Syllabus Document

B. Tech. CSE

Course Code:	MAL 103	**Course Title:**	Calculus for Engineers			
Category:	Core	**Credit Assigned**	L	T	P	C
			3	1	0	4
Pre-Requisite (if Any)	**NONE**	**Type of Course**	Basic Sciences			

Course Outcomes:

The students will be able

1) To analyze the nature (convergence or divergence) of a sequence or series.
2) To apply mean value theorems in the study of motion of an object.
3) To use integration in the calculation of area, volume, mass, and centre of gravity.
4) To apply multivariable calculus to study the nature of multivariable functions.
5) To exploit vector calculus in engineering problems.

Course Contents:

Module 1: Sequences and series: Sequences of real numbers, Series, ratio and root test.

Module 2: Calculus of functions of single variable: Review of limits, continuity, and differentiability. Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's theorem with remainders, indeterminate forms, curvature, curve tracing.

Module 3: Fundamental theorem of Integral calculus, mean value theorems of integral calculus, evaluation of definite integrals, applications in area, length, volumes and surface of solids of revolutions, Improper integrals: Beta and Gamma functions, differentiation under integral sign.

Module 4: Calculus of Functions of Several Variables: Limit, continuity and differentiability of functions of several variables, partial derivatives and their geometrical interpretation, Tangent plane and normal line. Total differentiation, chain rules, Taylor's formula, maxima and minima, Lagrange's method of undetermined multipliers. Double and triple integrals, Jacobian, change of order of integration, change of variables, application to area, volumes, Mass, Centre of gravity.

Module 5: Vector Calculus: Scalar and vector fields, gradient of scalar point function, directional derivatives, divergence and curl of vector point function, solenoidal and irrotational motion. Vector integration: line, surface and volume integrals, Statement of Green's, Stoke's and Gauss divergence theorems (without proof) and their applications.

Text Books:

1. Huges-Hallett et al., Calculus: Single and Multi Variable, John-Wiley & Sons (USA), 3rd edition, 2003.
2. George B.Thomas, D.Weir and J.Hass, Thomas Calculus, Pearson, 12th edition 2010.
3. J. Stewart, Calculus, Thomson, 5th Edition, 2003 (Indian Edition).

References:

1. John Bird, Higher Engineering Mathematics, Elsevier Limited, 5th Edition, 2006.

<table>
<tr><td>Course Code:</td><td>BEL 102</td><td>Course Title:</td><td colspan="4">Elements of Electrical Engineering</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>NONE</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
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Course Outcomes:

1. To enable the students understand the basic ideas and principles of Electrical Engineering.
2. To impart knowledge for understanding the details of electrical power systems, transformers, generators, motors etc.

Course Contents:

Electrical Circuit: Circuit Elements Resistance, Inductance & Capacitance, Kirchhoff's Laws, Voltage Source (Definition, Characteristics of Practical Source, and Equivalent Current Source), and Star-Delta Transformation.

Magnetic Circuit, Flux, MMF, Reluctance, Analogy with Electric Circuits. Simple Calculations for Composite Magnetic Circuits

AC Circuits: Periodic Function, Average & R.M.S., Values, Steady State Behaviour With Sinusoidal Excitation, Phase Representation, Reactance & Impedance, Series & Parallel Circuit, Power Factor, Principle of Generation of Single Phase & Three Phase Voltages, Power in Balanced Three Phase AC System

Electrical Measurements : Definition, Indicating, Integrating & Recording Instruments, Deflecting Controlling & Damping Mechanisms, Ammeter & Voltmeters, P.M.M.C. Type & Moving Iron Type, Electrodynamometer Type Wattmeter's, Induction Type Single Phase Energy Meter

Transformers : Introduction, Basic Principles, Construction, Phase Diagram for Transformer under No Load Condition Transformer On Load, Balance of MMF on Sides, Phase Diagram, Equivalent Circuit, Open Circuit & Short Circuit Test, Voltage Regulation and Efficiency

Power Systems : Elementary Idea about Power Generation, Transmission and Distribution Electric Machines :DC Shunt and Series Motor – Construction, Principle of Working, Characteristics, Speed Control and Applications

Induction Motors – Construction, Principle of Working of Single Phase and 3-Phase Motors. Torque Slip Characteristics

Text Books:

1. Hughes, Electrical Technology, Pearson Publishers
2. Theraja B.L., Electrical Technology, S. Chand Publishers

Reference Books:

1. Kothari D.P. and Nagrath I.J.,Theory And Problems Of Basic Electrical Engineering, Prentice Hall India

4. Kulshresta D.C., Basic Electrical Engineering, TMH India
5. Mittle and Mittal, Basic Electrical Engineering, TMH, 2005

Course Code:	ASL 101	Course Title:	Applied Sciences			
Category:	Core	Credit Assigned	L	T	P	C
			3	0	2	4
Pre-Requisite (if Any)	NONE	Type of Course	Basic Science			

Course Outcomes:

1. To recall the fundamentals of Quantum Mechanics that will serve as a foundation to quantum properties of materials.
2. To relate different theories of electron conduction and solve related problems.
3. To identify the relationship between material structure, processing and properties of Modern Engineering Materials.
4. To relate the concept of Nanoscience and Nanotechnology with real word application along with MEMS and NEMS.
5. To distinguish between classical computer and quantum computer.

Course Contents:

Module I: Quantum Mechanics:

Introduction of Quantum Mechanics, Failure of classical mechanics, Black Body radiation, Photoelectric effect, and Compton effect, Dual nature of matter, de-Broglie Hypothesis, phase velocity and group velocity, their relations, wave function & its physical significance, probability density, Schrodinger's wave equation, eigen values & eigen functions, applications.

Module II: Electronic properties of Metals/Materials:

Drude-Lorentz Theory, Drift velocity, relaxation time, mean collision time, mean free path, Electrical conductivity, Quantum free electron theory, density of energy states, Fermi energy, thermionic emission.

Module III: Modern Engineering Materials:

Crystal structure, Structure of materials, Metallic glasses, Liquid Crystals, Shape memory alloy and Biomaterials, Properties of materials, Transforming materials, Structure and transformation of materials, Composite materials and smart materials, Engineering applications of materials.

Module IV: Introduction to Nanoscience and Nanotechnology:

Nanoscale, Significance of the Nanoscale, Nanotechnology, Production techniques, Properties of materials, Nanostructures, Carbon Nanomaterials, Fullerenes, Carbon Nanotubes, Nanowires, Quantum dots, Dendrimers, Nanocomposites, Tools for Characterizationof Nanomaterials, Application of Nanomaterials.

Module V: Current trends in Engineering applications:

Nano and Micromechanical systems (NEMS and MEMS), Quantum information & quantum computing, evolution of quantum theory, quantum computer.

