

Number System, Permutation & Combination, Probability, Function, Data Interpretation, Syllogism.

Course outcome: After completion of this course students will be able to

CO 1	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting	K_1, K_3
CO 2	Apply the concept of hypothesis testing and statistical quality control to create control charts	K_1, K_3
CO 3	Remember the concept of probability to evaluate probability distributions	K_3, K_4
CO 4	Understand the concept of Mathematical **Expectations and Probability Distribution**	K_2
CO 5	Remember the concept of Wavelet Transform and Solve the problems of Number System, Permutation & Combination, Probability, Function, Data Interpretation,	K_3

	Syllogism.	

Text books
(1) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint)
(2) S. Ross: A First Course in Probability, 6th Ed., Pearson Education India, 2002
(3) W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
(4) HaitaoGuo, Ramesh A. Gopinath, C.S. Burrus, IVAN W AUTOR SELESNICK, JAN E AUTOR ODEGARD, SidnyBurrus
Reference Books
(1) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
(2) T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi
(3) R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
(4) J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi.
(5) D.N.Elhance,V. Elhance& B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, New Delhi.
(6) Wavelet Transforms & Time-Frequency Signal Analysis by Lokenath Debnath
Link:
https://youtu.be/aaQXMbpbNKw
https://youtu.be/wDXMYRPup0Y
https://youtu.be/m9a6rg0tNSM https://youtu.be/Qy1YAKZDA7k https://youtu.be/Qy1YAKZDA7k
https://youtu.be/s94k4H6AE54 https://youtu.be/lBB4stn3exM https://youtu.be/0WejW9MiTGg https://youtu.be/QAEZOhE13Wg https://youtu.be/ddYNq1TxtM0 https://youtu.be/YciBHHeswBM
https://youtu.be/bhp4nVkqA9o

B.TECH SECOND YEAR			
Course Code	**AASL0401**	**L T P**	**Credit**
Course Title	**Technical Communication**	**2 1 0**	**3**

Course objective:

1	• To help the students develop communication and critical thinking skills necessary for securing a job, and succeeding in the diverse and ever-changing workplace of the twenty first century	
2	• To enable students to communicate effectively in English at the workplace.	

Pre-requisites:

- The student must have a good degree of control over simple grammatical forms and some complex grammatical forms of English language.
- The student should be able to speak English intelligibly.

Course Content / Syllabus

UNIT-I	**Introduction to Technical Communication and Reading**	**4 Hours**

- Fundamentals of technical communication
- Role of technical communication
- Reading Comprehension - central idea, tone, and intention
- Critical reading strategies

UNIT-II	**Technical Writing 1**	**5 Hours**

- Characteristics of technical writing; technical vocabulary, etymology
- Business letters /emails – types, format, style and language
- Notices, agenda and minutes
- Job application, CV and resume'

UNIT-III	**Technical Writing 2**	**5 Hours**

- Technical reports – types & formats
- Structure of a report
- Technical Proposal - structure and types
- Technical/ Scientific paper writing

UNIT-IV	**Public Speaking**	**5 Hours**

- Components of effective speaking (emphasis on voice dynamics)
- Seminar and conference presentation
- Conducting/ participating in meetings
- Appearing for a job interview
- Mobile etiquettes

UNIT-V	**Manuscript Preparation**	**5 Hours**

- Short report writing
- Copy editing and referencing
- Developing writing style – Jargons, Abbreviations
- Ethical writing

Course outcome:

At the end of the course the students will be able to

		Levels
CO 1	Comprehend the fundamental principles of technical communication with special reference to reading.	L2
CO 2	Write various kinds of professional correspondence.	L5
CO 3	Recognise and produce different kinds of technical documents.	L2
CO 4	Apply effective speaking skills to communicate at the workplace.	L3
CO 5	Demonstrate their understanding of various ethical concerns in written communication.	L3

Textbook

1. **Technical Communication – Principles and Practices** by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.

Reference Books

1. **Personality Development and Soft Skills** by Barun K Mitra, Oxford Univ. Press, 2012, New Delhi.

2. **Spoken English- A Manual of Speech and Phonetics** by R K Bansal & J B Harrison, Orient Blackswan, 2013, New Delhi.

3. **Business Correspondence and Report Writing** by Prof. R C Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.

4. **Practical Communication: Process and Practice** by L U B Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.

5. **Modern Technical Writing** by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; USA

6**. A Textbook of Scientific and Technical Writing** by S D Sharma; Vikas Publication, Delhi.

7. **Skills for Effective Business Communication** by Michael Murphy, Harvard University, USA

8**. A Complete Guide to Write Right** by Agarwal, Deepa. Scholastic, 1st edition

9. **Technical writing and communication**, R S Sharma, V.P. Publication, 1st edition

10**. Business Communication for Managers** by Payal Mehra, Pearson Publication, Delhi.

