TRIPURA UNIVERSITY
(A CENTRAL UNIVERITY)

CURRICULUM STRUCTURE

OF

4 YEARS

BACHELOR OF TECHNOLOGY

DEPARTMENT OF ELECTRICAL &

COMPUTER SCIENCE ENGINEERING

(ECSE)

3rd Semester

2021

THIRD SEMESTER

Sl. No.	Course Category	Subject Code	Subject Title	L	T	P	Contact Hours/week	Credit	Full Marks
1.	Humanities Science - 2	HS 301	Effective Technical Communication	3	0	0	3	3	100
2.	Basic Science - 7	BS 302	Mathematics-III	2	1	0	3	3	100
3.	Basic Science - 8	BS 303	Biology for Engineers	2	0	0	2	2	100
4.	Engineering Science - 5	ES 304	Engineering Mechanics	2	1	0	3	3	100
5.	Program Core - 1	PC ECS 305	Introduction to Electrical Engineering with Computer Science (ECS)	3	1	0	4	4	100
6.	Program Core - 2	PC ECS 306	Analog & Digital Electronics	3	0	0	3	3	100
7.	Program Core - 3	PC ECS 307	Computer Organization & Architecture	2	0	0	2	2	100
8.	Program Core - 4	PC ECS 308	Electrical Engineering with Computer	0	0	2	2	1	100
9.	Program Core - 5	PC ECS 309	Electronics Lab	0	0	2	2	1	100
10.	Mandatory Course - 3	MC 310	Indian Constitution	2	0	0	2	0	100
			Total :	**19**	**3**	**4**	**27**	**22**	**1000**

Effective Technical Communication

Course Code	HS 301
Course Title	Effective Technical Communication
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	1st year B.Tech
Course Category	Humanities Science (HS)
Number of classes	36 Hours

Course Outcomes:

At the end of the course, the student will be able to –

CO Number	CO Description	K-level
CO-1	Understand the nature and objective of Technical Communication relevant for the work place as Engineers	K2
CO-2	Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.	K3
CO-3	Develop effective verbal and non-verbal communication skills.	K3
CO-4	Analyze ethical, legal, cultural, and global issues affecting Technical Communication and Develop appropriate life skills.	K4

Course Content:

Module 1: Essentials of Communication (09 Hours)

What is Communication, Process of Communication, Levels of communication, The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group) Communication Barriers to communication, Non-verbal Communication, , Technology Enabled communication, Impact of Technology, Selection of appropriate communication Technology, Importance of Technical Communication, Differences between general and technical communication.

Module 2: Technical Writing Skills (09 Hours)

Technical writing process – Choosing right words, phrases and sentence patterns, clarity of purpose, planning content, effective style of writing, formatting, proofreading.

Technical Reports & Proposals: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Writing of Reports & Proposals.

Business letters:Sales & Credit letters; Claim and Adjustment Letters; Letters of Enquiry, Order Placement letters

Email Writing: Reasons for popularity; guiding principles for composition; some common pitfalls; maintaining common etiquette.

Module: 3 Workplace Communication (09 Hours)

Applying for a job: Skimming advertisements; Writing job applications; Preparing CV, Resume.

Group Discussions: Group Discussion types; GD as a part of selection process; Key skills to succeed in group discussions; Dos and Don'ts of group discussions; Use of body language in GDs.

Job Interviews: Objectives; Types; Stages of Interview, Face to face Interviews; Telephonic Interviews.

Effective Business Presentations: Importance in workplace communication; Planning, Preparing, Organizing, Rehearsing, and Delivering Oral presentations, Handling Questions; Visual aids in presentations; Power Point Presentations

Ethics in Communication: Communication challenges in culturally diverse workforce; Bias-free communication

Module: 4 Developing soft skills/ Life Skills (09 Hours)

Introduction to soft skills: Soft skills as a competitive weapon in today's changing workplace.
Classification of soft skills: Time management, Attitude, Responsibility, Ethics & Values, self-confidence, Teamwork and Interpersonal skills, Problem solving skills.
Personality Development: Developing Right personality to enhance Life Skills, Personality types; Personality attributes; and Leadership Qualities.

Body Language : Emotions displayed by body language: Aggressive, Submissive, Attentive, Nervous, Upset, Bored, Relaxed, Defensive; Hand Shake; Eye Contact; Posture and Positioning.