Text:

1. Streetman B. G., Solid State Electronics, Prentice Hall India (2nd Edition) 1986.
2. Avadhanulu M. N. and P.G. Kshirsagar, A text Book of Engineering Physics, (7th Edition) 2004.
3. Dekkar A.J.; Electrical Engineering Materials; Prentice Hall India Publication, 1992.
4. Kenneth Krane; Modern Physics; (2nd Edition); John Wiley Eastern, 1998.
5. Pillai S. O., Solid State Physics, New Age International Publishers, 3rd edition, 1999.
6. Rathi Rakesh, Nanotechnology: Technology Revolution of 21st Century, S. Chand & Company PVT LTD, New Delhi

Reference:

1. John A. Pelesko, David H. Bernstein, "Modelling MEMS and NEMS" CRC Press, 2002

Course Code:	**CSL 101**	**Course Title:**	**Computer Programming**
Category:	**Core**	**Credit Assigned**	**L: 3, T: 0, P: 2, C: 4**
Pre-Requisite (if Any)	**NONE**	**Type of Course**	**Computer Science Engineering**

Course Outcomes:

1. Recognise basics of programming and develop logical thinking.
2. To illustrate how to model real world problems into the software and develop practical programming skills.
3. To use mathematical and statistical applications into programming.
4. To analyse and develop solutions for the general as well as scientific problems.

Course Contents:

Module 1:
Introduction – Computer generation and evolution, flowcharts, algorithm, What is C?, constants, variables, scope of variable, data types, operators, arithmetic expression, Hierarchy of operators, control flows, conditional operator, loops, switch concept.
Program Structure – Basic programs to illustrate structure of C program and its flow in execution.

Module 2:
Function – Introduction to function and parameter passing, returning value, recursive functions, macros.

Module 3:
Arrays – One-dimension and multi-dimension arrays, array initialization, how arrays are stored in memory, array as parameter in functions, programs based on arrays.

Module 4:
Pointers – Initialization, accessing a variable through pointers, pointers as function arguments, pointer to array, arrays of pointers, pointers to pointers.

Module 5:
Structure and Union – Defining a structure, accessing structure members, Array of structure, unions.

Module 6:
File Handling- reading from and writing to a file.

Text books:

1) The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, PHI.
2) Programming in C by E. Balguruswamy, Tata Mcgraw Hill Publishing.

List of Lab Assignments / Experiments:

1. Programs using function.
2. Programs using arrays.
3. Programs on structures.
4. File Handling

<table>
<tr><td>Course Code:</td><td>ECL 101</td><td>Course Title:</td><td colspan="4">Electronic Devices and Circuits</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>NONE</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
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Course Outcomes:

1. To apply concepts of basic electronic devices into electronic circuits and can analyze various parameters.
2. To Relate and apply fundamentals of semiconductor devices, such as diode, BJT, DIAC, LED, UJT, MOSFET in to various practical applications.
3. Design small and large signal amplifier circuits for various practical applications
4. Design various power devices including applications of these devices in to power amplifications
5. Design and analyze basic electronic circuits.

Course Contents:

P &N Type Semiconductors, Diodes and Power Supplies, Theory of P-N Junction Diode, Junction Capacitance, Halfwave & Fullwave, Rectifiers, Filters, Ripple-Factor

Characteristics & Applications of Following Diodes, Zener as Regulators, Schottkey, Photodiode, LED, LCD, Varactor Diode &Tunnel Diode

Junction Transistors Theory of Operation, Static Characteristics , Break Down Voltages, Current Voltage Power Limitations, Biasing of BJT Different Biasing Arrangements, Stability Factor, Thermal Runaway, Power Transistors

Small Signal Analysis & High Frequency Analysis of BJT CE, CB, CC Amplifiers and Comparison High Frequency Analysis Calculation of Frequency Response, Gain Bandwidth Product

Power Amplifiers Classification A, B, AB, C Classes, Efficiency, Push Pull Configuration, Complimentary Symmetry, Second Harmonic & Cross Over Distortion. Positive and Negative Feedback Amplifiers Classification, Practical Circuits, Applications, Advantages. Oscillators Stability, Barkhausen Criteria, RC, LC & Crystal Oscillators

Field Effect Transistor & MOSFET, Principle of Operation & Characteristics.

Text Books:

1. Milman and Halkias, “Integrated Electronics”, Second Edition, 2011, McGraw Hill.
2. Boylestad and Nashelsky, “Electronic Devices & Circuit theory”,2011, Tenth Edition

Reference Books:

1. David A. Bell, “Electronic Devices and Circuits”
2. Milman and Halkias, “Electronic Devices and Circuits”, Second Edition, 2011, McGraw Hill.

Course Code:	**SAP 101**	**Course Title:**	**Health, Sports & Safety**
Category:	**Core**	**Credit Assigned**	**L T P C** **0 0 2 0**
Pre-Requisite (if Any)	**NONE**	**Type of Course**	**Basic Science**

Course Outcomes:

1. To provide physical fitness and good health.
2. Create awareness among the students about their health status by conducting various tests and measurements and suggest them suitable remedial physical fitness program so that they can improve physical and physiological health status.
3. To improve productivity, foster social harmony, inculcate sense of discipline and dedication in general life, develop the spirit of team work, through various sports activities.

Course Contents:

Development of components of fitness through conditioning exercises: Strength: (Strength Endurance, Maximum Strength, explosive strength), Endurance: (aerobic endurance, anaerobic endurance, speed endurance and strength endurance), Speed, Co-coordinative ability, Flexibility

Physical Efficiency Test Level 1(Testing and Evaluation of Physical Fitness): Cooper Test 12 minute run or walk test, Sit and reach test, 100 meter run, one minute sit up test, Push up/Bent knee push up test

Teaching and development of sports skills: Cognitive, Perceptual, Motor, Perceptual motor. First Aid training

Intramural phase 1: Identification of sports talent through exposing students to inter- section tournament. Football, Volleyball, throw ball, table tennis & Chess.

Yoga, Meditation and Personal Safety.

Course Code:	**HUL 102**	**Course Title:**	**Environmental Studies**
Category:	**Core**	**Credit Assigned**	**L T P C** **2 0 0 2**
Pre-Requisite (if Any)	**NONE**	**Type of Course**	**Basic Science**

Course Outcomes:

1. Identify natural resources, ecosystem, and biodiversity, their structure and functions.
2. Describe the importance of environmental components, and their role in human life.
3. Illustrate the possible causes of various forms of environmental pollution, their consequences, and methods of prevention.
4. Define the concept of sustainable development and mechanism to attain it.
5. Recognize the integration of social issues and environmental problems.

Course Contents:

Module 1:

Natural resources: Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.

Module 2:
Ecosystem: Concept of an ecosystem, Structure and functions of an ecosystem, Producers, consumers and decomposers, Ecological succession, Food chain, food webs and pyramids.

