EVALUATION SCHEME AND SYLLABI

For

B. E. 1ST Year

Common to All Branches (CSE, Data Science, AI & ML)

Effective from the Session: 2025-26

B.E. First Year, Semester- I
(All Branches)

3- WEEKS STUDENT INDUCTION PROGRAMME in the beginning of the session													
								Evaluation Scheme					
SN	Subject Code	Subject Name	Type	Category	Period			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total	Credit
					L	T	P	CT	TA	CT+TA	TE/PE	SW+ESE	Cr
1.	BAS101/ BAS102	Engineering Physics/ Engineering Chemistry	T	BS	3	1	0	15	10	25	75	100	4
2.	BAS103	Engineering Mathematics-I	T	BS	3	1	0	15	10	25	75	100	4
3.	BEE101/ BEC101	Fundamentals of Electrical Engineering/ Fundamentals of Electronics Engineering	T	ES	2	1	0	15	10	25	75	100	3
4.	BCS101/ BME101	Programming for Problem Solving/ Fundamentals of Mechanical Engineering	T	ES	2	1	0	15	10	25	75	100	3
5.	BAS104/ BAS105	Environment and Ecology/ Soft Skills	T	BS/ HS	3	0	0	15	10	25	75	100	3
6.	BAS151/ BAS152	Engineering Physics Lab/ Engineering Chemistry Lab	P	BS	0	0	3	-	25	25	75	100	1
7.	BEE151/ BEC151	Basic Electrical Engineering Lab/ Basic Electronics Engineering Lab	P	ES	0	0	3	-	25	25	75	100	1
8.	BCS151/ BAS155	Programming for Problem Solving Lab/ English Language Lab	P	ES/ HS	0	0	3	-	25	25	75	100	1
9.	BCE151 / BWS151	Engineering Graphics & Design Lab/ Workshop Practice Lab	P	ES	0	1	3	-	25	25	75	100	2
					13	5	12			225	675	900	22

Note: Abbreviation Used:
BS: Basic Science Course
ES: Engineering Science Course
HS: Humanities and Social Science Course
VA: Value Added Course

B.E. First Year, Semester- II
(All Branches)

								Evaluation Scheme					
SN	Subject Code	Subject Name	Type	Category	Period			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination	Total	Credit
					L	T	P	CT	TA	CT+TA	TE/PE	SW+ESE	Cr
1.	BAS202/ BAS201	Engineering Chemistry / Engineering Physics	T	BS	3	1	0	15	10	25	75	100	4
2.	BAS203	Engineering Mathematics-II	T	BS	3	1	0	15	10	25	75	100	4
3.	BEC201/ BEE201	Fundamentals of Electronics Engineering / Fundamentals of Electrical Engineering	T	ES	2	1	0	15	10	25	75	100	3
4.	BME201/ BCS201	Fundamentals of Mechanical Engineering/ Programming for Problem Solving	T	ES	2	1	0	15	10	25	75	100	3
5.	BAS205/ BAS204	Soft Skills / Environment and Ecology	T	HS/ BS	3	0	0	15	10	25	75	100	3
6.	BAS252/ BAS251	Engineering Chemistry Lab / Engineering Physics Lab	P	BS	0	0	3	-	25	25	75	100	1
7.	BEC251/ BEE251	Basic Electronics Engineering Lab/ Basic Electrical Engineering Lab	P	ES	0	0	3	-	25	25	75	100	1
8.	BAS255/ BCS251	English Language Lab / Programming for Problem Solving Lab	P	HS/ ES	0	0	3	-	25	25	75	100	1
9.	BWS251/ BCE251	Workshop Practice Lab / Engineering Graphics & Design Lab	P	ES	0	1	3	-	25	25	75	100	2
10.	BVA251/ BVA252	Sports and Yoga / NSS	P	VA	0	0	3		100	*100		*100	0
					13	5	12+ 3*			225+ *100	675	900+ *100	22

*Compulsory Qualifying Audit Course

Abbreviation Used:
BS: Basic Science Course, ES: Engineering Science Course, HS: Humanities and Social Science Course
VA: Value Added Course

Summer Internship (4-week) / NPTEL Course (4-week) during summer break after Semester-II and same will be assessed/evaluated in the Semester-III

DETAILED SYLLABI

B. E. First Year
(For All Branches)

Effective from Session 2025-26

BAS101 / BAS201: ENGINEERING PHYSICS

Content	Contact Hours
Unit-1: Quantum Mechanics	9
Inadequacy of classical mechanics, Planck's theory of black body radiation(qualitative), Compton effect, de-Broglie concept of matter waves, Davisson and Germer Experiment, Phase velocity and group velocity, Time-dependent and time-independent Schrodinger wave equations, Physical interpretation of wave function, Particle in a one-Dimensional box.	
Unit-2: Electromagnetic Field Theory	8
Basic concept of Stoke's theorem and Divergence theorem, Basic laws of electricity and magnetism, Continuity equation for current density, Displacement current, Maxwell equations in integral and differential form, Maxwell equations in vacuum and in conducting medium, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Plane electromagnetic waves in conducting medium, Skin depth.	
Unit-3: Wave Optics	10
Coherent sources, Interference in uniform and wedge-shaped thin films, Necessity of extended sources, Newton's Rings and its applications, Introduction to diffraction, Fraunhoffer diffraction at single slit and double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power, Rayleigh's criterion of resolution, Resolving power of grating.	
Unit-4: Fiber Optics & Laser	9
Fiber Optics: Principle and construction of optical fiber, Acceptance angle, Numerical aperture, Acceptance cone, Step index and graded index fibers, Fiber optic communication principle, Attenuation, Dispersion, Application of fiber. Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Population inversion, Einstein's Coefficients, Principles of laser action, Solid state Laser (Ruby laser) and Gas Laser (He-Ne laser), Laser applications.	
Unit-5: Superconductors and Nano-Materials:	8
Superconductors: Temperature dependence of resistivity in superconducting materials, Meissner effect, Temperature dependence of critical field, Persistent current, Type I and Type II superconductors, High temperature superconductors, Properties and Applications of Super-conductors. Nano-Materials: Introduction and properties of nano materials, Basics concept of Quantum Dots, Quantum wires and Quantum well, Fabrication of nano materials -Top-Down approach (CVD) and Bottom-Up approach (Sol Gel), Properties and Application of nano materials.	