B.TECH. SECOND YEAR			
Course Code	**AEC0401**	**L T P**	**Credits**
Course Title	**Analog and Digital Communication**	**3 1 0**	**4**
Course Objective: Students will learn about			
1	Fundamentals of amplitude modulation (AM) and angle modulation and demodulation techniques and its application.	K_1, K_2	
2	The key modules of digital communication systems with emphasis on digital modulation techniques.	K_2, K_3	
3	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.	K_2, K_4	
4	The concept and basics of information theory and the basics of source and channel coding/decoding.	K_2, K_4, K_5	
5	The performance of error detection & correction using different coding schemes in digital communication.	K_2, K_4, K_5	
Pre-requisites: Classification of signals, operations on signals, Fourier transform and its properties, set theory, ADC and DAC converters.			
Course Contents / Syllabus			
UNIT-I	**Analog Modulation**	**8 hours**	
Introduction to Communication system, Need for modulation, Amplitude Modulation and Demodulation, Angle Modulation: Frequency and Phase Modulation and Demodulation, Frequency Division Multiplexing (FDM), Signal to Noise Ratio (SNR), Figure of Merit, Noise Figure.			
UNIT-II	**Digital Modulation**	**8 hours**	
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).			
UNIT-III	**Digital Receiver**	**8 hours**	
Noise, Concept of Matched Filters, BER analysis of BASK, BFSK, BPSK. **Spread Spectrum Communication**: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).			
UNIT-IV	**Information theory**	**8 hours**	
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			
UNIT-V	**Error correcting codes**	**8 hours**	
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.			
Course outcome: After completion of this course students will be able to			
CO 1	Explain various modulation and demodulation methods of Amplitude Modulation and Angle Modulation.	K_1, K_2	

CO 2	Implement various digital modulation techniques.	K_2, K_3
CO 3	Analyze the effect of noise and explain the concept of spread spectrum communication system.	K_2, K_4
CO 4	Identify source coding and channel coding schemes for a given communication link.	K_2, K_4, K_5
CO 5	Characterize error-control codes and apply the encoding and decoding processes.	K_2, K_4, K_5

Text books

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

1. Simon Haykin, "Communication Systems", 4th Edition, WileyIndia.
2. H.P.Hsu& D. Mitra "Analog and Digital Communications", 2nd Edition, Tata McGraw- Hill.

Link:

https://nptel.ac.in/courses/117/101/117101051/

https://www.youtube.com/channel/UCnWGGUyQOZkXylsoI5w-J4Q

NPTEL/ YouTube /Faculty Video Link:	
Unit-I	https://youtu.be/m4sjTt7rhow
Unit-II	https://youtu.be/DVehz1WW_dA
Unit-III	https://youtu.be/XkpdX6j9p2I
Unit-IV	https://youtu.be/GzbE5PSfnJ0
Unit-V	https://youtu.be/0RSl-QJ5-4A, https://youtu.be/nMv5YyaNw3M

Course Code	AEC0402	L T P	Credits
Course Title	Analog Circuits	3 0 0	3

Course Objectives: Students will learn about

1	Multistage amplifier circuits with feedback topologies.
2	The functioning of Op-Amp with its parameters and configurations.
3	The applications of OP-AMP including active filter circuits.
4	Sinusoidal and non-sinusoidal oscillators.
5	The current mirror circuits.

Pre-requisites: Basic knowledge of Semiconductor devices.

Course Contents / Syllabus

UNIT-I	Analysis of Amplifiers and Feedback Amplifiers	8 hours

Introduction, frequency response of single stage and multistage amplifiers, cascode amplifier.

Power Amplifier: Various classes of operation (Class A, B, AB, C etc), Comparison on the Basis their Power Efficiency and Linearity, **Feedback Amplifiers:** Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.

UNIT-II	Operational Amplifiers	8 hours

Introduction to Op-Amp and block diagram of Op-Amp, Pin diagram of IC741, Characteristics of Ideal & Practical Op-Amp, Op-Amp AC and DC parameters. Practical Op-Amp circuits: Concept of Virtual ground and Virtual short, Inverting amplifier, Non inverting amplifier, Unity gain amplifier.

Differential amplifier: Basic structure and principle of operation, calculation of differential gain and common mode gain.

UNIT-III	Op-Amp Applications and Active Filters	8 hours

Adder, Subtractor, Integrator and Differentiator circuits, Log–Anti Log Amplifiers, precision rectifier, comparator, Schmitt trigger, Astable, Mono stable and Bi stable vibrator using IC555.

Active filters: Low pass, high pass, band pass and band stop, design guidelines for filters.

UNIT-IV	Oscillators	8 hours

Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge), LC oscillators (Hartley, Colpitt, Clapp), non-sinusoidal oscillators.

UNIT-V	Current Mirror	8 hours

Current Mirrors using BJT, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror, Design of various stages of Operational Amplifier

Course Outcome: After completion of this course students will be able to

CO 1	Design and analyze multistage amplifier circuits with feedback topologies.	K_1, K_2
CO 2	Explain the functioning of Operational Amplifier with its configurations.	K_1, K_2
CO 3	Analyze and design applications of OP-AMP including active filter circuits.	K_1, K_2, K_3, K_4
CO 4	Design and analyze sinusoidal and non-sinusoidal oscillators.	K_1, K_2, K_3
CO 5	Analyze and utilize the current mirror circuits.	K_1, K_2, K_3, K_4

Text books:

1. R. A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Pearson Publication, 4th edition.

2.	A.S. Sedra and K.C. Smith, "Microelectronic Circuits," Saunder's College11 Publishing, 4th edition.
3.	J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theory and applications," Mc Graw Hill, 1992.
4.	Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.
Reference Books:	
1.	J. Millman and A. Grabel, "Microelectronics," 2nd edition, McGraw Hill, 1988.
2.	P. Horowitz and W. Hill, "The Art of Electronics," 2nd edition, Cambridge University Press, 1989.
3.	Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," John Wiley, 3rd edition.
4.	Behzad Razavi, "Fundamentals of Microelectronics", 2nd Edition, Wiley.