Module 3:
Biodiversity and its conservation: Introduction, definitions: genetics, species and diversity, Value of biodiversity, Biodiversity at global, national and local level, India as a mega-diversity nation, Hot-spot of biodiversity, Threat to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Conservation of biodiversity: in-situ and ex-situ conservation.

Module 4:
Environmental pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste management: Causes, effects and control measures of urban and industrial wastes.

Module 5:
Social issues and environment: Sustainable development, Water conservation, Rain water harvesting, Watershed management, Climate change, Global warming, Ozone layer depletion, Nuclear accident, Environmental rules and regulations, Human population and environment. Role of information technology in environment and human health.
Case studies related to ecosystem, environmental pollution, sustainable development will be discussed in a class.

Text:

1. Rajagopalan, Raghavachari. *Environmental studies: from crisis to cure*. No. Ed. 3. Oxford University Press, 2015.

Reference:

1. Joseph, Benny. *Environmental studies*. Tata McGraw-Hill Education, 2005.
2. Chopra, Kanchan and G. K. Kadaekodi, Operationalizing Sustainable Development: Economic- Ecological Modeling for Developing Countries: Sage, Chapter 1, 1999.
3. Kolstad, Charles, D., *Environmental Economics*, Press, 2000.
4. Reed, David (Ed.), *Structural Adjustments, the Environment and Sustainable Development*, Earthscan, Chapters 1, 12, 13 and 14, 1996.
5. Bharucha, Erach. *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press, 2005.

Course Code:	**MAL 104**	**Course Title:**	**Matrices, Transform Techniques, and Differential Equations**
Category:	**Core**	**Credit Assigned**	**L** **T** **P** **C** **3** **1** **0** **4**
Pre-Requisite (if Any)	**MAL 103**	**Type of Course**	**Basic Science**

Course Outcomes:

The students will be able

1. To apply the concepts of matrices for solving system of linear equations.
2. To use the Fourier transform and Laplace transform for solving the differential equations.
3. To solve different types of differential equations.
4. To model the LR-circuit, RL-circuit, radioactive decay, and population growth, and heat equation.
5. To exploit partial differential equations in solving heat flow problems.

Course Contents:

Module 1:

Matrices:Vectors in R^n, notion of linear independence and dependence, rank of matrix, system of linear equations, Gauss-elimination, eigenvalues and eigenvectors, algebraic and geometric multiplicity, Cayley – Hamilton theorem, linear and orthogonal transformations, reduction to diagonal form, Hermitian and skew Hermitian matrices. Applications of linear transformations in computer graphics.

Module 2:

Introduction to complex numbers and domain transformation: Review of complex numbers, Fourier series, Dirichlet conditions, half range series, RMS value, Parseval's identity, Fourier transform and properties, Fourier sine and cosine transforms, Convolution Theorem and Parseval's identity, Simple problems, Definition of Laplace transform-Properties-Laplace transform of periodic functions, Laplace transform of unit step function, impulse function, inverse Laplace transform, convolution, Z-transform, Z-transforms of standard functions, inverse Z-transforms: by partial fraction method and convolution method.

Module 3:

Ordinary Differential Equations: First order differential equations: exact equations, integrating factors and Bernoulli's equations, orthogonal trajectories, existence and uniqueness of solutions. Solutions of second and higher order differential equation with constant coefficients: homogeneous and non-homogeneous. Linear independence and dependence of solutions, method of variation of parameters, Cauchy-Euler equations, simultaneous linear equations.

Module 4:

Applications in LR-circuit, RL-circuit, radioactive decay, and population growth, LCR circuit and vibrations in electrical systems.

Module 5:

Partial Differential Equations: Formation and solution of partial differential equations, General, particular, complete and singular integrals, partial differential equations of first order of the forms: $F(p,q)=0$, $F(z,p,q)=0$, $F(x,p)=G(y,q)$ and Clairaut's form, Lagrange`s equation: $Pp+Qq = R$.Linear partial differential equations of higher order with constant coefficients. Classification of second order PDE, solution of a partial differential equation by separation of variables, boundary value problems-one dimensional wave and heat equations-heat flow in an infinite bar, wave propagation on a semi infinite string – one dimensional heat equations in steady state – solution using Fourier transforms.

Text Books:

1. Erwin Kreyszig , Advanced Engineering Mathematics, John WileyIndia, 10th Edition, 2015

2. Gilbert Strang, Introduction to Linear Algebra, Wellesley- Cambridge Press, 4th Edition, 2011.
3. G. F. Simmons, Differential Equations with Applications and Histrorical Notes, Tata McGraw Hill, Second Edition, 2003.
4. J. D. Logan, Applied Partial Equations, Springer-Verlag, 3rd Edition, 2015.
5. S. Kumaresan, Geometrical Approach to Linear Algebra, Prentice Hall of India, 2000.

Reference:

1. Jin Ho Kwak and Sungpyo Hong, Linear Algebra, Springer, Second edition, 2004.
2. S. L. Ross, Partial Differential Equations, Wiley, 3rd Edition, 2007.

Course Code:	**ECL 102**	**Course Title:**	**Digital Electronics**
Category:	**Core**	**Credit Assigned**	**L** | **T** | **P** | **C** **3** | **0** | **2** | **4**
Pre-Requisite (if Any)	**ECL 101**	**Type of Course**	**Electronics and Communication Engineering**

Course Outcomes:

1. To understand the fundamentals of digital logic design
2. Applications of combinational and sequential logic circuits
3. To learn the HDL programming

Course Contents:

Module 1:

NUMBER SYSTEMS: Representations, signed, 1's complement, 2's complement, saturation and overflow in fixed point arithmetic.

Module 2:

BOOLEAN ALGEBRA: Axioms and theorems, DeMorgan's law, universal gate, duality, expression manipulation using axioms and theorems.

Module 3:

COMBINATIONAL LOGIC: Introduction to switching algebra, canonical forms, two-level simplification, Boolean cube, logic minimization using K-map method, Quine McCluskey tabular method, minimization for product-of-sum form, minimization for sum-of-product form, multiplexers, Demultiplexers, decoders, encoders, hazard free synthesis, Arithmetic circuits, adders, half adder, full adder, BCD adder, ripple carry adder, carry-look ahead adder combinational multiplier.

Module 4:

SEQUENTIAL LOGIC: Simple circuits with feedback, basic latches, clocks, R-S latch, master-slave latch, J-K flip flop, T flip-flop, D flip-flop, storage registers, shift register, ripple counter, synchronous counters, Finite State Machine (Moore/Mealy Machines), FSM with single/multiple inputs and single/multiple outputs etc.