Reference Books:

Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
Optics - Brijlal & Subramanian (S. Chand)
Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
Engineering Physics-Malik HK and Singh AK (Mc Graw Hill)

BAS102 / BAS202: ENGINEERING CHEMISTRY

Content	Contact Hours
Unit-1:	8
Atomic and Molecular Structure: Molecular orbitals of diatomic molecules, Bond Order, Magnetic characters and numerical problems. Chemistry of Advanced Materials: *Liquid Crystals;* Introduction, Types and Applications of liquid crystals, industrially important materials used as liquid crystals. *Graphite and Fullerene;* Introduction, Structure and applications. *Nanomaterials;* Introduction, Preparation, characteristics of nanomaterials and applications of nanomaterials, Carbon Nano Tubes (CNT), Green Chemistry: Introduction, 12 principles and importance of green Synthesis, Green Chemicals, Synthesis of typical organic compounds by conventional and green route (Adipic acid and Paracetamol), Environmental impact of green chemistry on society.	
Unit-2:	8
Spectroscopic Techniques and Applications: Elementary idea and simple applications of UV, IR and NMR, Numerical problems. Stereochemistry: Optical isomerism in compounds without chiral carbon, Geometrical isomerism, Chiral Drugs.	
Unit-3:	8
Electrochemistry and Batteries: Basic concepts of electrochemistry. *Batteries;* Classification and applications of Primary Cells (Dry Cell) and Secondary Cells (Lead Acid battery). *Corrosion:* Introduction to corrosion, Types of corrosion, Cause of corrosion, Corrosion prevention and control, Corrosion issues in specific industries (Power generation, Chemical processing industry, Oil & gas industry and Pulp & paper industries). Chemistry of Engineering Materials: *Cement;* Constituents, manufacturing, hardening and setting, deterioration of cement, Plaster of Paris (POP).	
Unit-4:	8
Water Technology: Sources and impurities of water, Hardness of water, Boiler troubles, Techniques for water softening (Lime-Soda, Zeolite, Ion Exchange and Reverse Osmosis process), Determination of Hardness and alkalinity, Numerical problems. Fuels and Combustion: Definition, Classification, Characteristics of a good fuel, Calorific Values, Gross & Net calorific value, Determination of calorific value by Bomb Calorimeter, Theoretical calculation of calorific value by Dulong's method, Ranking of Coal, Analysis of coal by Proximate and Ultimate analysis method, Numerical problems, Chemistry of Biogas production from organic waste materials and their environmental impact on society.	
Unit-5:	8

Materials Chemistry: *Polymers;* Classification, Polymerization processes, Thermosetting and Thermoplastic Polymers, Polymer Blends and Composites, Conducting and Biodegradable polymers, Preparation, properties, industrial applications of Teflon, Lucite, Bakelite, Kelvar, Dacron, Thiokol, Nylon, Buna-N and Buna-S and their environmental impact on society, Speciality polymers. Organometallic Compounds: General methods of preparation and applications of Organometallic compounds (RMgX and $LiAlH_4$).	

Reference Books:

Engineering Chemistry by Rath & Singh, 2nd Edition, Cengage Learning India Pvt Ltd Delhi.
Engineering Chemistry by SS Dara, S Chand & Co Ltd
Engineering Chemistry by Jain & Jain, S.Chand & Comp, New Delhi
Engineering Chemistry by K. Sesha Maheswaramma, Pearson
Engineering Chemistry by OG Palanna, Mc Graw Hill Education, New Delhi
Engineering Chemistry by Shashi Chawala, Dhanpat Rai Publishing Comp, New Delhi
University Chemistry by BH Mahan
University Chemistry by CNR Rao

BAS103: ENGINEERING MATHEMATICS-I

Content	Contact Hours
Unit-1: Matrices	8
Elementary transformations, Inverse of a matrix, Rank of matrix, Solution of system of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Linear Dependence and Independence of vectors, Eigen values and Eigen vectors, Complex Matrices, Hermitian, Skew-Hermitian and Unitary Matrices, Applications to Engineering problems.	
Unit-2: Differential Calculus- I	8
Successive Differentiation (nth order derivatives), Leibnitz theorem, Curve tracing, Partial derivatives, Euler's Theorem for homogeneous functions, Total derivative, Change of variables.	
Unit-3: Differential Calculus-II	8
Expansion of functions by Taylor's and Maclaurin's theorems for functions of one and two variables, Maxima and Minima of functions of several variables, Lagrange's method of multipliers, Jacobians, Approximation of errors.	
Unit-4: Multiple integration	8
Double integral, Triple integral, change of order of integration, Change of variables, Beta and Gama function and their properties, Dirichlet's integral and its applications to area and volume, Liouville's extensions of Dirichlet's integral.	
Unit-5: Vector Calculus	8
Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications.	

Text Books:

B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd.,2008.
B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House2002.

Reference Books:

E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition,Pearson.
D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill;Sixth Edition.
P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition,Pearson Education.
Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

BAS203: ENGINEERING MATHEMATICS-II

Content	Contact Hours
Unit -1: Ordinary Differential Equation of Higher Order	8
Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, second order linear differential equations with variable coefficients, Solution by changing independent variable, Method of variation of parameters, Cauchy-Euler equation, Application of differential equations in solving engineering problems.	
Unit-2: Laplace Transform	10
Laplace transform, Existence theorem, Properties of Laplace Transform, Laplace transform of derivates and integrals, Unit step function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem. Application of Laplace Transform to solve ordinary differential equations and simultaneous differential equations.	
Unit-3: Sequence and Series	8
Definition of Sequence and series with examples, Convergence of series, Tests for convergence of series, Ratio test, D' Alembert's test, Raabe's test, Comparison test. Fourier series, Half range Fourier sine and cosine series.	
Unit-4: Complex Variable–Differentiation	8
Functions of complex variable, Limit, Continuity and differentiability, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Milne's Thompson Method, Conformal mapping, Mobius transformation and their properties.	
Unit-5: Complex Variable –Integration	8
Complex integration, Cauchy- Integral theorem, Cauchy integral formula, Taylor's and Laurent's series, singularities and its classification, zeros of analytic functions, Residues, Cauchy's Residue theorem and its application.	

Text Books:
B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
R. K. Jain & S. R. K. Iyenger, Advance Engineering Mathematics , Narosa Publishing - House, 2002
Reference Books:
E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-McGraw-Hill
D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6thEdition, McGraw- Hill.
James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, McGraw-Hill.
P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi.
Laplace Transforms by Schaum's series, 2005 Edition, Spiegel Publicaiton.