NPTEL/ YouTube /Faculty Video Link:	
Unit-I	https://youtu.be/m4sjTt7rhow
Unit-II	https://youtu.be/DVehz1WW_dA
Unit-III	https://youtu.be/XkpdX6j9p2I
Unit-IV	https://youtu.be/GzbE5PSfnJ0
Unit-V	https://youtu.be/0RSl-QJ5-4A, https://youtu.be/nMv5YyaNw3M

B.TECH. SECOND YEAR			
Course Code	**AEC0403**	**L T P**	**Credits**
Course Title	**Internet of Things**	**3 0 0**	**3**

Course Objective: Students will learn about

1	Key elements of an IoT device along with opportunities and risk associated with IoT adoption.	**K_1**
2	The different IoT System Architectures and Standards including latest computing paradigm viz., fog and edge computing.	**K_1, K_2**
3	The concepts of hardware platform and the factors influencing its design along with the A/D and D/A conversion techniques.	**K_1, K_2**
4	The concept of Bluetooth technology, architecture and protocol stack used in ZigBee and all the IEEE 802.11 protocols.	**K_1, K_2**
5	Importance, challenges, and issues related to IoT Security, and future trends of IoT.	**K_1, K_2, K_5**

Pre-requisites: Basic Electronics and Electrical Engineering

Course Contents / Syllabus

UNIT-I	**Interaction to Internet of Things**	**8 hours**

Describe the concepts of IoT and understand the key elements of an IoT device, Outline the evolution of IoT, Describe the main technologies that enable IoT, Identify the key challenges facing IoT systems, Evaluate the opportunities and risks that emerge with IoT adoption, Introduction and use of Mbed OS for IoT applications.

UNIT-II	**IoT System Architectures and Standards**	**8 hours**

Identify the key considerations that underpin IoT architectures, differentiate between cloud, fog, and edge computing paradigms, Outline the roles of gateways in fog architectures for IoT, Evaluate the architecture that is best suited for a particular application, Outline the scope and efforts of different standardization bodies. Outline the different Arm Processor families, Outline the main features of Arm Cortex-M4 processor.

UNIT-III	**Hardware Platforms for IoT**	**8 hours**

Identify the concepts of hardware platform and the factors influencing its design, differentiate between various types of memory, Explain the principles of sensors and the role of I/O, describe analog-to-digital and digital-to-analog conversion techniques, Identify the different techniques that can be used to save energy

UNIT-IV	**Communication under IoT**	**8 hours**

IoT Protocols: MQTT, CoAP, XMPP and AMQT, IoT communication models, IoT Communication technologies: Bluetooth, BLE, Zigbee, Zwave, NFC, RFID, LiFi, Wi-Fi, Interfacing of Wi-Fi, RFID, Zigbee, NFC with development board.

Case Studies on e-health: Characteristics of e-health and applications- monitoring of health parameters, smart medicine box, elderly people monitoring, challenges.

UNIT-V	**IoT Security, Current & Future Trends**	**8 hours**

IoT Security: Explain why security is critical in IoT, Describe the threat modelling methodologies relevant to IoT, Identify the principles of code signing, Explain the principles of encryption, differentiate between symmetric/asymmetric encryption and be familiar with the most important encryption algorithms for each.

Current and Future IoT Trends: Describe the key factors that will fuel the future adoption of IoT technology, Outline the role of AI/ML in the IoT context, Explain the key technological advances that enable edge computing, Illustrate the role of Platform Security Architecture in IoT and its different phases

Case Study on IoT Smart City: Characteristics and applications– Smart Economy, Smart People, Smart Goverence, Smart Mobility, Smart Environment, Smart Living Smart Grid, Smart Home, Transport and Traffic Management, Smart Healthcare

Course outcome: After successful completion of this course, students will be able to

CO1	Explain the key elements of an IoT device along with opportunities and risk associated with IoT adoption.	**K_1**
CO2	Explain and implement the different IoT System Architectures and Standards including latest computing paradigm viz., fog and edge computing.	**K_1, K_2**
CO3	Use various hardware platform for design of IoT based solutions.	**K_1, K_2**
CO4	Explain the concept of Bluetooth technology, architecture and protocol stack used in ZigBee and all the IEEE 802.11 protocols.	**K_1, K_2**
CO5	Analyze challenges, and issues related to IoT Security.	**K_1, K_2, K_5**

Textbooks:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515.

2. Internet of Things, CENGAGE Leaning India, 2017

3. Samuel Greengard, Internet of Things MIT Press, 2015

Reference Books:

1. Perry Lea Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security**, Amazon**

2. Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri , **Internet of Things: Architectures, Protocols and Standards**, First Edition, Amazon

3. Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2012, 9781119958345 3.