Personality traits and soft skills in early stages of career advancement and for future career advancement.

List of Software/Learning Websites

1. http://www.free-english-study.com/
2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/
4. http://www.talkenglish.com/
5. http://www.learnenglish.de/

Recommended Books:

1) Sanjay Kumar & Pushp Lata Communications Skills , 2nd Edition, Oxford University Press
2) Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3) Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press.
4) Personality Development, Harold R. Wallace & L. Ann Masters, Cengage Learning, NewDelhi.
5) Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
6) Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
7) Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, McGraw Hill & Co. Ltd., 2001, New Delhi.
8) A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
9) Skills for Effective Business Communication by Michael Murphy, Harward University, U.S

Mathematics-III

Course Code	BS 302
Course Title	Mathematics-III
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	B.Tech 1st Year Mathematics
Course Category	Basic Science (BS)
Number of classes	36 Hours

Course Outcome :-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Solve problems in 1st and 2nd order linear Partial Differential Equations	K3
CO-2	Show Fourier series expansion of a given function and solve PDEs by variables separable method	K3
CO-3	Identify mean and variance of a given probability distribution	K3

CO-4	Solve numerically algebraic/transcendental equation and ordinary differential equations	K3

Course Content:-

Module 1: Partial Differential Equations **(10 Hours)**

First order partial differential equations, solutions of first order linear and quasi-linear partial differential equation (Pp + Qq =R) by Lagrange method. Homogeneous and non-homogeneous type of second order linear differential equation with constant coefficients by complimentary function and particular integral method.

Module 2: Fourier series **(08 Hours)**

Expansion of a function in Fourier series for a given range - Half range sine and cosine expansions. One-dimensional wave equation and one-dimensional heat flow equation - method of separation of variables - Fourier series solution.

Module 3: Probability **(08 Hours)**

Classical and axiomatic definition of probability, conditional probability, Bayes' theorem, independent events, random variables, expectation and higher order moments, probability mass function and probability density function, distribution function, Sample space, Events, Random Variables; Definitions of probability, conditional Probability, examples of discrete and continuous distributions: Normal, Poisson, Binomial distributions.

Module 4: Numerical Analysis **(10 Hours)**

Numerical solution of algebraic and transcendental equations by Regula-Falsi method Newton-Raphson's method; Finite Differences - Newton's Forward, backward difference interpolation formulae - Lagrange interpolation; Numerical Integration with Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule; Solving first order differential equations –Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta method of 4th order.

References / Suggested Learning Resources:-

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 1965.
2. Rajnish Verma & H.K. Dass, Higher Engineering Mathematics, S Chand, 2014.
3. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993
4. Jain, Iyengar and Jain, Numerical methods for Scientific and Engineering Computation, New Age International Publications, 2008.
5. Erwyn Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition, 2008.

Biology for Engineers

Course Code	BS-303
Course Title	Biology for Engineers
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	Basic Science (BS)
Number of classes	26 Hours

Course Outcome:

After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Demonstrate the understandingof biology and its branches, major classifications of life,Cells, Cellular systems their functions and biological molecules.	K2
CO-2	Illustrate the molecular basis of genetic information and the flow of genetic information from DNA to RNA to protein and the concept of mutations, re-combinations and its applications.	K2
CO-3	Classify microorganisms, growth, nutrition with their various methods used for the isolation, identification, control and maintenance of microbial cultures.	K4
CO-4	Explain the fundamental principles of energy transactions in physical and biological and physiological systems, basic metabolisms.	K2

Course Content:

Module 1: Introduction to Biology, Classification and Biomolecules (8 Hours)

Detailed content of the module: Introduction to Biology and its branches. Molecular taxonomy- three major kingdoms of life. Prokaryotic and Eukaryotic cells. Energy and Carbon utilization. Cells: Animal and Plant cell structures and functions. Cell cycle and Cell division. Transport across cell membrane. Cell signaling. Molecules of life. Monomeric units and polymeric structures. Sugars, starch and cellulose. Lipids, Amino acids and proteins. Nucleotides, DNA and RNA. Proteins- structure and function. Proteins as enzymes, transporters, receptors and structural elements. Enzyme classification. Mechanism of enzyme action. Enzyme kinetics.