Text:

1. Digital Design, Morris Mano, Prentice Hall, 2002
2. Digital Fundamentals,10^{th} , Floyd T L, Prentice Hall, 2009.

Reference:

1. Digital Design-Principles and Practices, 4th , J F Wakerly, Prentice Hall, 2006.
2. Fundamentals of Digital Logic with Verilog Design, 2nd Ed, S. Brown and Z. Vrsaniec, McGraw Hill, 2007

List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)

1. Study of basic components and ICs used in digital electronics lab.
2. Implementation of basic logic gates using switches, p-n junction diodes and bipolar junction transistor.
3. Study of universal gates and implementation of Boolean functions using NAND and NOR gates.
4. Implementation of 1-bit Full Adder/Subtractor using logic gates.
5. Implementation of 2-bit binary ripple adder using logic gates.
6. Implementation of 3X2 bit binary multiplier using logic gates.
7. Design and implementation of code converters.
8. Realization of Adder and Subtractor circuits using Multiplexer.
9. Study of sequential circuits and implementation of Flip-Flops.
10. Design and implementation of asynchronous decade counter.

Course Code:	**CSL 102**	**Course Title:**	**Data Structures**
Category:	**Core**	**Credit Assigned**	**L** | **T** | **P** | **C** **3** | **0** | **2** | **4**
Pre-Requisite (if Any)	**CSL 101 (Computer Programing)**	**Type of Course**	**Computer Science and Engineering**

Course Outcomes:

Students will be able to:

1. Design and differentiate the recursive and iterative versions of the program.
2. Implement and analyse algorithms using dynamic memory allocation.
3. Apply, implement and evaluate various concepts of linear data structures for solving real life problems.
4. Apply, implement and evaluate non-linear data structures in solving various problems.

Course Contents:

Module 1:

Types and operations, Iterative constructs and loop invariants, Quantifiers and loops, Structured programming and modular design, Illustrative examples, Scope rules, parameter passing mechanisms, recursion, program stack and function invocations including recursion, Overview of arrays and array based algorithms - searching and sorting, Mergesort, Quicksort, Binary search, Introduction to Program complexity (Big Oh notation)

Module 2:

Implementation of Structures (Records) and array of structures (records). Database implementation using array of records. Dynamic memory allocation and deallocation. Dynamically allocated single and multi-dimensional arrays.

Module 3:
Lists as dynamic structures, operations on lists, implementation of linked list using arrays pointers and its operations. Introduction to Overview of linked list implementation using self-referential-structures/pointers. Stack, Queues and its operations. Concept of an Abstract Data Type (ADT), Implementation of stacks and queues using both array-based and pointer-based structures. Uses of stacks in simulating recursive procedures/ functions. Applications of stacks and queues.

Module 4:
Lists - Singly-linked lists, doubly linked lists and circular linked lists. List traversal, insertion, deletion at different positions in the linked lists, concatenation, list-reversal etc. Mergesort for linked lists.

Module 5:
Trees, binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs.

Module 6:
Generalization of trees to graphs – their representation & traversals. Directed Acyclic Graphs and topological sort, Dijkstra‟s shortest path algorithm,

Text:
1. Data Structures & Program Design in C: Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.
2. Fundamentals of Data Structures in C : E. Horowitz, S. Sahni, and S. Anderson-Freed, University Press

Reference:
1. Aho, Hopcroft and Ullmann, ―Data Structures and Algorithms,‖ Addison Wesley, 1983.

Course Code:	**CSL 103**	**Course Title:**	**Application Programming**
Category:	**Core**	**Credit Assigned**	**L** | **T** | **P** | **C** **3** | **0** | **2** | **4**
Pre-Requisite (if Any)	**CSL 101 (Computer Programming)**	**Type of Course**	**Computer Science and Engineering**

Course Outcomes:
1. To recognize and use different tools for Web Programming.
2. Analyse the working background of web.
3. Construct efficient web pages with CSS and Javascript.
4. Demonstrate competency in the use of common HTML code for the development of website.

Course Contents:
Internet fundamentals, LAN, WAN, Introduction to common Internet terms, www. Basics of networking, DNS, URL, firewall, proxy, Web protocols – http and https.

Designing web pages: HTML, forms, DHTML, XML, CSS. Extensible Hypertext Mark up

Language (XHTML): XHTML syntax, headings, linking, images, special characters and horizontal rules, lists, tables, forms, internal linking, meta elements.

Introduction to Web Server – Setting up and configuration of Apache Tomcat server, Accessing pages from another machine.

Server Side Programming: Introduction to web programming with PHP. Client side programming with Javascript.

Introduction to Python - Statements and Control Flow, Expressions, Methods, Typing, Libraries and Developmental Environment, Web Programming using Python.

Text:

1. Deitel H.M. and P. J. Deitel, Internet & World Wide Web - How to Program, Prentice-Hall.
2. Goodman D, Morrison M., JavaScript Bible; Wiley India
3. Lutz, Mark, Learning Python (4th ed.). O'Reilly Media

Reference:

1. Garfinkle S., Spafford G; Web Security, Privacy and Commerce; O'Reilly, 2002.
2. Atkinson L., Core PHP Programming, Prentice Hall.
3. N.P.Gopalan, Akilandeswari, Web Technology, Prentice-Hall.

Course Code:	**HUL 101**	**Course Title:**	**Communication Skills**
Category:	**Core**	**Credit Assigned**	**L** **T** **P** **C** **2** **0** **2** **3**
Pre-Requisite (if Any)	**NONE**	**Type of Course**	**Humanities**

Rationale

The Bachelor's degree holder in Computer Science Engineering or Electronics Communication and Engineering has to work in the industry. To get the expertise and know the technology in his respective field, it is necessary to know effective communication, team building, leadership quality, good interpersonal skills, and the recent trend in Engineering and Technology.

Competency

For engineers to be successful throughout their careers, communication skills are just as important as technical knowledge. Work doesn't happen in a vacuum. Engineers have to communicate daily with each other, with supervisors, with people in different departments, and even with clients. Their work is complex and technical, but not everyone they work with has the same technical expertise, which makes it even more important for them to have good communication skills. Effective communication in engineering is critical to ensuring that all project participants are on the same page. This course enhances the oral and written communication of students.