4. Olivier Hersent, David Boswarthick, Omar Ello Umi, "The Internet of Things – Key applications and Protocols", Wiley, 2012, ISBN:978-1-119-99435-0

5. The definitive guide to the Arm Cortex-M0 by Joseph Yi

6. White Paper: Cortex M for beginners-An Overview of the Arm Cortex-M-Processor family and comparison.

B.TECH. SECOND YEAR			
Course Code	**AEC0404**	**L T P**	**Credits**
Course Title	**Microprocessor and Microcontroller**	**3 0 0**	**3**
Course Objective: Students will learn about			
1	The fundamentals of general microprocessor & microcontroller.	K_1, K_2	
2	The architecture of 8085 microprocessor with assembly level language.	K_1, K_4	
3	The architecture of 8051 microcontroller with real time application.	K_4	
4	The fundamentals of ARM Processor and embedded systems.	K_1, K_2	
5	The knowledge of ARM Instruction Set for programming.	K_2, K_3	
Course Contents / Syllabus			
UNIT-I	**Introduction**	**8 hours**	
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, Registers and memory organization, Various types of memory: RAM, ROM cache, virtual memory. Methods of data Transfer: Serial and parallel data transfer. Concepts of pipelining.			
UNIT-II	**8085 Microprocessor**	**8 hours**	
Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, addressing modes, timing diagram of the instructions, Interrupts of 8085 microprocessor, Assembly language programming.			
UNIT-III	**8051 Microcontroller**	**8 hours**	
Overview of the 8051, Inside the 8051, Addressing modes, 8051 data types and directives, Instruction set and assembly language programming of 8051 microcontroller, Programming the 8051 timers, Interfacing of I/O devices (keypad & display) with 8051. Application of 8051 microcontroller.			
UNIT-IV	**The Arm Cortex-M0 Processor Architecture: Part 1**	**8 hours**	
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.			
UNIT-V	**The Arm Cortex-M0 Processor Architecture: Part 2**	**8 hours**	
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 Operation, Arithmetic Shift Operation, Logical Shift Operation, Rotate Operation, Reverse Ordering Operation, Extend Operation, Program Flow Control, Conditional Branch Example, Memory			

Barrier Instructions, Exception-Related Instructions, Sleep Mode Related Instructions, Cortex-M0 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,

Course Outcome: After completion of this course students will be able to

CO 1	Explain the fundamentals of general microprocessor & microcontroller.	K_2, K_3
CO 2	Analyze the architecture of 8085 microprocessor with assembly level language	K_1, K_4
CO 3	Implement 8051 microcontroller for designing various applications.	K_3
CO 4	Illustrate the fundamentals of ARM Cortex M0 Processor.	K_2
CO 5	Apply the knowledge of ARM Instruction Set for programming.	K_2, K_3

Text books

(1) Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publication (India) Pvt. Ltd.

(2) Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.

(3) ARM system developers guide, Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier, Morgan Kaufman publishers, 2008.

(4) The Definitive Guide to the ARM Cortex-M0, Joseph Yiu, Newnes publication.

Reference Books

(1) Douglas V. Hall: Microprocessors and Interfacing, Revised 2nd Edition, TMH, 2006.

(2) Computer Aided Engineering Drawing - S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition-2006

(3) White Paper: Cortex-M for Beginners - An overview of the Arm Cortex-M processor family and comparison: https://community.arm.com/developer/ip-products/processors/b/processors-ip-blog/posts/white-paper-cortex-m-for-beginners-an-overview-of-the-arm-cortex-m-processor-family-and-comparison

(4) Embedded Systems Fundamentals on Arm Cortex-M based Microcontrollers: A Practical Approach by Alexander G. Dean https://www.arm.com/resources/education/textbooks/efficient-embedded-systems

Link:

Unit 1	https://nptel.ac.in/courses/108/105/108105102/
Unit 2	https://nptel.ac.in/courses/108/103/108103157/

B.TECH. SECOND YEAR			
Course Code	**AEC0451**	**L T P**	**Credit**
Course Title	**Analog and Digital Communication Lab**	**0 0 2**	**1**

Lab Objective: The student will learn about

1.	Amplitude modulation (AM), frequency modulation (FM) and their demodulation.
2.	The skill to analyze and implement analogue to digital converters like Pulse Code Modulation (PCM).
3.	Line coding schemes in digital communication.
4.	The practical aspects of digital communication system and various band-pass digital modulation techniques.
5.	The simulation of convolutional coding using MATLAB software.

List of Experiments

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

10	Demonstrate Quadrature Phase Shift Keying (QPSK) modulator and demodulator for message signal 10101010 with carrier frequency f_c = 960kHz. (i) Draw its output waveform (ii) Determine Energy per bit (E_b) for QPSK (iii) Bandwidth (BW) for QPSK	**4**
11	Analysis and performance evaluation of convolutional codes using MATLAB for message code = [1 0 1 1]	**5**

Lab Outcome: After successful completion of this Lab students will be able to	
CO 1	Demonstrate and perform amplitude modulation (AM), frequency modulation (FM) and its demodulation.
CO 2	Demonstrate and perform Pulse Code Modulation (PCM).
CO 3	Encode and decode digital data into different data formats.
CO 4	Perform digital modulation techniques.
CO 5	Analyze convolutional code using MATLAB.

B.TECH. SECOND YEAR			
Course Code	**AEC0452**	**L T P**	**Credit**
Course Title	**Analog Circuits Lab**	**0 0 2**	**1**

Lab Objective: Students will learn about

1	Designing and plot the frequency response curve for single-stage (CE) and multistage (CE-CE) amplifiers with and without feedback.
2	Designing of OP-AMP based circuits including the parameters calculation.
3	Designing and analysis of circuits related to OP-AMP applications.
4	Designing of sinusoidal and non-sinusoidal oscillator circuits.
5	Simulation of amplifier and filter Circuits using simulation software.