Module 2: Fundamentals of genetics and flow of information (6 Hours)

Detailed content of the module: General principles of genetics, Concept of segregation and independent assortment. Molecular basis of information transfer, molecular basis of coding and decoding genetic information. DNA as genetic material. Concept of genetic code. Define gene in terms of complementation and recombination. Mutation. Recombinant DNA technology. Gene mapping. Application of recombinant DNA technology, recombinant products available in the market and at laboratory scale.

Module 3: Microbiology and applications (6 Hours)

Detailed content of the module: Microorganisms and environment: Identification and classification of microorganisms. Ecological aspects of single celled organisms. Microbial integrations. Growth, nutrition and reproduction. Growth kinetics. Isolation and identification of microorganisms. Pure cultures and their characteristics. Maintenance of cultures. Sterilization. Physical and chemical methods of control of microorganisms. Management of toxic industrial wastes.

Module 4: Fundamentals of energy transaction and metabolism (6 Hours)

Detailed content of the module: Thermodynamics –laws and its application in biological systems. Energy yielding and energy consuming biochemical processes.
Metabolism- Glycolysis & Krebs cycle, Role of ATP and concept of energy change. Equilibrium constant. Physiological steady-state, Living body as a thermodynamic system.
Fundamental aspects of analysis of living systems; quantitative aspects of physiology and engineering applications to clinical medicine based on body fluid balance, solute transport, basic endocrinology, reproduction physiology, neurophysiology, skeletal and smooth muscle physiology.

References / Suggested Learning Resources:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd. 12th Edition, 2020

2. Guyton and Hall, Medical Physiology, 14th Edition, Elsevier Saunders, 2020

3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.

4. Principles of Genetics, D. Peter Snustad and Michael J. Simmons. 7th Edition, Wiley Publisher, 2015

5. Prescott's Microbiology, Joanne Willey and Kathleen Sandman and Dorothy Wood, 2020. 11th Edition McGraw Hill

Engineering Mechanics

Course Code	ES 304
Course Title	Engineering Mechanics
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	---
Course Category	Engineering Science (ES)
Number of classes	36 Hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Differentiate coplanar, concurrent & non-concurrent forces and their resultants and confidently tackle equilibrium equations and its applications.	K3
CO-2	Explain centroid of simple figures, centre of gravity, moment of inertia of composite sections & mass moment of inertia of circular plates, cylinder, cone, sphere & hook.	K2
CO-3	Analyze simple truss, compound truss, frame & virtual work.	K4
CO-4	Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, analyze D'Alembert's principle and differentiate longitudinal, transverse, torsional and damped vibrations.	K2

Course Content:-

Module 1: Fundamentals of Engineering Mechanics (09 Hours)

-Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

-Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Module 2: Centre of Gravity & Moment of Inertia (09 Hours)

-Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications;
-Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Module 3: Trusses, Frames & Virtual Work (09 Hours)

-Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;

-Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

Module 4: Dynamics & Mechanical Vibrations (09 Hours)

Dynamics - Basic terms & General principles of dynamics, Types of motion, Instantaneous centre of rotation in plane motion, D'Alembert's principle and its application, Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

-Vibration - Basic concepts of Longitudinal, Transverse and Torsional vibrations, Free & Forced vibration, Resonance and its effects, Damped vibration.

Text Books / References:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications
11. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education.
12. Bansal R.K. (2010), A Text Book of Engineering Mechanics by Laxmi Publications.
13. Irving, H.Shames, Engineering Mechanics-Statics and Dynamics, by Prentice-Hall of India.
14. Khurmi R. S. (2010), Engineering Mechanics, S. Chand & Co.
15. NPTEL web or video courses on Engineering Mechanics.
16. Timoshenko & D.H.Young, Engineerring Mechanics,Tata McGraw-Hill publishing Co. Ltd.