BEE101 / BEE201: FUNDAMENTALS OF ELECTRICAL ENGINEERING

Content	Contact Hours
Unit -1: DC Circuits	6
Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity, unilateral and bilateral elements. Kirchhoff's laws, Mesh and nodal methods of analysis.	
Unit-2: Steady State Analysis of Single-Phase AC Circuits	6
Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors. Analysis of single-phase AC Circuits consisting R-L-C combination (Series and Parallel) Apparent, active & reactive power, Power factor. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections.	
Unit-3: Transformers	6
Magnetic circuits, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.	
Unit-4: Electrical machines	8
DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems) Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only) Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.	
Unit-5: Electrical Installations	4
Introduction of Switch Fuse Unit (SFU), MCB, ELCB, MCCB, ACB. Types of Wires, Cables and Bus-bars. Fundamentals of earthing and lightning protection. Types of Batteries	

Text Books:

Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House, 2018.
P.V. Prasad, S.Sivanagaraju,"Electrical Engineering:Concepts and Applications" Cengage, 2018
D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Reference Books:

E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
V. D. Toro, "Electrical Engineering Fundamentals", Pearson India, 1989.

Spoken Tutorial (MOOCs):

AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

BEC101 / BEC201: FUNDAMENTALS OF ELECTRONICS ENGINEERING

Topics	Contact Hours
Unit-1	8
Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical Diodes, Diode Equivalent Circuits, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes.	
Unit-2	8
Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration Field Effect Transistor: Construction and Characteristic of JFETs. Transfer Characteristic. MOSFET (MOS) (Depletion and Enhancement) Type, Transfer Characteristic.	
Unit-3	8
Operational Amplifiers: Introduction, Op-Amp basic, Practical Op-Amp Circuits (Inverting Amplifier, Non-inverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation, Comparators.	
Unit-4	8
Digital Electronics: Number system & representation, Binary arithmetic, Introduction of Basic and Universal Gates, using Boolean algebra simplification of Boolean function. K Map Minimization upto 6 Variables.	
Unit-5	8
Fundamentals of Communication Engineering: Basics of signal representation and analysis, Electromagnetic spectrum Elements of a Communication System, Need of modulation and typical applications, Fundamentals of amplitude modulation and demodulation techniques. Introduction to Wireless Communication: Overview of wireless communication, cellular communication, different generations and standards in cellular communication systems, Fundamentals of Satellite & Radar Communication.	

Text Books:

Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
George Kennedy, "Electronic Communication Systems", McGrawPublication
David A. Bell, "Electronic Devices and Circuits", Oxford UniversityPress.
Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGrawHill.
A. Anand Kumar, "Fundamental of Digital Circuits," PHI 4th edition, 2018.

BCS101 / BCS201: PROGRAMMING FOR PROBLEM SOLVING

Content	Contact Hours
Unit -1:	8
Introduction to Components of a Computer System: Memory, Processor, I/O Devices, Storage, Operating System, Concept of Assembler, Compiler, Interpreter, Loader and Linker. Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo Code with Examples, From Algorithms to Programs, Source Code. Programming Basics: Structure of C Program, Writing and Executing the First C Program, Syntax and Logical Errors in Compilation, Object and Executable Code. Components of C Language. Standard I/O in C , Fundamental Data types, Variables and Memory Locations, Storage Classes.	
Unit-2:	8
Arithmetic Expressions and Precedence: Operators and Expression Using Numeric and Relational Operators, Mixed Operands, Type Conversion, Logical Operators, Bit Operations, Assignment Operator, Operator precedence and associatively. Conditional Branching: Applying if and Switch Statements, Nesting if and Else and Switch.	
Unit-3:	8
Iteration and Loops: Use of While, do While and for Loops, Multiple Loop Variables, Use of Break, Goto and Continue Statements. Arrays: Array Notation and Representation, Manipulating Array Elements, using Multi-Dimensional Arrays. Character Arrays and Strings, Structure, union, Enumerated Data types, Array of Structures, Passing Arrays to Functions.	
Unit-4:	8
Functions: Introduction, Types of Functions, Functions with Array, Passing Parameters to Functions, Call by Value, Call by Reference, Recursive Functions. Basic of searching and Sorting Algorithms: Searching & Sorting Algorithms (Linear Search, Binary search, Bubble Sort, Insertion and Selection Sort)	
Unit-5:	8
Pointers: Introduction, Declaration, Applications, Introduction to Dynamic Memory Allocation (Malloc, Calloc, Realloc, Free), String and String functions, Use of Pointers in Self-Referential Structures, Notion of Linked List (No Implementation) File Handling: File I/O Functions, Standard C Preprocessors, Defining and Calling Macros and Command-Line Arguments.	

Text Books:
Schaum's Outline of Programming with C by Byron Gottfried , McGraw-Hill
The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
Let Us C By Yashwant P. Kanetkar.
Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison- Wesley, 2006.
Programming in C by Kochan Stephen G. Pearson Education – 2015.
Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication

BME101 / BME201: FUNDAMENTALS OF MECHANICAL ENGINEERING

Content	Contact Hours
Unit -1: Introduction to Mechanics	8
Force moment and couple, principle of transmissibility, Varignon's theorem. Resultant of force system- concurrent and non-concurrent coplanar forces, Types of supports (Hinge, Roller) and loads (Point, UDL, UVL), free body diagram, equilibrium equations and Support Reactions. Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety.	
Unit-2: Introduction to IC Engines and Electric Vehicles	8
IC Engine:Basic definition of engine and Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; difference between two-stroke and four stroke IC engines and SI and CI Engines. Electric vehicles and hybrid vehicles: Components of an EV, EV batteries, chargers, drives, transmission and power devices. Advantages and disadvantages of EVs. Hybrid electric vehicles, HEV drive train components, advantages of HV.	
Unit-3: Introduction to Refrigeration and Air-Conditioning	8
Refrigeration: Refrigerating effect, Ton of Refrigeration; Coefficient of performance, methods of refrigeration, construction and working of domestic refrigerator, concept of heat pump. Air-Conditioning: Its meaning and application, humidity, dry bulb, wet bulb, and dew point temperatures, comfort conditions, construction and working of window air conditioner.	
Unit-4: Introduction to Fluid Mechanics and Applications	8
Introduction: Fluids properties, pressure, density, dynamic and kinematic viscosity, specific gravity, Newtonian and Non-Newtonian fluid, Pascal's Law and Continuity Equation. Working principles of hydraulic turbines (Pelton Wheel and Francis)& pumps (Centrifugal and Reciprocating) and their classifications and hydraulic lift.	
Unit-5: Introduction to Measurement and Mechatronics	12
Introduction to Measurement: Concept of Measurement, Error in measurements, Calibration, measurements of pressure (Bourdon Tube Pressure and U-Tube Manometer), temperature(Thermocouple and Optical Pyrometer), mass flow rate(Venturi Meter and Orifice Meter), strain (Bonded and Unbonded Strain Gauge), force (Proving Ring) and torques(Prony Brake Dynamometer); Concepts of accuracy, precision and resolution. Introduction to Mechatronic Systems: Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotropic, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics.	