List of Experiments

Sr. No.	**Name of Experiments**	**CO**
1	Design single-stage (CE) and multistage (CE-CE) amplifiers using 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.	**CO1**
2	Design Voltage series/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.	**CO1**
3	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. (ii) Voltage follower circuits for input voltage 1V.	**CO2**
4	Design a differential amplifier with ±12V DC power supply and calculate Common mode gain, differential mode gain, CMRR and slew-rate.	**CO2**
5	Design and analyze OP-AMP applications as a difference amplifier, integrator and differentiator Circuits for 1 KHz input signal.	**CO3**
6	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. (ii) Wien bridge oscillator uses R=4.7KΩ, C=0.01μF, and R_F=2R_1	**CO4**
7	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. (ii) For a Colpitts oscillator in which feedback network consists of two capacitors of 100pF and 20 pF with 100mH coil across these capacitors.	**CO4**
8	Design the following non-sinusoidal oscillators; Also verify the theoretical and practical Oscillating frequency. (i) For the UJT oscillator with R_E = 10 KΩ, η= 0.75, C=0.002μF. (ii) An astable multivibrator with component values: R_1 = 2 KΩ, R_2 = 20 KΩ, C_1 = 0.01 μF and C2 = 0.05 μF.	**CO4**

9	Simulation of single stage 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.)	**CO5**
10	Design and simulate of 2nd order Active Low and High pass filter for cut-off frequency 1kHz and pass band gain of 1.586, also draw the frequency response curve for each type.	**CO5**
11	**Mini Project:** Design a mini project using the applications of this Lab.	**CO5**
Lab Outcome: After successful completion of this Lab, students will be able to		
CO 1	Design and plot frequency response curve for single-stage (CE) and multistage (CE-CE) amplifiers with and without feedback.	
CO 2	Design of OP-AMP based circuits including the parameters calculation.	
CO 3	Design and analyze circuits related to OP-AMP applications.	
CO 4	Design and analyze sinusoidal and non-sinusoidal oscillator circuits.	
CO 5	Design and Simulate amplifier and filter Circuits using simulation software.	

B.TECH. SECOND YEAR			
Course Code	**AEC0454**	**L T P**	**Credit**
Course Title	**Microprocessor and Microcontroller Lab**	**0 0 2**	**1**

Lab Objective: The student will learn about

1.	8085 Microprocessor for writing assembly level language.
2.	Interfacing of various I/O devices with programming.
3.	The timer of 8051 microcontroller for generating waveforms.
4.	ARM Instruction Set for writing program.

List of Experiments

Sr. No.	Name of Experiments	CO
1	Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of following two Numbers i. 20 & 33, 57 & 87 ii. ABH & 27H, 2AH & C2H	**1**
2	Write a program using 8085 Microprocessor for addition and subtraction of following set of two BCD numbers. i. 33 & 99 ii. 78 & 42	**1**
3	Write a program of flashing LED connected to port 1 of the 8051 Micro Controller.	**2**
4	Write a program to generate 10 kHz square wave using 8051 microcontroller.	**3**
5	Write a program to show the use of INT0 and INT1 of 8051 microcontroller.	**2**
6	Write a program to generate a Ramp waveform of 1 KHz using DAC with 8051 micro controller.	**3**
7	To write and simulate ARM assembly language programs for data transfer, arithmetic and logical operations (Demonstrate with the help of a suitable program).	**4**
8	To write and simulate C Programs for ARM microprocessor using KEIL software. (Demonstrate with the help of a suitable program)	**4**
9	Write a program for Interfacing of temperature sensor with ARM freedom board (or any other ARM microprocessor board) and display object temperature on LCD.	**4**
10	**Case Study**: Implement an audio wave generator using PWM & ARM based development board.	**4**

Lab Outcome: After successful completion of this Lab students will be able to

CO 1	Apply the knowledge of 8085 Microprocessor for writing assembly level language.
CO 2	Analyze the interfacing of various I/O devices with programming.
CO 3	Implement timer in 8051 microcontroller for generating waveforms.
CO 4	Apply the knowledge of ARM Instruction Set to write the program for given application.

B.TECH. SECOND YEAR			
Course Code	**AEC0459**	**L T P**	**Credit**
Course Title	**IoT Lab with Mini Project**	**0 0 2**	**1**

Lab Objective: The students will learn about	
1.	The different types of sensors used for IoT applications.
2.	The operation and installation of different IoT development boards viz., Raspberry-Pi**, and STM32 discover board**
3.	Interfacing the various sensors with IoT development boards.
4.	To design and implement IoT system for real time applications.