Introduction to Electrical Engineering with Computer Science (ECS)

Course Code	PE ECS 305
Course Title	Introduction to Electrical Engineering with Computer Science (ECS)
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	Basic Electrical, Linear Algebra & Differential Equation
Course Category	Program Core (PC)
Number of classes	48 Hours

Course Outcome:

After completion of the course, students will be able to:

CO Number	CO Description	K-level

CO-1	Learn and use the fundamental design principles of modularity and abstraction in a variety of contexts from electrical engineering and computer science.	K3
CO-2	Demonstrate the interdependency of electrical engineering and computer science, including modern software engineering, linear systems analysis, electronic circuits, and decision-making.	K3
CO-3	Analyze which aspects of the real world are important to the problem being solved and to design models in ways that give insight into the problem.	K5
CO-4	Compare the different types of Electrical systems with the help of Computer programming and modeling and evaluate various parameters from the design.	K6

Course Content:

Module-1:Introduction to Electrical Engineering with Computer Science (ECS) (10 Hours)

ECS scope and utilities. Passive & active electrical component, Ohms Law, KCL & KVL, Mesh analysis, Reducing Electrical Circuits to system of Linear equations, 1st order and 2nd order Response of Electrical Circuits.

Module-2: Application of Complex number & Linear Algebra in solving Electrical Circuits

(12 Hours)

Complex numbers in rectangular or polar form;concept of complex functions; domain and range;limit of a complex function, analytic functions, derivative of complex functions using Cauchy Riemann conditions and rules of taking derivative; Application of complex variables to solve problems in Electrical circuits. Matrices**,** Types of matrices, arithmetic operations on matrices, Eigen Values and Eigen vectors, Application of linear Algebra in solving problems of Electrical circuits.

Module-3: Application of Differential equations in solving Electrical Circuits (12 Hours)

Concept of partial differential equations; Natural Response of RL, RC and RLC circuits; Forced response of RL, RC and RLC circuits; Design of 1st- and 2nd order networks in the time and frequency domains; Application of Laplace Transform in solving 1st and 2nd order Differential Equations.

Module-4: Application of Python Programming in solving Electrical Circuits (14 Hours)

Review of Trigonometry; Sine wave & Cosine Wave, AC Analysis, Lead, Lag, Complex number application in AC circuits, Complex rotation; Euler's formula; Complex exponential magnitude and spin; Concept of negative Frequency; AC analysis superposition, Impedance, Impedance of simple networks, Impedance Vs Frequency, KVL in frequency domain.

Python Programming: Libraries of Python: numpy, pandas, matplotlib; Solving Electrical Circuit Problem with Python and SchemDraw.

Text Books / References:

1. Circuit Theory (Analysis And Synthesis) by A. Chakrabarti, Publisher: Dhanpat Rai.
2. Engineering Circuit Analysis | 9th Edition by William H. Hayt Jr., Jack E. Kemmerly, Jamie D. Phillips, Steven M. Durbin.ISBN: 9789390185139.
3. Circuits, Matrices and Linear Vector Spaces by Lawrence P. Huelsman , Dover Publications,ISBN-10 : 048648534X, ISBN-13:978-0486485348
4. ELECTRICAL CIRCUIT ANALYSIS by Prof. Vishwajit K. Barbudhe,Publisher: Notion Press, Edition: 2020 ISBN: 9781648692413
5. Python Programming: Problem Solving, Packages and Libraries, by Anurag Gupta & G P Biswas, Publisher: Tata McGraw Hill; 1st Edition (1st August 2019), ISBN-10: 9353168007 ISBN-13: 978-9353168001.
6. "Learning Python" by Mark Lutz, David Ascher, Publisher: O'Reilly Media, Inc.

Analog & Digital Electronics

Course Code	PE ECS 306
Course Title	Analog & Digital Electronics
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Basic Electronics, Boolean Algebra.
Course Category	Program Core (PC)
Number of classes	38 Hours

Course Outcome:

After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Describe diode circuits along with the ability to construct different types of rectifiers, filter circuits.	K3
CO-2	Demonstrate different methods of biasing BJT, FET &construct h-parameter, hybrid-pi models of transistor. Analyze frequency response, gain, input and output impedance of amplifier to design simple amplifier circuits.	K4
CO-3	Differentiate between Analog & Digital Circuits, design Logic gates and analyze Combinational Circuits.	K5
CO-4	Construct Sequential Circuits & Interface Circuits, evaluate their operation and compare their different types.	K6

Course Content:

Module 1: Semiconductor Physics & Study of Rectifiers & Filters (10 Hours)

Introduction to semiconductor Energy level, Energy band, doping,Piece wise diode characteristics, Junction capacitances, Biasing of diode, Breakdown mechanisms in diode, application of different breakdown diodes, clipper & Clamper circuits. Introduction to rectifiers, Derivation of rectifier's efficiency, ripple factor,PIV,

Designing of full, half, center-tapped and bridge rectifiers, Study and designing of RC,RL, RLC filter circuits.