Overview of Mechanical Actuation System – Kinematic Chains, Cam, Ratchet Mechanism, Gears and its type, Belt, Bearing. Hydraulic and Pneumatic Actuation Systems: Overview: Pressure Control Valves, Direction Control Valves, Rotary Actuators, Accumulators and Pneumatic Sequencing Problems.	

Reference Books:

Basic Mechanical Engineering, G Shanmugam, S Ravindran, McGraw Hill
Basic Mechanical Engineering, M P Poonia and S C Sharma, Khanna Publishers
Mechatronics: Principles, Concepts and Applications, Nitaigour Mahalik, McGraw Hill
Mechatronics, As per AICTE: Integrated Mechanical Electronic Systems, K.P. Ramachandran, G.K. Vijayaraghavan, M.S.Balasundaram, Wiley India
Mechanical Measurements & Control, Dr. D. S. Kumar. Metropolitan Book Company
Fluid Mechanics and Hydraulic Machines, Mahesh Kumar, Pearson India

BAS104 / BAS204: ENVIRONMENT AND ECOLOGY

Topics	Contact Hours
Unit-1	8
Environment: Definition, Types of Environments, Components of environment, Segments of environment, Scope and importance, Need for Public Awareness. *Ecosystem:* Definition, Types of ecosystems, Structure of ecosystem, Food Chain, Food Web, Ecological pyramid. Balance Ecosystem. Effects of Human Activities such as Food, Shelter, Housing, Agriculture, Industry, Mining, Transportation, Economic and Social security on Environment, Environmental Impact Assessment, Sustainable Development.	
Unit-2	8
Natural Resources: Introduction, Classification. *Water Resources;* Availability, sources and Quality Aspects, Water Borne and Water Induced Diseases, Fluoride and Arsenic Problems in Drinking Water. *Mineral Resources;* Material Cycles; Carbon, Nitrogen and Sulfur cycles. *Energy Resources;* Conventional and Non-conventional Sources of Energy. *Forest Resources;* Availability, Depletion of Forests, Environment impact of forest depletion on society.	
Unit-3	8
Pollution and their Effects; Public Health Aspects of Environmental; Water Pollution, Air Pollution, Soil Pollution, Noise Pollution, Solid waste management.	
Unit-4	8
Current Environmental Issues of Importance; Global Warming, Green House Effects, Climate Change, Acid Rain, Ozone Layer Formation and Depletion, Population Growth and Automobile pollution, Burning of paddy straw.	

Unit-5	8
Environmental Protection; Environmental Protection Act 1986, Initiatives by Non-Governmental Organizations (NGO's), Human Population and the Environment: Population growth, Environmental Education, Women Education.	

Reference Books:

Textbook of Environment and Ecology by Dave, Katewa & Singh, 2nd Edition, Cengage Learning India Pvt Ltd Delhi.
Environmental Studies by S Deswal, Dhanpat Rai & Co.
Environmental Studies by VK Ahluwalia, 2nd Edition,TERI Press, New Delhi.
Environmental Studies by R Rajgopalan, Oxford University Press.
Environment & Ecology by Singh & Malviya, Acme Learning

BAS105 / BAS205: SOFT SKILLS

Content	Contact Hours
Unit-1 Applied Grammar and Usage:	8
Transformation of Sentences: Simple, Compound and Complex, Subject- verb agreement, Prefix and Suffix, Antonyms, Synonyms, Homophones, Homonyms, New word Formation, Select word power	
Unit-2: Listening and Speaking Skills	8
Active Listening: Meaning and Art of Listening, Traits of a Good Listener, Listening modes, listening and Note taking, Types of Listening, Listening Techniques using Ted Talk Audio listening with script reading, Pronunciation; Speaking style ; content and sequencing.	
Unit-3: Reading and Writing Skills:	8
Reading style: Skimming; Scanning; Churning & Assimilation, Effective writing tools and methods: Inductive Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc, Official and Business Letter writing, Agenda, Notices, Minutes of meeting,	
Unit-4: Presentation and Interaction Skills	8
Introduction to oral communication, Nuances and Modes of Speech Delivery, Public speaking: confidence, clarity, and fluency, Individual Speaking: Elements; Non verbal Communication: Kinesics, Paralinguistic features of Voice-Dynamics, Proxemics, Chronemics, and Presentation Strategies: planning, preparation, organization, delivery	
Unit-5: Work- place skills:	8
Leadership qualities; Impact, Communication skills for Leaders: Listening and Responding; Mental health at work place: Managing Stress; Techniques: Application of4 A's; Avoid; Alter; Access; Adapt	

Prescribed Books:

Technical Communication, (Second Ed.); O.U.P., Meenakshi Raman & S.Sharma New Delhi, 2011.
Business Communication for Managers, Payal Mehra, Pearson, Delhi, 2012.
Personality Development, Harold R. Wallace et. al, Cengage Learning India Pvt. Ltd; New Delhi 2006.
Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, Delhi 2013.
Personality Development & Soft Skills, Barun K.Mitra, Oxford University Press, New Delhi, 2012.
Public Speaking, William S. Pfeiffer, Pearson, Delhi, 2012.
Human Values, A.N. Tripathi, New Age International Pvt. Ltd. Publishers New Delhi, 2005.
English Grammar & Usage, R.P.Sinha, Oxford University Press, New Delhi, 2005.
English Grammar & Composition, *Wren* & Martin S.Chand & Co Ltd, New Delhi, 2009.
Soft Skills for Everyone. Jeff Butterfield, Cengage Learning India Pvt. Ltd; New Delhi 2017.

BAS151 / BAS251: ENGINEERING PHYSICS LAB

List of Experiments

Any ten experiments (at least four from each group).