List of Experiments

Sr. No.	**Name of Experiments**	**COs**
1.	Study of Raspberry Pi 4 and Operating systems for the same. Understand the process of OS installation for **Raspberry Pi**.	**CO2, CO4**
2.	Study of different sensors: - temperature sensor, biosensor, IR sensor, chemical sensor (PH), gauge sensor, ultrasonic sensor etc.	**CO1**
3.	Understand the connection and configuration of GPIO and its use in programming. Write an application of the use of push switch and LEDs.	**CO1, CO2**
4.	Understanding and connectivity of Raspberry-Pi with a Zigbee module. Write a network application for communication between two devices using Zigbee to on and off remote led.	**CO5**
5.	Interface stepper motor and seven segment displays with Raspberry Pi 4/STM32 discovery board and write a program to control the motion of motor and display number of rotations made by motor on 7 segment displays.	**CO5**
6.	Write an application using Raspberry Pi/ **STM 32 discovery board** for traffic signal monitoring and control system.	**CO5**
7.	Interface IR sensor to STM 32 discovery board. Write a program to detect obstacle using IR sensor and notify it using LED.	**CO3, CO5**
8.	Write an application using Raspberry Pi/**Discovery STM32 board** for smart health monitoring system which records heartbeat rate and temperature and sends SMS alerts if readings are beyond critical values.	**CO5**
9.	Create a simple web interface for Raspberry-Pi/**Discovery STM32 board** to control the connected LEDs remotely through the interface.	**CO5**
10.	Implement smart home automation system. The system automates home appliances and control them over internet from anywhere.	**CO5**
11.	Develop a Real time application like a smart home security. **Description:** When anyone comes at door the camera module automatically captures his image and sends a notification to the owner of the house on his mobile phone using GSM modem.	**CO5**

Lab Outcome: After successful completion of this Lab, students will be able to

CO1	The different types of sensors used for IoT applications.
CO2	The operation and installation of different IoT development boards viz., Raspberry-Pi **and STM32 discovery board**
CO3	Interfacing the various sensors with IoT development board.
CO4	To design and implement IoT system for real time applications.

B. TECH. SECOND YEAR

Course Code	ANC0402	L T P	Credits
Course Title	Environmental Science	2 0 0	0

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 develop the sense of awareness among the students about environment and its various problems.
3	To create positive attitude about environment among the student.
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

Pre-requisites: Basic knowledge of nature.

Course Contents / Syllabus

UNIT-I Basic Principle of Ecology — 8 Hours

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.

UNIT-II Natural Resources and Associated Problems — 8 Hours

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.

UNIT-III Biodiversity Succession and Non-Renewable Energy Resources — 8 Hours

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.

UNIT-IV Pollution and Solid Waste Management — 8 Hours

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 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-V Role of Community and Environmental Protection Acts — 8 Hours

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.

Course outcome: After completion of this course students will be able to

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
CO 3	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

Text books:

1. Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York.
2. Botkin, D.B and Kodler E.A., 2000, Environmental Studies: The earth as a living planet. John Wiley and Sons Inc.
3. Rao M.N. and H.V.N. Rao, 1989: Air Pollution, Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Singh J.S., Singh S.P. and Gupta S.R., 2006, Ecology Environment and Resource Conservation, Anamaya Publishers, New Delhi.
5.Environmental Studies -Benny Joseph-Tata McgrawHill-2005
6. Environmental Studies- Dr. D.L. Manjunath, Pearson Education-2006.
7. Environmental studies- R, Rajagopalan -Oxford Pubtiotion2005.

Reference Books:

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.
5.Principles of Environmental Sciences and Engineering -P. Venugoplan Rao, Prenitice Hall of India.
6. Environmental Science and Engineering Meenakshi, Prentice Hall India.

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=T21OO0sBBfc, https://www.youtube.com/watch?v=qt8AMjKKPDohttps://www.youtube.com/watch?v=yAK-m91Nxrshttps://www.youtube.com/watch?v=ha_O-1uOWkk, https://www.youtube.com/watch?v=brF0RWJyx9w
Unit 2	https://www.youtube.com/watch?v=mOwyPENHhbc, https://www.youtube.com/watch?v=yqev1G2iy20, https://www.youtube.com/watch?v=_74S3z3IO_I, https://www.youtube.com/watch?v=jXVw6M6m2g0
Unit 3	https://www.youtube.com/watch?v=GK_vRtHJZu4, https://www.youtube.com/watch?v=b6Ua_zWDH6U, https://www.youtube.com/watch?v=7tgNamjTRkk, https://www.youtube.com/watch?v=ErATB1aMiSU, https://www.khanacademy.org/science/high-school-biology/hs-ecology/hs-human-impact-on-ecosystems/v/conservation-and-the-race-to-save-biodiversity
Unit 4	https://www.youtube.com/watch?v=7qkaz8ChelI, https://www.youtube.com/watch?v=NuQE5fKmfME, https://www.youtube.com/watch?v=9CpAjOVLHII, https://www.youtube.com/watch?v=yEci6iDkXYw, https://www.youtube.com/watch?v=yEci6iDkXYw
Unit 5	https://www.youtube.com/watch?v=ad9KhgGw5iA, https://www.youtube.com/watch?v=nW5g83NSH9M, https://www.youtube.com/watch?v=xqSZL4Ka8xo, https://www.youtube.com/watch?v=WAI-hPRoBqs, https://www.youtube.com/watch?v=o-WpeyGlV9Y, https://www.youtube.com/watch?v=EDmtawhADnY