Course Outcomes:

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

1. Utilize functional English grammar for accurate and enhanced language skills.
2. Construct and use effective interpersonal and workplace communication
3. Acquire better reading comprehension, pronunciation and reading skills
4. Introspect and illustrate the personality traits and soft skills
5. Develop the skills for better pre and post placement communication through effective

presentations, personal interviews and group discussions

Course Contents:

Module 1
Communication:-
Definition of Communication, Process of Communication, Stages of Communication, Content of the message, Types of communication, Transmission, Medium/Modes of Communication, Verbal and Non-verbal Communication (Kinesics, Proxemics, Chronemics, Haptics, Paralinguistic Feature), Levels of Communication, Flow of Communication, Communication Networks, Grapevine, Barriers to Communication, Choice of Medium,

Module 2
Listening Skills:-
Art of Listening, Listening vs Hearing, (Poor Listening vs Effective Listening), Advantages of Good Listening, Barriers to Effective Listening, Techniques of Effective Listening
Reading Skills:-
Reading Comprehensions, Process of Reading, Techniques of Reading, Techniques for Good Comprehension, Reading Skills(Skimming, Scanning, Intensive Reading, SQ3R), Orientation in Literary and Scholarly Article

Module 3
Speaking Skills:-
Types of Speech, Public Speaking, Components of Effective speech, Stage Presence & Personality Development, Clarity and Fluency, Body Language, , Barriers to Effective Speaking
Presentation Skills:-
Characteristics of a Successful Presentation, Power Point Presentation, Using Audio Visual Aids

Module 4
Group Discussion:-
Do's and Don'ts of GD, Essential Skills for GD, Evaluation Pattern
Personal Interview:-
Objectives of Interview, Types of Interview, Job Interviews, Employer's Expectations, Do's & Don'ts of Social Media Profile, Success Factors, Failure Factors

Module 5
Grammar:-
Transformation of Sentences, Punctuation, Spellings and Mechanics of Writing

Text Books:
1. Orient Longman, A Textbook of English for Engineers and Technologists
2. M. Ashraf Rizvi, Effective Technical Communication. Tata Mc Grwa-Hill Publishing Company Limited, 2009

Reference Books:
1. Quirk R. and Greenbaum S., A University Grammar of English.
2. Krishnaswamy N., English Grammar (Longman Publication) (Macmillan India Ltd)
3. Sanjay Kumar and Pushpa Lata, Communication Skills. Oxford Publication
4. Meenakshi Raman and Sangita Sharma. Technical Communication. Second Edition. Oxford Publication, 2011

List of Lab Assignments/Experiments
1. Speaking Skills (Verbal/Non verbal Skit, Role Play, Extempore, Story Telling, Word Wheel,

Debate)
2. Presentation Skills (Film/Book Review, PPT Presentation)
3. Group Discussion (Practice GD, Mock GD)
4. Personal Interview/ SWOT Analysis (SWOT Analysis, Mock PI)
5. Comprehending a Technical Report/News Paper Article.
6. Presenting a Book Chapter using PowerPoint slides

Course Code:	BEL 101	Course Title:	Mechanics and Graphics
Category:	Core	Credit Assigned	L: 3, T: 0, P: 2, C: 4
Pre-Requisite (if Any)	NONE	Type of Course	Basic Science

Course Outcomes:

1. Use of various drawing instruments, Concept of scales, Representative factor and dimensioning, Orthographic projections of points, lines, plane on principle planes/ Profile plane/ Auxiliary planes. Projection of right regular solids inclined to both the planes. Projection of right regular solids inclined to both the planes. Drawing isometric views from orthographic projection orthographic views.
2. Principles of Vector representation of force system, Moment of a force about a point and about an axis; couple moment; reduction of a force system to a force – a couple Wrench , Free Body Diagram, Reactions at supports, Equilibrium of Planar (including friction) and Spatial force system,
3. Internal forces in member: Determination of variation of Axial force (Axial Force Diagram), Shear force (Shear Force Diagram), Bending moment (Bending Moment Diagram) and twisting moment (Torque diagram)
4. Concept of stress and strain: Normal and shear stress and strain, State of stress at a point, Stress strain curve, Hook's law, Modulus of elasticity, Poisson's ratio, Modulus of rigidity, Bulk modulus, Transformation of stress

Course Contents:

Module I

Engineering Graphics

Engineering curves like cycloid, conic sections. Concept of scales, Representative factor. Orthographic projections of points, lines, plane. Projection of right regular solids inclined to both the planes. Conversion of isometric view to orthographic views. Isometric views. Development of surfaces. Introduction to CAD, applications, Softwares, AUTOCAD, Basic commands and problems in 2D and 3D.

Module II

Applied Mechanics

Principles of Vector representation of force system, Moment of a force about a point and about an axis; couple moment; reduction of a force system to a force – a couple Wrench , Free Body Diagram, Reactions at supports, Resultant and Equilibrium Analysis, Equilibrium of Planar and Spatial force system, friction. Internal forces in member (TRUSS): Determination of variation of Axial force (Axial Force Diagram), Shear force (Shear Force Diagram), Bending moment (Bending Moment Diagram) and twisting moment (Torque diagram). Concept of stress and strain: Normal and shear stress and strain, State of stress at a point, Stress strain curve, Hook‟s law, Modulus of elasticity, Poisson‟s ratio, Modulus of rigidity, Bulk modulus, Transformation of stress.
Kinetics of Particles (a) D'Alembert's principle applied to bodies having rectilinear motion. (b) Principle of work and Energy: General numerical applications (c) Principle of Impulse and momentum: General numerical applications
Centre of Gravity, Second moment of area, polar moment of inertia, radius of gyration, Parallel axis theorem, Product of inertia.

Text:

1. Singer F.L. and Andrew Pytel, Strength of Material, Harper and Row Publishers, New York.
2. Bhatt N.D. and Panchal V.M., Elementary Engineering Drawing, Charotar Publishing House, 43rd edition.

Reference:

1. Hibbler, Engineering Mechanics, Pearson Education, Asia Pvt Ltd.
2. Beer F.P. and Johnston E.R., Vector Mechanics for Engineers: Statics and Dynamics, Tata McGraw-Hill
3. Irving H. Shames, Engineering Mechanics: Static and Dynamics, Pearson Education, Asia Pvt Ltd.
4. Meriam J.L. and Kraige L.G., Engineering Mechanics, John Wiley and Sons.
5. Stephen Timoshenko, Strength of Materaials, Part -1, CBS Publishers and Distributors, New Delhi.
6. Popov E.P., Mechanics of deformable bodies, Prentice-Hall
7. Beer F.P. and Johnston E.R., Mechanics of materials, McGraw-Hill International

<table>
<tr><td>Course Code:</td><td>MAL 201</td><td>Course Title:</td><td colspan="4">Numerical Methods and Probability Theory</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Mathematics-I (101), Mathematics-II (102)</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
</table>

Course Outcomes:

The students will be able

1. Apply numerical methods to obtain approximate solutions of nonlinear equations.
2. Compare different iterative methods based on their order of convergence.
3. Choose appropriate numerical methods and apply to solve linear systems of equations and ordinary differential equations.
4. Develop probability density functions of random variables and calculate measures of central tendency.
5. Predict missing data using various distributions.