Group A

To determine the wavelength of sodium light by Newton's ring experiment.
To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
To determine the specific rotation of cane sugar solution using polarimeter.
To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
To measure attenuation in an optical fiber.
To determine the wavelength of He-Ne laser light using single slit diffraction.
To study the polarization of light using He-Ne laser light.
To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
To determine the coefficient of viscosity of a given liquid.
To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

To determine the energy band gap of a given semiconductor material.
To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
To verify Stefan's law by electric method.
To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
To study the resonance condition of a series LCR circuit.
To determine the electrochemical equivalent (ECE) of copper.
To calibrate the given ammeter and voltmeter by potentiometer.
To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
To measure high resistance by leakage method.

Reference Books

Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
Engineering Physics-Theory and Practical- Katiyar & Pandey (Wiley India)
Engineering Physics Practical- S K Gupta (Krishna Prakashan Meerut)

BAS152 / BAS252: ENGINEERING CHEMISTRY LAB

LIST OF EXPERIMENTS

Calibration of Analytical Equipment and apparatus.
Determination of Hardness of water sample by EDTA method.
Determination of Alkalinity of water sample.
Determination of pH by titrimetric method.
Determination of surface tension of given liquid.
Determination of Viscosity of a given liquid by viscometer.
Determination of the strength of Ferrous ammonium sulfate using external indicator.
Determination of the strength of Potassium dichromate using internal indicator.
Determination of available chlorine in bleaching powder.
Determination of chloride content in water sample.
Preparation of Phenol formaldehyde (PF) resin.
Preparation of Urea formaldehyde (UF) resin.
Preparation of Adipic acid / Paracetamol.
Determination of Cell Conductance of a solution.
Determination of Rate constant of hydrolysis of esters.
Element detection and identification of functional groups in organic compounds.

BEE151 / BEE251: BASIC ELECTRICAL ENGINEERING LAB

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.
Hardware based experiments

Verification of Kirchhoff's laws
Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
Connection and measurement of power consumption of a fluorescent lamp (tube light).
Measurement of power in 3- phase circuit by two-wattmeter method and determination of its power factor for star as well as delta connected load.
Determination of parameters of ac single phase series RLC circuit
Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase Transformer
Determination of efficiency of a dc shunt motor by load test
To study running and speed reversal of a three phase induction motor and record speed in both directions.
Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

Experiments available on virtual lab
Kirchhoff's laws.
Virtual lab link: http://vlab.amrita.edu/?sub=3&brch=75&sim=217&cnt=2
Thevenin Theorem.
Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=313&cnt=1
RLC series resonance.
Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1
Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
Virtual lab link: http://vp-dei.vlabs.ac.in/Dreamweaver/measurement.html
Determination of parameters of ac single phase series RLC circuit.
Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=332&cnt=1
To observe the B-H loop of a ferromagnetic material in CRO.
Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=2
Determination of the efficiency of a dc motor by loss summation method (Swinburne's test). Virtual lab link: http://em-iitr.vlabs.ac.in/exp5/index.php?section=Theory

BEC151 / BEC251: BASIC ELECTRONICS ENGINEERING LAB

Suggestive List of Experiments

Part A:

Study of various types of Active & Passive Components based on the ir ratings.
Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
PCB Lab: a. Artwork & printing of a simple PCB. b. Etching & drilling of PCB
Winding shop: Step down transformer winding of less than 5VA.
Soldering shop: Soldering and disordering of Resistor in PCB. Soldering and disordering of IC in PCB. Soldering and disordering of Capacitor in PCB

Part B:

Study of Lab Equipment and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
Applications of PN Junction diode: Half & Full wave rectifier- Measurement of V_{rms}, V_{dc}, and ripple factor.
Characteristics of Zener diode: V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance.
Characteristic of BJT: BJT in CE configuration.
To study Operational Amplifier as Adder and Subtractor
Verification of Truth Table of Various Logic Gate.
Implementation of the given Boolean function using logic gates in both SOP and POS forms.

Part (C):

Part A	PCB Lab: a. Artwork & printing of a simple PCB. b. Etching & drilling of PCB	This practical is not possible by virtual lab. It will be conducted only in physical mode
Part B	Study of Lab Equipment's and Components: CRO, Multi meter, Function Generator, Power supply- Active, Passive Components and Bread Board.	NA, These test equipment can be Demonstrated online from any lab of ECE department or physical mode is only option.

Experiments available on virtual lab

PN Junction on diode: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.	http://vlabs.iitkgp.ernet.in/be/exp5/index.html
Applications of PN Junction diode: Half & Full wave rectifier- Measurement of V_{rms},V_{dc}, and ripple factor.	http://vlabs.iitkgp.ernet.in/be/exp6/index.ht mlhttp://vlabs.iitkgp.ernet.in/be/exp7/index. html
Characteristics of Zener diode: V-I characteristics of Zener diode, Graphical measurement of forward and reverse resistance.	http://vlabs.iitkgp.ernet.in/be/exp10/index.html
Characteristic of BJT: BJT in CE configuration.	http://vlabs.iitkgp.ernet.in/be/exp11/index.html
To study Operational Amplifier as Adder and Subtractor	http://vlabs.iitkgp.ernet.in/be/exp17/index.ht mlhttp://vlabs.iitkgp.ernet.in/be/exp18/index. html
Verification of Truth Table of Various Logic Gate	https://de-iitr.vlabs.ac.in/digital-electronics-iitr/exp/truth-table-gates/
Implementation of the given Boolean function using logic gates in both SOP and POS forms.	https://de-iitr.vlabs.ac.in/digital-electronics-iitr/exp/realization-of-logic-functions/

BCS151 / BCS251: PROGRAMMING FOR PROBLEM SOLVING LAB

WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
WAP to calculate the area and circumference of a circle.
WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
WAP that swaps values of two variables using a third variable.
WAP that checks whether the two numbers entered by the user are equal or not.
WAP to find the greatest of three numbers.
WAP that finds whether a given number is even or odd.
WAP that tells whether a given year is a leap year or not.
WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100% Print 'A'
80-90% Print 'B'
60-80% Print 'C'
Below 60% Print 'D'

WAP that takes two operands and one operator from the user, perform the operation, and prints the result by using Switch statement.
WAP to print the sum of all numbers up to a given number.
WAP to find the factorial of a given number.
WAP to print sum of even and odd numbers from 1 to N numbers.
WAP to print the Fibonacci series.
WAP to check whether the entered number is prime or not.
WAP to find the sum of digits of the entered number.
WAP to find the reverse of a number.
WAP to print Armstrong numbers from 1 to 100.
WAP to convert binary number into decimal number and vice versa.
WAP that simply takes elements of the array from the user and finds the sum of these elements.
WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
WAP to find the minimum and maximum element of the array.
WAP to search an element in a array using Linear Search.
WAP to sort the elements of the array in ascending order using Bubble Sort technique.