B.TECH. SECOND YEAR			
Course Code	**ANC0401**	**L T P**	**Credits**
Course Title	**Cyber Security**	**2 0 0**	**0**
Course Objective: Students will learn about			
Security of Information system and Risk factors and examine security threats and vulnerability in various scenarios, understand concept of cryptography and encryption technique to protect the data from cyber-attack and provide protection for software and hardware.			
Pre-requisites: Basics recognition in the domain of Computer Science. Concept of network and operating system. Commands of programming language.			
Course Contents / Syllabus			
UNIT-I	**INTRODUCTION**		**8 hours**
Introduction to Information Systems: Types of Information Systems, Development of Information Systems, Need for Information Security, Threats to Information Systems, Information Assurance, Guidelines for Secure Password and WI-FI Security and Social Media and Windows Security, Security Risk Analysis, and Risk Management.			
UNIT-II	**APPLICATION LAYER SECURITY**		**8 hours**
Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall , Intrusion Detection, Access Control, Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security, Threats to E-Commerce: Electronic Payment System, e- Cash, Issues with Credit/Debit Cards.			
UNIT-III	**SECURE SYSTEM DEVELOPMENT**		**8 hours**
Application Development Security, Architecture & Design, Security Issues in Hardware: Data Storage and Downloadable Devices, Mobile Protection, Security Threats involving in Social Media, Physical Security of IT Assets, Access Control, CCTV and Intrusion Detection Systems, Backup Security Measures.			
UNIT-IV	**CRYPTOGRAPHY AND NETWORK SECURITY**		**8 hours**
Public key cryptography: RSA Public Key Crypto with implementation in Python, Digital Signature Hash Functions, Public Key Distribution, Symmetric key cryptography: DES (Data Encryption Standard), AES (Advanced Encryption Standard),secure hash algorithm(SHA-1) Real World Protocols: Basic Terminologies, VPN, Email Security Certificates, Transport Layer Security, TLS, IP security, DNS Security.			
UNIT-V	**SECURITY POLICY**		**8 hours**
Policy design Task, WWW Policies, Email based Policies, Policy Revaluation Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the updated and new Policies. Recent trends in security.			
Course outcome: After completion of this course students will be able to			
CO 1	Analyze the cyber security needs of an organization.		K4
CO 2	Identify and examine software vulnerabilities and security solutions.		K1,K3
CO 3	Comprehend IT Assets security (hardware and Software) and performance indicators		K2
CO 4	Measure the performance and encoding strategies of security systems.		K3,k5
CO 5	Understand and apply cyber security methods and policies to enhance current scenario security.		K2, K3
Text books			

5) Charles P. Pfleeger, Shari LawerancePfleeger, “Analysing Computer Security”, Pearson Education India
6) V.K.Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India
7) Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House
8) Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage

Reference Books

5) Schou, Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw Hill.
6) CHANDER, HARISH,” Cyber Laws and It Protection”, PHI Learning Private Limited,Delhi
7) V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi
8) William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition,
9) 2010

Link:

6) https://www.youtube.com/watch?v=vv1ODDhXW8Q
7) https://www.youtube.com/watch?v=fQ3ESFfvchg&list=PLUtfVcb-iqn834VGI9faVXGIGSDXZMGp8
8) https://www.youtube.com/watch?v=iTVyKbDCJrA&list=PLgMDNELGJ1CbdGLyn7OrVAP-IKg-0q2U2
9) https://www.youtube.com/watch?v=1plMO7ChXMU&list=PLJ5C_6qdAvBFAuGoLC2wFGruY_E2gYtev
10) https://www.youtube.com/watch?v=_9QayISruzo

List of Open-Source Software/learning website:

- https://github.com/connectIOT/iottoolkit
- https://www.arduino.cc/ • http://www.zettajs.org/
- Contiki (Open source IoT operating system)
- Arduino (open source IoT project)
- IoT Toolkit (smart object API gateway service reference implementation)
- Zetta (Based on Node.js, Zetta can create IoT servers that link to various devices and sensors)

Certification Courses from Coursera:

Introduction to Artificial Intelligence (AI)	**8hrs**
Introducing AI, What is AI?, Tanmay's journey and take on AI, Impact and Examples of AI, Application Domains for AI, Some Applications of AI, More Applications of AI, Famous applications of AI from IBM	
Cognitive Computing (Perception, Learning, Reasoning) , Terminology and Related Concepts, Machine Learning, Machine Learning Techniques and Training, Deep Learning, Neural Networks, Key Fields of Application in AI, Natural Language Processing, Speech, Computer Vision, Self Driving Cars	
Issues and Concerns around AI , AI and Ethical Concerns, AI and Bias, AI: Ethics, Bias, and Trust, Jobs and AI, Employment and AI	
The evolution and future of AI, Future with AI, The AI Ladder - The Journey for Adopting AI Successfully, Advice for a career in AI, Hotbeds of AI Innovation Tanmay's Advice to Learn AI, Polong's Advice for a Job in AI	

Python Data Structure	**19 hrs**
Strings, Manipulating Strings, Worked Exercise	
Demonstration: Using the Python Playground Windows 10: Installing Python and Writing a Program, Windows: Taking Screen Shots Macintosh: Using Python and Writing a Program, Macintosh: Taking Screen Shots	
Files, Processing Files, Demonstration: Worked Exercise	
Lists, Manipulating Lists, Lists and Strings, Worked Exercise	
Dictionaries, Counting with Dictionaries, Dictionaries and Files, Worked Exercise: Dictionaries	
Tuples, Worked Exercise: Tuples and Sorting, Inventing JQuery, JavaScript Object Notation (JSON), The Greatest Taco in the World	