Module 2:Bipolar Junction Transistor & Field Effect Transistor (10 Hours)

Introduction to working and structure of NPN &PNP transistor, Different configurations of NPN & PNP transistors, Biasing of BJT, Early effect, Punch Through, Darlington pair, h-parameter analysis of BJT. Application of transistor as an amplifier. Introduction to MOSFET structure and its operation. Derivation of MOSFET capacitances, Types of MOSFET and their operation. Introduction to structure and working of field effect transistor,Analysis and design of different biasing circuits for FET amplifiers.

Module 3: Digital Logic Circuits & Combination Circuits (08 Hours)

Difference between Analog & Digital signals, AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra. K-map representation and simplification of logical functions Don't care conditions, X-OR & X-NOR simplification of K-maps. Combinational Circuits:Multiplexers, de-multiplexers, Decoders & Encoders, Adders &subtractors, Code Converters, comparators, Flip Flops: S-R, J-K, D & T flip-flops, excitation table of a flip-flop, race around.

Module 4: Sequential Circuits & Interface Circuits (10 Hours)

Sequential Circuits:Shift registers, Ripple counter, Synchronous counters. State table, Statediagram, State assignment & reduction. Interface circuits:Digital to Analog converter (DAC) - weighted resistor method, R-2R ladder method; Analog to Digital converter (ADC) - parallel comparator method, counter method, successive approximation method, dual-slope method.

Text Books / References*:*

1. Taub & Schelling - Digital Integrated Electronics – McGraw Hill International Edition
2. Malvino & Leach - Digital Electronics and Circuit design — TMN
3. G. Gopalan - Introduction to Digital Microelectronics Circuits
4. Ranbaey - Digital Integrated Circuits: A Design Perspective — PHI
5. Digital Logic Design, M. Morris Mano, PHI
6. Modern Digital Design, R.P. Jain, TMH.
7. Digital Circuits and Design, S. Salivahanan & S. Arivazhagan, Vikas Publishing.
8. Digital Circuits: An Introduction Part -1 & 2, D. Roychaudhuri, Eureka Publisher.

9. Digital Systems, Principles and Applications, Ronald J Tocci , PHI

10. Integrated Electronics, Millman & Hailkias : TMH.

11. Electronic Devices And Circuits, Salivahanan, Kumar & Vallavaraj: TMH

12. Electronic Devices & Circuits, Boylestead & Neshelsky : PHI

13. Electronic Circuits , Discrete & Integrated, Schilling & Belove: TMH

14. Electronic Fundamentals & Applications, Chattopadhyay & Rakhshit, New Age.

Computer Organization & Architecture

Course Code	PC ECS 307
Course Title	Computer Organization & Architecture
Number of Credits	2(L: 2, T: 0, P: 0)
Prerequisites	Physics, Mathematics
Course Category	Program Core (PC)
Number of classes	26 Hours

Course Outcome:

After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Identify various components of computer and their interconnection.	K2
CO-2	Demonstrate of I/O organization and interconnection structures of computer system.	K3
CO-3	Compare and select various Memory devices as per requirement.	K6
CO-4	Apply various critical operations involved in the execution of a process.	K3

Course Content:

Module 1: Introduction to Computer Organization & Architecture (06 Hours)

Basic organization of computers, Integer representation, 1's and 2's complement arithmetic, Multiplication of signed binary numbers, Fixed- point arithmetic: Addition, Subtraction, Booth's multiplication algorithm and Division algorithm; Floating point representation (IEEE 754), floating point number arithmetic.

Module 2: I/O organization and interconnection structures of computer system. (07 Hours)

Arithmetic Logic Units control and data path, data path components, design of ALU and data path; Hardwired control unit, Micro-programmed control unit; Machine instructions, Fetch, decode and execute cycle, Instruction formats, Addressing modes, Instruction execution with timing diagram, Introduction to RISC versus CISC architectures.

Module 3: Introduction to various memory devices (07 Hours)

Memory Technology and memory classification, static and dynamic memory, Random Access Memory, Address decoding, Registers and stack, Magnetic memories - Disk and tape Units, Concept of memory map, Cache memory and Memory Hierarchy, Address Mapping, Cache updation schemes, Virtual memory and memory management unit.