WAP to add and multiply two matrices of order nxn.
WAP that finds the sum of diagonal elements of a mxn matrix.
WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:
List all the trains (sorted according to train number) that depart from a particular section.
List all the trains that depart from a particular station at a particular time.
List all he trains that depart from a particular station within the next one hour of a given time.
List all the trains between a pair of start station and end station.
WAP to swap two elements using the concept of pointers.
WAP to compare the contents of two files and determine whether they are same or not.
WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

Note:
The instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
The subject teachers are suggested to use the concept of project based learning. The subject teacher may giver certain use cases/case studies where student is able to apply multiple concepts in one single program
It is also suggested that open source tools should be preferred to conduct the lab. Some open source online compiler to conduct the C lab are as follows:

https://www.jdoodle.com/c-online-compiler/
https://www.tutorialspoint.com/compile_c_online.php
https://www.programiz.com/c-programming/online-compiler/
https://www.hackerrank.com/

Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Problem Solving Lab	Numerical Representation
	Beauty of Numbers
	More on Numbers
	Factorials
	String Operations
	Recursion
	Advanced Arithmetic
	Searching and Sorting
	Permutation
	Sequences

BAS155 / BAS255: ENGLISH LANGUAGE LAB

Course Objectives:
To facilitate software-based learning to provide the required English Language proficiency to students.
To acquaint students with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
To train students to use the correct and error-free writing by being well versed in rules of English grammar.
To cultivate relevant technical style of communication and presentation at their work place and also for academic uses.
To enable students to apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics.

Professional Communication Lab shall have two parts:

Interactive Communication Skills:
Students should practice the language with variety of activities and exercises based on employability skills.
Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication, based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic/Kinesics.
Presentation Skills for Technical Paper/Project Reports/ proposals based on proper Stress and Intonation Mechanics
Official/Public Speaking practice sessions based on suitable Rhythmic Patterns.
Theme Presentation/ Keynote Presentation based on correct methodologies of argumentation
Individual Speech Delivery/Conferencing with skills to defend Interjections/Quizzes.
Argumentative Skills/Role Play Presentation with Stress and Intonation.
Comprehension Skills based on Reading and Listening Practical's on a model Audio
Startup presentations, Video portfolio, Extempore, Role play, Just a Minute (JAM) etc.

Computer assisted software-based Language Learning:
Software based self-guided learning to provide the required English language proficiency to students from an employability and career readiness standpoint. The software should align to Common European Framework of Reference for Languages (CEFR) and deliver a CEFR level – B2 upon completion.

Suggested Software:
Oxford Achiever by Oxford University Press.
Cambridge English Empower by Cambridge University Press.
MePro. by Pearson India Education Services Pvt. Ltd.
New Interactions by McGraw-Hill India.

Reference Books:
Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar,2013, Delhi
Practical Communication Process & Practice, LU.B. Pandey: A.I.T.B.S. Pub. India Ltd Krishna Nagar, Delhi, 2013.
English Grammar and Usage by R.P. Sinha, Oxford University Press, 2005, New Delhi.
English Grammar, Composition and Usage by N.K.Agrawal & F.T.Wood, Macmillan India Ltd., New Delhi.
Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
English Grammar & Composition by Wren & Martin, S.Chand & Co. Ltd., New Delhi.
Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd, 2011, New Delhi.
Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
Personality Development & Soft Skills, Barun K.Mitra, Oxford University Press, 2012 New Delhi.
Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi

BCE151/ BCE251: ENGINEERING GRAPHICS & DESIGN LAB

Content	Contact Hours
Unit-1: Introduction to Engineering Drawing and Orthographic Projections	8
Principles of Engineering Graphics and their significance. Dimensioning, Lettering. Scales: Plain, Diagonal and Engineering Scales. Orthographic Projection, Projection of Point, Projection of Lines: Projection of straight lines; Projection of lines inclined to one plane and both planes.	
Unit-2: Projection of Planes and Solids	8
Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.	
Unit-3: Sections of Regular Solids and development of Surfaces	8
Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.	
Unit-4: Isometric Projection	8
Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids. Perspective Projection: Orthographic representation of perspective views — Plane figures and simple solids — Visual Ray Method. Conversion of pictorial view into orthographic Projection.	
Unit-5: Introduction to Computer Aided Design	8
Introduction to AutoCAD: Basic commands for 2D drawing: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc. Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-Versa in AutoCAD. Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form.	

Suggested Text/ Reference Books:

Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charter Publishing House.
Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(Corresponding set of) CAD Software Theory and User Manuals.

BWS151/ BWS251: WORKSHOP PRACTICE LAB

S. No.	Mechanical Workshop	Duration
1	Introduction to Mechanical workshop material, tools and machines	3 Hrs
	To study layout, safety measures and different engineering materials (mild steel, medium carbon steel, high carbon steel, high speed steel and cast iron etc) used in workshop.	
	To study and use of different types of tools, equipment, devices & machines used in fitting, sheet metal and welding section.	
	To determine the least count of Vernier calliper, vernier height gauge, micrometer (Screw gauge) and take different reading over given metallic pieces using these instruments.	
2	Machine shop	3 Hrs
	Demonstration of working, construction and accessories for Lathe machine	
	Perform operations on Lathe - Facing, Plane Turning, step turning, taper turning, threading, knurling and parting.	
3	Fitting shop	3 Hrs
	Practice marking operations. Preparation of U or V -Shape Male Female Work piece which contains: Filing, Sawing, Drilling, Grinding.	
4	Carpentry Shop	3 Hrs
	Study of Carpentry Tools, Equipment and different joints.	
	Making of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint	
5	Welding Shop	6 Hrs
	Introduction to BI standards and reading of welding drawings.	
	Practice of Making following operations Butt Joint Lap Joint TIG Welding MIG Welding	
6	Moulding and Casting Shop	6 Hrs

	Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes Demo of mould preparation and Aluminum casting Practice – Study and Preparation of mould for Plastic	
7	CNC Shop	6 Hrs
	Study of main features and working parts of CNC machine and accessories that can be used. Perform different operations on metal components using any CNC machines	
8	To prepare a product using 3D printing	3 Hrs
	Total	33 Hrs

Reference Books:

Workshop Practice, H S Bawa, McGraw Hill
Mechanical Workshop Practice, K C John, PHI
Workshop Practice Vol 1, and Vol 2, by Hazra Choudhary , Media promoters and Publications
CNC Fundamentals and Programming, By P. M. Agrawal, V. J. Patel, Charotar Publication.