Course Contents:

Numerical Analysis: Solutions of algebraic and transcendental equations by Iteration method, method of false position, Newton-Raphson method and their convergence.
Solutions of system of linear equations: Gauss elimination method, Gauss Seidal method, LU decomposition method. Newton-Raphson method for system of nonlinear equations. Eigen values and eigen vectors: Power and Jacobi methods.
Numerical solution of ordinary differential equations: Taylor's series method, Euler's modified method, Runge-Kutta method, Adam's Bashforth and Adam's Moulton, Milne's predictor corrector method. Boundary value problems: Shooting method, finite difference methods.

Probability theory: Random variables, discrete and continuous random variable, probability density function; probability distribution function for discrete and continuous random variable joint distributions. Definition of mathematical expectation, functions of random variables, The variance and standard deviations, moment generating function other measures of central tendency and dispersion, Skewness and Kurtosis. Binomial, Geometric distribution, Poisson distribution, Relation between Binomial and Poisson's distribution, Normal distribution, Relation between Binomial and Normal distribution. Random processes, continuous and discrete, determinism, stationarity, ergodicity etc. correlation functions, autocorrelation and cross-correlation, properties and applications of correlation functions.

Text Book:

1. Jain, Iyengar and Jain, Numerical Methods for Engineers and Scientists, Wiley Eastern.
2. Kendall Atkinson, Weimin Han, Elementary Numerical Analysis, Wiley.
3. Gerald and Wheatley Applied Numerical Analysis, Addison-Wesley.
4. Paul L. Meyer, Introductory Probability and Statistical Applications, Addison Wesley.
5. Miller and Freund, Probability and Statistics for Engineers Eastern Economy Edition, PHI.
6. Ross, A First Course in Probability, Pearson Education India.

Reference:

1. S. D. Cante and C. de Boor, Elementary Numerical Analysis, an algorithmic approach, McGraw-Hill.
2. M. R. Spiegel, Theory and problems of Probability and statistics; McGraw-Hill Book

Company; 1980.

Course Code:	**CSL202**	**Course Title:**	**Introduction to Object Oriented Programming**
Category:	**Core**	**Credit Assigned**	**L** **T** **P** **C** **3** **0** **2** **4**
Pre-Requisite (if Any)	**None**	**Type of Course**	**Computer Science and Engineering**

Course Outcomes:

Students will be able to:

1. Evaluate various object-oriented paradigms like abstraction, encapsulation, inheritance, polymorphism, information hiding, exception handling, etc.
2. Identify the implementational differences between different object-oriented programming languages.
3. Analyse a problem description and design and develop object-oriented software using best coding practices.
4. Assess object-oriented solutions for various real-world problems.

Course Contents:

Module 1:

Object Oriented Programming, Features of object oriented programming languages like data encapsulation, inheritance, polymorphism and late binding.

Module 2:

Concept of a class, Access control of members of a class, instantiating a class, static and non-static members, overloading a method. Deriving a class from another class, access control of members under derivation, different ways of class derivation, overriding of a method, run time polymorphism.

Module 3:

Concept of an abstract class. Concept of an interface. Implementation of an interface. Exception and exception handling mechanisms. Study of exception handling mechanisms in object-oriented languages

Module 4:

Introduction to streams, use of stream classes. Serialization and de-serialization of objects. Templates, Implementation of data structures like linked lists, stacks, queues, trees, graphs, and hash table etc. using object oriented programming languages.

Module 5:

Introduction to concept of refactoring, modelling techniques like UML, Design patterns.

Text:

1. Bjane Strostrup, “The C++ programming language”, Addison-Wesley
2. Herbert Shildt, “C++: The Complete Reference”, 4th Edition
3. Arnold Ken, Gosling J, “The Java Programming Language”, Addison Wesley
4. Matt Weisfeld, “The Object-Oriented Thought Process”, Pearson
5. Cox Brad, “Object –Oriented Programming: An Evolutionary Approach”, Addison –Wesley

<table>
<tr><td>Course Code:</td><td>CSL 203</td><td>Course Title:</td><td colspan="4">Computer System Organisation</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>None</td><td>Type of Course</td><td colspan="4">Computer Science and Engineering</td></tr>
</table>

Course Outcomes:

Students will be able to:

1. Inspect the basic functional organization of a computing system.
2. Evaluate the performance of the machines based on the memories, I/O interfaces and pipelined architecture, etc.
3. Identify and interpret the implementation of memory chips, caches, modules, etc.
4. Analyse and compare CPU implementations, I/O methods, bus structures, modes of operations, ISA, etc.
5. Compare and contrast advanced architectures such as GPU in advanced digital systems.

Course Contents:

Module 1:

Addressing methods, their application in implementation of HLL constructs and data**.** Structures, instruction formats, expanding opcode method, subroutine linkage in PDP-11 and 68000, zero address machine such as HP3000.

Module 2:

Processing unit, bus architecture, execution of a complete instruction, sequencing of control signals, micro programmed control, microinstruction format, microinstruction sequencing, and bit slice concept.

Module 3:

Arithmetic, number representations and their operations, design of fast address, signed multiplication, Booth's Algorithm, bit-pair recording, division , floating point numbers and Operations, guard bits and rounding.

Module 4:

Main memory organization, various technologies used in memory design, higher order Memory design, multimodal memories and interleaving, cache memory, concept of cache memory, mapping functions, replacement algorithms. Input-output organization, I/O mapped I/O and memory mapped I/O, Direct Memory Access, interrupts and interrupt handling mechanisms, device identification, vectored interrupts, interrupt nesting, I/O Interfaces, synchronous vs. asynchronous data transfer, I/O channels.

Module 5:

Computer peripherals, I/O devices such as video terminals, video displays, graphic input devices, printers, magnetic disk, magnetic tape , CDROM systems. RISC philosophy, pipelining, basic concepts in pipelining, delayed branch, branch prediction, data

Module 6:

Dependency, influence of pipelining on instruction set design, multiple execution units, and performance. Considerations, basic concepts in parallel processing & classification of parallel architectures

Textbook:

1. Computer Organization , Hamacher, Carl V. et al, McGraw Hill
2. Structured Computer Organization , Tanenbaum A.S, Prentice Hall of India Ltd
3. Computer Organization & Design, The Hardware/ Software Interface, Patterson D. A
J. L. Second Edition. Harcourt, Hennessy Asia

Course Code	CSL 210	Course Title	Data Structures with Applications			
Category	Core	Credit Assigned	L	T	P	C
			2	0	2	3
Pre-requisite (If any)	Data structures(CSL-102)	Type of Course	Computer Science and Engineering			

Course Outcomes:

1. Ability to design and analyze the applications based on dynamic memory allocation such as linked lists.
2. Ability to apply and relate the concepts of height balanced trees for comparative analysis, and their applications to real world.
3. Ability to incorporate the knowledge of tries and skip lists for different applications.
4. Ability to apply the knowledge of graph data structures for various applications and algorithm design paradigms.