IoT Devices	**13hrs**
Welcome to Internet of Things, How the Internet Works, How Can Many Hosts Communicate?, What is a Protocol?, Protocol Stacks, Network Addressing, Addressing Layers, IoT Protocols, Intra-domain vs. Inter-domain, Example: XO Communications Backbone, Layer 2 vs Layer 3 Forwarding, Network Virtualization , Delivery Methods, Multicast Approaches	
Introduction to IoT Hardware Background: Electrical Circuit Design, Use Case: Something That Lights Up, Use Case: Something That Uses Electricity, Use Case: Something That Moves, Use Case: Something That Observes, Useful Circuits	
Integrated Circuits in Practice, Data Encoding: Challenges, Data Encoding: Approaches, Microcontrollers, Programmable Circuits	
IoT Platform Design and Programming, Arduino Programming	

Python Classes and inheritance	**17hrs**
Introduction to the Specialization, Welcome to Python Classes and Inheritance, How to Use the Interactive Textbook, User-Defined Classes, Adding Parameters to the Constructor, Adding Other Methods to a Class, Instance Variable Search Order Example: Creating Instances from Data, Converting an Object to a String, Special (underscore) Methods, Instances as Return Values, Sorting Lists of Instances, Class Variables and Instance Variables Thinking About Classes and Instances	
Inheriting Variables and Methods, Overriding Methods, Invoking the Parent Class's Method	
Introduction: Test Cases, The test, test Equal Function, Return Value Tests, Side Effect Tests, Program Development with Test Cases, Testing Classes, Conclusion: Test Cases, Exception Handling Flow-of-control, When to use Try/Except Handling Different Exception Types, Introduction to Django, How Django Uses Classes and Inheritance, Introduction - Final Course Project	

Data Structure	**25hrs**
Arrays, Singly-Linked Lists, Doubly-Linked Lists Stacks, Queues, Trees, Tree Traversal	
Dynamic Arrays, Amortized Analysis: Aggregate Method, Amortized Analysis: Banker's Method Amortized Analysis: Physicist's Method, Amortized Analysis	
Introduction, Naive Implementations of Priority Queues, Binary Trees, Basic Operations, Complete Binary Trees, Pseudocode, Heap Sort, Building a Heap, Final Remarks, Overview, Naive Implementations, Trees for Disjoint Sets, Union by Rank, Path Compression Analysis	
Applications of Hashing, Analysing Service Access Logs, Direct Addressing, List-based Mapping, Hash Functions, Chaining Scheme, Chaining Implementation and Analysis, Hash Tables, Phone Book Problem, Phone Book Problem – Continued, Universal Family, Hashing Integers Proof: Upper Bound for Chain Length (Optional) Proof: Universal Family for Integers (Optional) Hashing Strings, Hashing Strings - Cardinality Fix Search Pattern in Text, Rabin-Karp's Algorithm, Optimization: Precomputation, Optimization: Implementation and Analysis, Instant Uploads and Storage Optimization in Dropbox, Distributed Hash Tables	

Design-Led Strategy: Design thinking for business strategy and entrepreneurship	**20hrs**
Introduction to the course, Introduction to design thinking, Introduction to corporate strategy, Introduction to design strategy: corporate strategy meets design thinking The Ubank & Swiss Re stories, The design strategy framework Part 1, The design strategy framework Part 2	
Understanding the problem - do you have a headache or a migraine?, Who is your customer? Developing customer personas, The UBank/ Swiss Re experience - market research, What is a problem definition statement?	
What do we mean by prototype?, Defining your minimum viable product, High fidelity prototype vs low fidelity prototype, Testing your prototype on end-users and soliciting their feedback, Ideation, The UBank/ Swiss Re experience - prototyping	
Design strategy in the corporate context, Building real products using design strategy principles, Iterating and ideating using customer feedback, Embedding design strategy within business strategy	

The Arduino Platform and C Programming	**13hrs**
Introduction, Arduino Platform, Arduino Board Direct Programming, Arduino Schematics, Arduino IDE, Compiling Code, Arduino Shields and Libraries, Arduino Basic Setup	
Introduction, Setting Up Your Environment, Hello World, Variables, Basic C Operators, Conditionals, Loops, Functions, Global Variables	
Introduction, Arduino Toolchain, Cross-Compilation, Arduino Sketches, Classes Sketch Structure, Pins, Input and Output, Blink Example, Arduino Blink Example	
Introduction, Debugging Debug Environments, Debug via Serial, UART Protocol, UART Synchronization, UART Parity and Stop, Serial on Arduino, Reading from Serial	

The Raspberry Pi Platform and Python Programming for the Raspberry Pi	**11hrs**
Introduction, Raspberry Pi Board, Raspberry Pi Processor, Raspberry Pi vs. Arduino, Operating System Benefits, Processes, Raspberry Pi IoT, Raspberry Pi Setup, Raspberry Pi Configuration, Overclocking	
Introduction, Linux Basics, Login, Linux Filesystem, Navigating the Filesystem, Text Editors, Accessing Files, Permissions, Processes, Linux Graphic User Interface	
Introduction, Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions, Function Arguments, Lists, List Methods, Control Flow	
Introduction, General Purpose IO Pins, Protocol Pins, GPIO Access, General Purpose IO Pins, Pulse Width Modulation, Demo of a Blink, Graphic User Interface, Tkinter Library, Interaction	