Module 4: Introduction to I/O subsystems (06 Hours)

I/O subsystems: Interfacing with IO devices; Basic concepts Bus Control, Read Write operations, Programmed IO, Concept of handshaking, Polled and Interrupt -driven I/O, DMA data transfer, Concept of Parallel Processing, Pipeline Processing, Instruction and Arithmetic Pipeline, Pipeline hazards and their resolution.

Text Books / References:

1. Computer Organization by V. Carl Hamacher, Safwat G. Zaky and Zvonko G. Vranesic , McGraw-Hill series (2002)
2. Computer System Architecture by Mano, M.M., Prentice Hall of India, New Delhi.
3. William Stallings (2010), Computer Organization and Architecture- designing for performance, Prentice Hall, New Jersy
4. Kai Hwang and F A Briggs-Computer Architecture and parallel processing, McGraw Hills.
5. Computer Architecture and Organization, by Hayes, J.P.1998, McGraw –Hill.
6. Operating System Concept, Abraham Silberschatz.

Electrical With Computer Science (ECS) Laboratory

Course Code	PC ECS 308
Course Title	Electrical With Computer Science (ECS) Laboratory
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Basic Electrical Engineering, Basics of Computer Programming
Course Category	Program Core (PC)
Number of classes	24 Hours

Course Outcome :-

After completion of the course in Electrical with Computer Science (ECS) Laboratory, students will be able to:

CO No	CO Description	K-level
CO-1	Solve Numerical Based on Electrical Circuits using Python Programming	K3
CO-2	Create electrical Circuits by Writing Python Programming	K5
CO-3	Verify the various Theorems related to Electrical Circuits Using Python Programming	K6
CO-4	Compare Theoretical and Practical Data for various electrical parameters.	K6

List of Experiments:

1. Write a Program in Python and Design Electrical Circuit using SchemDraw and verify Ohm's Law.
2. Write a Program in Python and Design Electrical Circuit using SchemDraw and verify KCL & KVL.
3. Write a Program in Python and Design Electrical Circuit using SchemDraw and verify Superposition Theorem
4. Write a Program in Python and Design Electrical Circuit using SchemDraw and verify Maximum Power Transfer Theorem.
5. Write a Program in Python and Design Electrical Circuit using SchemDraw and verify Thevenin's Theorem.
6. Write a Program in Python and Design Electrical Circuit using SchemDraw and verify Norton Theorem.
7. Solve Problem in Electrical Circuits using Mesh Analysis using Python Programming.
8. Solve Problem in Electrical Circuits using Nodal Analysis using Python Programming.
9. Evaluate various electrical parameters of given Circuit using Python Programming
10. Build an R-L-C circuit using Python Programing and analyze the frequency Response.

References / Suggested Learning Resources:-

1. Circuit Theory (Analysis And Synthesis) by A. Chakrabarti, Publisher: Dhanpat Rai.
2. Engineering Circuit Analysis | 9th Edition by William H. Hayt Jr., Jack E. Kemmerly, Jamie D. Phillips, Steven M. Durbin. ISBN: 9789390185139.
3. Circuits, Matrices and Linear Vector Spaces by Lawrence P. Huelsman , Dover Publications, ISBN-10 : 048648534X, ISBN-13: 978-0486485348
4. ELECTRICAL CIRCUIT ANALYSIS by Prof. Vishwajit K. Barbudhe, Publisher: Notion Press, Edition: 2020 ISBN: 9781648692413
5. Python Programming: Problem Solving, Packages and Libraries, by Anurag Gupta & G P Biswas, Publisher: Tata McGraw Hill; 1st Edition (1st August 2019), ISBN-10: 9353168007 ISBN-13: 978-9353168001.
6. "Learning Python" by Mark Lutz, David Ascher, Publisher: O'Reilly Media, Inc.