SEMESTER –III

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	BOE3** / BAS303	Science Based Open Elective/BSC (Maths-III/Math IV/ Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	BVE301 / BAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	BCS301	Data Structure	T	PC	3	1	0	20	10	30	70	100	4
4	BCS302	Computer Organization and Architecture	T	PC	3	1	0	20	10	30	70	100	4
5	BCS303	Discrete Structures & Theory of Logic	T	PC	2	1	0	20	10	30	70	100	3
6	BCS351	Data Structure Lab	P	PC	0	0	2		50	50	50	100	1
7	BCS352	Computer Organization and Architecture Lab	P	PC	0	0	2		50	50	50	100	1
8	BCS353	Web Designing Workshop	P	PC	0	0	2		50	50	50	100	1
10	BCC301 / BCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
11	BCC351	Internship Assessment /Mini Project*	P							100		100	2
		Total			15	5	6						25

- Mathematics –III for CE / ENV and allied branches
- Mathematics-IV for Computer/Electronics/Electrical & allied Branches, Mechanical & Allied Branches Textile/Chemical & allied Branches
- Mathematics-V for Bio Technology / Agriculture Engineering

SEMESTER –IV

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	BAS403 / BOE4**	BSC(Maths-III/Math IV/ Math V)/Science Based Open Elective	T	BS/ES	3	1	0	20	10	30	70	100	4
2	BAS401 / BVE401	Technical Communication / Universal Human Value and Professional Ethics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	BCS401	Operating System	T	PC	3	1	0	20	10	30	70	100	4
4	BCS402	Theory of Automata and Formal Languages	T	PC	3	1	0	20	10	30	70	100	4
5	BCS403	Object Oriented Programming with Java	T	PC	2	1	0	20	10	30	70	100	3
6	BCS451	Operating System Lab	P	PC	0	0	2		50	50	50	100	1
7	BCS452	Object Oriented Programming with Java Lab	P	PC	0	0	2		50	50	50	100	1
8	BCS453	Cyber Security Workshop	P	PC	0	0	2		50	50	50	100	1
9	BCC402 / BCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	BVE451 / BVE452	Sports and Yoga - II / NSS-II	P	VA	0	0	3			100		100	0
		Total			15	5	9						23
		Minor Degree/ Honors Degree MT-1/HT-1											

*The Mini Project or internship (4 weeks) will be done during summer break after 4th Semester and will be assessed during V semester.

BCS301	DATA STRUCTURE	
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	08
II	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	08
III	Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	08

IV	Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree. A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree, B Tree & Binary Heaps	08
V	Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	08

Text books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India.
2. Gilberg ,Forouzan, Data Structures: A Pseudocode Approach with C 3rd edition , Cengage Learning publication.
3. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
4. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
5. Thareja, "Data Structure Using C" Oxford Higher Education.
6. AK Sharma, "Data Structure Using C", Pearson Education India.
7. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
8. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
9. P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.
10. R. Kruseetal, "Data Structures and Program Design in C", Pearson Education.
11. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
12. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
13. Adam Drozdek "Data Structures and Algorithm in Java", Cengage Learning

CS302	COMPUTER ORGANIZATION AND ARCHITECTURE	
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.	08
II	Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers	08
III	Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	08
IV	Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	08
V	Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	08

Text books:

1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998.

Reference books

4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012
7. Structured Computer Organization, Tannenbaum(PHI)

BCS303	Discrete Structures & Theory of Logic	
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Set Theory& Relations: Introduction, Combination of sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. POSET & Lattices: Hasse Diagram, POSET, Definition & Properties of lattices – Bounded, Complemented, Distributed, Modular and Complete lattice.	08
II	Functions: Definition, Classification of functions, Operations on functions. Growth of Functions. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps.	08
III	Theory of Logics: Proposition, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well- formed formula of predicate, quantifiers, Inference theory of predicate logic.	08
IV	Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	08
V	Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle	08

Text books:

1. Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006.
2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.
3. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004 5.Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.
6.Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill. 4. Deo, 7. Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.
8. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi

BCS351- Data Structure Lab

List of Experiments (Indicative & not limited to)

1. Implementing Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Shell, Sort, Radix Sort, Quick sort
2. Implementing Searching and Hashing Techniques: Linear search, Binary search, Methods for Hashing: Modulo Division, Digit Extraction, Fold shift, Fold Boundary, Linear Probe for Collision Resolution. Direct and Subtraction hashing
3. Implementing Stacks: Array implementation, Linked List implementation, Evaluation of postfix expression and balancing of parenthesis, Conversion of infix notation to postfix notation
4. Implementing Queue: Linked List implementation of ordinary queue, Array implementation of circular queue, Linked List implementation of priority queue, double ended queue
5. Implementing Linked List: Singly Linked Lists, Circular Linked List, Doubly Linked Lists: Insert, Display, Delete, Search, Count, Reverse (SLL), Polynomial, Addition, Comparative study of arrays and linked list
6. Implementing Trees: Binary search tree: Create, Recursive traversal: preorder, post order, in order, Search Largest, Node, Smallest Node, Count number of nodes, Heap: Min Heap, Max Heap: reheap Up, reheap Down, Delete, Expression Tree, Heapsort
7. Implementing Graphs: Represent a graph using the Adjacency Matrix, BFS, Find the minimum spanning tree (using any method Kruskal's Algorithm or Prim's Algorithm) Self Learning Topics: Shortest Path Algorithm

BCS352- Computer Organization Lab

List of Experiments (Indicative & not limited to)

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3–8-line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

FOURTH SEMESTER (DETAILED SYLLABUS)

BCS401 Operating system		
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction: Operating system and functions, Classification of Operating systems- Batch, Interactive, Time-sharing, Real-Time System, Multiprocessor Systems, Multiuser Systems, Multiprocessor Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	08
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08

V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08

Text books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, "An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems: A Concept based Approach", 2nd Edition,
5. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson Education