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Electronics Laboratory

Course Code	PC ECS 309
Course Title	Electronics Laboratory
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Physics, Analog & Digital Electronics.
Course Category	Program Core (PC)
Number of classes	24 Hours

Course Outcome:-

After completion of the course in Electronics Laboratory, students will be able to:

CO No	CO Description	K-level
CO-1	Design Half Wave, Full wave, Centre Tapped, Bridge rectifier with different filters, Clipper & clamper Circuits.	K5
CO-2	Analyse Amplifier Configurations and performance of Darlington Pair.	K4
CO-3	Verify the truth table of different logic gates & Various Flip-flops, Laws of Boolean Algebra.	K6
CO-4	Analyse the performance of combinational Circuits, ADC & DAC.	K4
CO-5	Create simulation model using Pspice OR Equivalent Simulation CAD Software.	K5

List of Experiments:

1. Design Half Wave, Full wave, Centre Tapped, Bridge rectifier with different filters.
2. Design Clipper & Clamper Circuits.
3. Study the Characteristics of Simple BJT amplifier configurations (CB, CC, CE).
4. Design of Biasing Circuit for BJT.
5. Analysis of Darlington configuration.
6. Study of different basic digital logic gates and verification of their Truth Table
7. Study and verification of the law of Boolean Algebra and De-Morgan's Theorem
8. Construction and verification of various combinational circuits such as Half Adder, Full Adder, Half & Full Sub tractor, Different Code Converters, Encoder, Decoder, Magnitude Comparator, Multiplexer, De-multiplexer
9. Construction and verification of various types of Flip-Flops using gates and IC's
10. Study of different types of ADC and DAC.
11. Design and Simulation using Pspice OR Equivalent Simulation CAD Software of the above experiments.

References / Suggested Learning Resources:-

1. Electronic Devices And Circuits, Salivahanan, Kumar & Vallavaraj: TMH
2. Digital Logic Design, M. Morris Mano, PHI
3. Electronic Circuits , Discrete & Integrated, Schilling & Belove: TMH
4. Hands-On Electronics: A Practical Introduction to Analog and Digital Circuits, Daniel M. Kaplan, Cambridge University Press; 1st edition (June 23, 2003).

5. Electronic Devices & Circuits, Boylestead & Neshelsky : PHI
6. Integrated Electronics, Millman & Hailkias : TMH.

Indian Constitution

Course Code	MC 310
Course Title	Indian Constitution
Number of Credits	0 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Mandatory Course (MC)
Number of classes	25 Hours

Course Outcome:-

After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Explain about framing and nature of Indian Constitution.	K2
CO-2	Identify the fundamental rights and duties of individual and demonstrate the knowledge on Directive Principles of State Policy.	K3
CO-3	Outline the Federal Structure, Centre- State relation, Union Executive and Amendment Procedure	K2
CO-4	Demonstrate the meaning of local self govt., types of local self govt. in rural and urban areas.	K2

Course Content:

Module 1: Constitutional Framework (05 Hours)

1. Meaning of Constitutional Law and Constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features of the Constitution of India.

Module 2: Fundamental Rights, Duties and Directive Principles of State Policy (06 Hours)

1. Fundamental Rights- Articles 14, 19 and 21.
2. Fundamental Duties.
3. Directive Principles of State Policy; Its Legal Status and Significance

Module 3: Nature of India's Political system (07 Hours)

1. Federal structure, Distribution of Legislative and Financial Powers between the Union and States.
2. Parliamentary Form of Government- Powers and Position of President of India.
3. Emergency Provisions.
4. Amendment Procedures of the Constitution of India.

Module 4: Rural and Urban Local Self Govt. (07 Hours)

1. 73rd Amendment of the Constitution and Panchayati Raj Institutions.
2. 74th Amendment of the Constitution and Urban Local Self Govt. (Municipal Corporation, Municipal Council and Nagar Panchayat).
3. TTAADC

References / Suggested Learning Resources:

1. Fadia, B.L- "Indian Govt. and Politics"Sahitya Bhawan, Agra.
2. D.D.Basu- "An introduction to the Constitution of India"Lexis Nexis publichers.
3. M.V.Pylee- "Constitutional Govt. in India"S.Chand and Company Ltd.
4. S.C.Kashyap(ed)- "Perspectives on the constitution"Shipra Publication.
5. B.K. Sharma- "Introduction to the Constitution of India"Prentice Hall India Private Ltd.
6. Bhattacharya, D.C. and Banerjee, Malay- "Indian Govt. and Politics"Vijaya Publishing House
7. J.C. Johari- "Indian Govt. and Politics" (2 vols)
8. Das Nityananda- "Grassroot Democracy and Panchayati Raj in Tripura" Progressive Publichers

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