BCS402: Theory of Automata and Formal Languages		
	DETAILED SYLLABUS	3-1-0
Unit	Topic	Proposed Lecture
I	Basic Concepts and Automata Theory: Introduction to Theory of Computation-Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata.	08
II	Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages	08
III	Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	08
IV	Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	08

V	Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondence Problem, Introduction to Recursive Function Theory.	08

Text books:

1. Introduction to Automata theory, Languages and Computation, J.E. Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitriou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International

BCS403: Object Oriented Programming with Java		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Why Java, History of Java, JVM, JRE, Java Environment, Java Source File Structure, and Compilation. Fundamental, Programming Structures in Java: Defining Classes in Java, Constructors, Methods, Access Specifies, Static Members, Final Members, Comments, Data types, Variables, Operators, Control Flow, Arrays & String. Object Oriented Programming: Class, Object, Inheritance Super Class, Sub Class, Overriding, Overloading, Encapsulation, Polymorphism, Abstraction, Interfaces, and Abstract Class. Packages: Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention For Packages	08
II	Exception Handling: The Idea behind Exception, Exceptions & Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions, Checked and Un-Checked Exceptions. Input /Output Basics: Byte Streams and Character Streams, Reading and Writing File in Java. Multithreading: Thread, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Inter-thread Communication.	08
III	Java New Features: Functional Interfaces, Lambda Expression, Method References, Stream API, Default Methods, Static Method, Base64 Encode and Decode, ForEach Method, Try-with- resources, Type Annotations, Repeating Annotations, Java Module System, Diamond Syntax with	08

	Inner Anonymous Class, Local Variable Type Inference, Switch Expressions, Yield Keyword, Text Blocks, Records, Sealed Classes	
IV	Java Collections Framework: Collection in Java, Collection Framework in Java, Hierarchy of Collection Framework, Iterator Interface, Collection Interface, List Interface, ArrayList, LinkedList, Vector, Stack, Queue Interface, Set Interface, HashSet, LinkedHashSet, SortedSet Interface, TreeSet, Map Interface, HashMap Class, LinkedHashMap Class, TreeMap Class, Hashtable Class, Sorting, Comparable Interface, Comparator Interface, Properties Class in Java.	08
V	Spring Framework: Spring Core Basics-Spring Dependency Injection concepts, Spring Inversion of Control, AOP, Bean Scopes- Singleton, Prototype, Request, Session, Application, Web Socket, Auto wiring, Annotations, Life Cycle Call backs, Bean Configuration styles Spring Boot: Spring Boot Build Systems, Spring Boot Code Structure, Spring Boot Runners, Logger, BUILDING RESTFUL WEB SERVICES, Rest Controller, Request Mapping, Request Body, Path Variable, Request Parameter, GET, POST, PUT, DELETE APIs, Build Web Applications	08

Text Books

1. Herbert Schildt, "Java The complete reference", McGraw Hill Education
2. Craig Walls, "Spring Boot in Action" Manning Publication
1. Steven Holzner, "Java Black Book", Dreamtech.
2. Balagurusamy E, "Programming in Java", McGraw Hill
3. Java: A Beginner's Guide by Herbert Schildt, Oracle Press
4. Greg L. Turnquist "Learning Spring Boot 2.0 - Second Edition", Packt Publication
5. AJ Henley Jr (Author), Dave Wolf, "Introduction to Java Spring Boot: Learning by Coding", Independently Published
6. Bhave "Programming with Java" , Pearson

BCS451- Operating System Lab

List of Experiments (Indicative & not limited to)

1. Study of hardware and software requirements of different operating systems (UNIX, LINUX, WINDOWS XP, WINDOWS7/8
2. Execute various UNIX system calls for
    i. Process management
    ii. File management
    iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
    i. SJF
    ii. Priority
    iii. FCFS
    iv. Multi-level Queue
4. Implement file storage allocation technique:
    i. Contiguous(using array)
    ii. Linked –list(using linked-list)
    iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
    i. Worst-Fit
    ii. Best- Fit
    iii. First- Fit
6. Calculation of external and internal fragmentation
    i. Free space list of blocks from system
    ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker"s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique - Semaphore

BCS452- Object Oriented Programming with Java

List of Experiments (Indicative & not limited to)

1. Use Java compiler and eclipse platform to write and execute java program.
2. Creating simple java programs using command line arguments
3. Understand OOP concepts and basics of Java programming.
4. Create Java programs using inheritance and polymorphism.
5. Implement error-handling techniques using exception handling and multithreading.
6. Create java program with the use of java packages.
7. Construct java program using Java I/O package.
8. Create industry-oriented application using Spring Framework.
9. Test RESTful web services using Spring Boot.
10. Test Frontend web application with Spring Boot

BCS453- Cyber Security Workshop

List of Experiments (Indicative & not limited to)

Module 1: Packet Analysis using Wire shark

- Basic Packet Inspection: Capture network traffic using Wire shark and analyze basic protocols like
    - HTTP, DNS, and SMTP to understand how data is transmitted and received.
- Detecting Suspicious Activity: Analyze network traffic to identify suspicious patterns, such as repeated connection attempts or unusual communication between hosts.
- Malware Traffic Analysis: Analyze captured traffic to identify signs of malware communication, such as command-and-control traffic or data infiltration.
- Password Sniffing: Simulate a scenario where a password is transmitted in plaintext. Use Wireshark to capture and analyze the packets to demonstrate the vulnerability and the importance of encryption.
- ARP Poisoning Attack: Set up an ARP poisoning attack using tools like Ettercap. Analyze the captured packets to understand how the attack can lead to a Man-in-the-Middle scenario.

Module 2: Web Application Security using DVWA

- SQL Injection: Use DVWA to practice SQL injection attacks. Demonstrate how an attacker can manipulate input fields to extract, modify, or delete database information.
- Cross-Site Scripting (XSS): Exploit XSS vulnerabilities in DVWA to inject malicious scripts into web pages. Show the potential impact of XSS attacks, such as stealing cookies or defacing websites.
- Cross-Site Request Forgery (CSRF): Set up a CSRF attack in DVWA to demonstrate how attackers can manipulate authenticated users into performing unintended actions.
- File Inclusion Vulnerabilities: Explore remote and local file inclusion vulnerabilities in DVWA. Show how attackers can include malicious files on a server and execute arbitrary code.
- Brute-Force and Dictionary Attacks: Use DVWA to simulate login pages and demonstrate brute-force and dictionary attacks against weak passwords. Emphasize the importance of