Course Contents:

Module 1:

Applications of lists in polynomial representation, multi-precision arithmetic, Hash-tables, Radix Sort etc. Multi linked structures and an example application like sparse matrices. Implementation of priority queues.

Module 2:

Overview of Binary Search Tree (BST), Height-balanced (AVL) trees, insertion/deletion and rotations. Heaps and heapsort.

Multi-way trees and external sorting - B-trees – insertion and deletion, Introduction to B+ trees with insertion and deletion algorithms. Red-black trees, Splay trees.

Module 3:

Tries, Multi-way tries, Suffix trees, Segment trees. Applications of the above mentioned trees. Introduction to Skip lists, Data structures for disjoint set representation

Module 4 :

Overview and definition of Graph as data structure, Traversals (BFT, DFT, Topological Sort), Data structures for Dijkstra's Shortest Path Algorithm, All-pairs shortest paths, Minimum spanning trees – Algorithms (Kruskal, Prim) and data structures. Huffman coding. Introduction to network flow problem.

Text Books:

1. Data Structures & Program Design in C: Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.
2. Fundamentals of Data Structures in C : E. Horowitz, S. Sahni, and S. Anderson-Freed, University Press

Reference:

1. Aho, Hopcroft and Ullmann, ―Data Structures and Algorithms,‖ Addison Wesley, 1983.

Course	CSP 201	Course Title:	IT Workshop-I

Code:			
Category:	**Core**	**Credit Assigned**	**L** **T** **P** **C** **0** **0** **4** **2**
Pre-Requisite (If Any)	**None**	**Type of Course**	**Computer Science and Engineering**

Course Outcomes:

1. Effectively use the Unix programming environment - shell, file system, scripts, filters, program development tools.
2. Develop good programming style using Python with usage of packages: math, Cmath and functions.
3. Be familiar with writing of real time application programs using the concepts like class, object, inheritance, constructor, tkinter.
4. Use of effective procedures and tools for data analytics using graphical outcomes: Pandas, numpy, openpyxl and matplotlib.
5. Learn to automate tasks for making predictions using machine learning: scikit learn, countplot.

Course Contents:

Module 1:
Introduction to different tools for identification and possibility of errors in C program – gdb, concepts of "core dump", backtracing using "bt", using "info" to dump all registers, creating watch-list / watch variables. DDD (Data Display Debugger) – introduction and usage, debugging with ddd (step, step into, step over). Using DevCpp and/or VisualStudio b. Setting compiler options and linker options. Unix tools - Awk, sed, Emacs. Make files and automated builds.

Module 2:
Text editors. Users, files, permissions, and processes on Linux. Introduction to shell: Set and Unset a variable, Displaying – using echo, Using Expr & Test, Getting input – using read, Header files of shell script – using Shabang, Sample Shell script program. Assigning a command to a variable, Storing output to a variable, Assigning global value – using Export. Command Line Arguments, Conditional & Looping Statement, Functions.

Module 3:
Advanced Commands: SED, Replacing values in a file, STTY, TOP, Sending an email using MAIL, HERE. Scheduler: Scheduling a job – using 'Crontab', 'at' and 'nohup. Shell Programming: Essential systems administration with shell scripting and elementary Python, Version control. Advanced Shell Scripting: Monitoring a file, Handling Shell Script Interrupts, Extracting data from HTML/XML file, Trapping Signals Database Connectivity, Connecting MYSQL to Shell, Running SQL queries from Shell Script.

Module 4:
Bash and Bash Scripting: Common shell programs, Advantages of BASH, Executing commands, Building blocks, developing good scripting, variables, conditionals, loops, finding logged in users. Writing and Debugging Scripts.

Module 5:
Bash Environment: Shell Initialization files, Quoting characters, Shell expansion, Aliases and More options in Bash. Regular Expressions: Meta characters, Extended regular expressions Using GREP, Pattern matching. Python Integration, Testing and Debugging with Software Development Practice.

Text Books:

1. Christopher Negus “Linux Bible”, Wiley
2. Steve Parker “Shell Scripting: Expert Recipes for Linux, Bash & more” Wrox
3. Richard Petersen “Linux: The Complete Reference”, TMH
4. Robert Collins “Shell Programming and Bash Scripting: Ultimate Beginners Guide Book”, CreateSpace.

<table>
<tr><td>Course Code:</td><td>ECL202</td><td>Course Title:</td><td colspan="4">Microprocessors & Interfacing</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>NONE</td><td>Type of Course</td><td colspan="4">Electronics and Communication Engineering</td></tr>
</table>

Course Outcomes:

Students will be:

1. Able to explain the use of internal registers and memory organization of microprocessor.
2. Able to develop assembly language programs using the instruction set of microprocessor.
3. Able to interface and program any peripheral with the microprocessor as per the system requirement.
4. Able to design a system using microprocessor and peripheral devices.

Course Contents:

Intel's 8085 microprocessor: Architecture, timing diagrams, Machine cycle, T-states, Bus structure, Instruction set, Grouping of instructions, Instruction cycle and their timing diagrams, Assembly language programming. Stacks and sub routines, related instructions, Interrupts and associated instructions, Expanding interrupts, ALP for stacks and interrupt service routines. Memory Interfacing, I/O mapped and memory mapped modes, interfacing of input and output devices, Multiplexed and matrix interfacing. Study and Interfacing of (at least four of the following) peripherals with 8085: Peripherals: 8255, 8254, 8251, 8259, 8257/37, and 8279**.**

8086 microprocessor: Architecture, Instruction set, memory interfacing and programming, 8087 coprocessor interface

Text:

1. "Microprocessors Architecture, Programming and applications with 8085", Gaonkar R.S, Penram Publishing, Edition

Reference:

1. Microprocessors and Microcontrollers, Uffenbeck J, Prentice Hall of India Edition
2. K M Bhurchandi, A K Ray, Advanced microprocessors and Peripherals, McGraw Hill Education India, 2012, 3rd ed

List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)

<table>
<tr><td>Course Code:</td><td>CSL 204</td><td>Course Title:</td><td colspan="4">Discrete Maths and Graph Theory</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>None</td><td>Type of Course</td><td colspan="4">Computer Science and Engineering</td></tr>
</table>

Course Outcomes:

1. Student should be able to use different proof techniques.
2. Students would be able to argue about limits by using Pigeon Hole principle.
3. Solve problems based on set theory, Permutations and Combinations, as well as Discrete Probability.
4. Students will be able to solve mathematical problems on partial orders, and group theory.
5. Students would be able to model and analyze computational problems in graph theoretical framework.

Course Contents:

Module 1:

Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem.

Module 2:

Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

Module 3:

Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.

Module 4:

Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs. Graphs, hypergraphs, transitive closure, trees, spanning trees. Eulerian tours, Hamiltonian cycles, Planar Graphs, Connectivity, Colorability, Line Graphs

Module 5:

Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices.

Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimonial Coefficients Recurrence Relation and Generating Function, Recurrence Relation and Recursive algorithms , Linear recurrence relations with constant coefficients, Homogeneous solutions,

Particular solutions, Total solutions .

Text Books:

1. C.L.Liu, “Elements of Discrete Mathematics” Tata Mc Graw-Hill Edition.
2. Trembley, J.P & Manohar; “Discrete Mathematical Structure with Application CS”, McGraw Hill.
3. Kenneth H. Rosen, “Discrete Mathematics and its applications”, McGraw Hill.
4. Lipschutz; Discrete mathematics (Schaum); TMH
5. Deo, Narsingh, “Graph Theory With application to Engineering and Computer Science.”, PHI.

<table>
<tr><td>Course Code:</td><td>CSL 205</td><td>Course Title:</td><td colspan="4">Design and Analysis of Algorithms</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Data Structures</td><td>Type of Course</td><td colspan="4">Computer Science and Engineering</td></tr>
</table>

Course Outcomes:

1. Student will be able to derive the recurrence relations for algorithms and analyze the performance of algorithms using asymptotic notations.
2. Student will be able to perform the amortized analysis and evaluate the cost of various operations on the data structure.
3. Student will be able to analyze and apply various algorithm design paradigms for real world applications. Also, evaluate the performance of algorithm based on various parameters.
4. Student will be able to apply and relate various algorithms to solve the problems based on Graphs.

Course Contents:

Module 1:

Mathematical foundations, summation of arithmetic and geometric series, n, n^2, bounding summations using integration, recurrence relations, and solutions of recurrence relations using technique of characteristic equation and generating functions.

Module 2:

Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, lower bound proof, elementary and advanced data structures with operations on them and their time complexity.

Module 3:

Divide and conquer basic strategy, binary search, quick sort, merge sort, Fast Fourier Transform etc. Greedy method - basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc.

Module 4:

Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem.

Module 5:

Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking basic strategy, 8-Queen’s problem, graph colouring, Hamiltonian cycles etc. NP-hard and NP-complete problems, basic concepts, nondeterministic algorithms, NP-hard and NP-complete, Cook’s Theorem, decision and optimization problems, polynomial reduction.

Text:

1. Introduction to Algorithms : Cormen T.H. et.al : Prentice Hall of India
2. Computer Algorithms : Horowitz, Sahani, Rajsekharan , Galgotia Publications Pvt.Ltd
3. Fundamentals of Algorithms : Brassard, Bratley , Prentice Hall

<table>
<tr><td>Course Code:</td><td>CSL206</td><td>Course Title:</td><td colspan="4">Software Engineering</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Computer Programming(CSL 101)</td><td>Type of Course</td><td colspan="4">Computer Science and Engineering</td></tr>
</table>

Course Outcomes:

1. Develop ideas and techniques for designing, developing, and modifying large software systems.
2. Discuss the Function-oriented and object-oriented modular design techniques, designing for re-use and maintainability.
3. Analyse specification and documentation, Verification and validation, Cost and quality metrics and estimation.
4. Illustrate to work in industry as a team member on a substantial project and used the management skill to handle the crucial project.

Course Contents:

Module 1:

Software Engineering Process & Management: Generic view, Capability Maturity Model, Process models-waterfall, evolutionary, incremental etc., unified process, agile view, project management, metrices estimation, project scheduling, risk management.

Module 2:

Software engineering Principles and Practice: Communication, planning and modelling practices, system engineering and modeling, business process engineering requirement analysis, system analysis- flow oriented and class oriented modeling using data modelling concepts.

Module 3:

Software Design Engineering: Design Concepts: Abstraction Architecture, pattern modularity, information hiding, design classes, refactoring etc., Design of web application, architectural design, component level design, user interface design.

Module 4:

Software Testing and Quality Management: Testing strategies, testing for object oriented software testing for web applications, validation testing etc. Black box testing, white box testing, Basis path testing. Testing for specialized environments, architectures and application. Quality concepts, quality assurance, software reviews, statistical quality assurance.

Module 5:

Software configuration management and advance topics : Elements of configuration management system, process configuration for web engineering, component-based development, clean room software engineering, formal methods, software reengineering, Software Maintenance

Text:

1. Software Engineering by Ian Sommerville ; Pearson Ed
2. Software Engineering: A Practitioner’s Approach by Roger Pressman ; Tata-McGraw Hill

Course Code:	CSL 207	Course Title:	Operating Systems
Category:	Core	Credit Assigned	L T P C 3 0 2 4
Pre-Requisite (if Any)	Data Structures (CSL 102)	Type of Course	Computer Science and Engineering

Course Outcomes:

Students should be able to

1. Identify the structure and design issues of operating systems.
2. Summarise the concepts of process management and relate the underlying programming constructs.
3. Analyse and evaluate the memory management techniques, I/O management and file systems.
4. Implement general operating system concepts using modern operating systems like Unix and others.

Course Contents:

Module 1:

Introduction, basic h/w support necessary for modern operating systems - Services provided by OS, system programs and system calls - brief discussions of evolution of OS - real time and distributed systems: a brief overview of issues.

Processes and 3 levels of scheduling - process control block and context switch - goals of scheduling and different scheduling algorithms - threads: user-level and kernel level.

Module 2:

Process cooperation and synchronization - mutual exclusion and implementation - semaphores, conditional critical regions and monitors - classical inter - process communication problems - message passing.

Deadlocks and strategies for handling them - protection and security issues - access lists, Capabilities.

Module 3:

Memory management techniques - contiguous and non-contiguous - paging and segmentation - translation look-aside buffers (TLB) and overheads - virtual memory and demand paging- page faults and instruction restart - problems of large address spaces - page replacement algorithms and working sets - miscellaneous issues.

Module 4:

File systems, user interface - disk space management and space allocation strategies - examples from UNIX, DOS, Windows etc - directory structures - disk caching - file system consistency and logs - disk arm scheduling strategies.

Module 5:

Linker and Loader - Concept of static and dynamic relocation, external symbols, design of linker, design of object file for different loading schemes.

Common Object file format - Structure of object file and executable file, section or segment headers, symbol table, concept of storage class, string various, data types line insert, character, arrays structures.

Device Drivers - Device programming, system drivers, non-system drivers, virtual drivers,

Incorporation of driver routines, Basic device driver operation, character and block drivers.

Text:

1. Silberchatz & Galvin, “Operating System Concepts”, Addison Wesley
2. Tanenbaum A, “Modern Operating Systems”, PHI 2 nd Ed
3. William Stallings, “Operating Systems”, Pearson Publications

Course Code:	**CSL 208**	**Course Title:**	**Design Principles of Programming Languages**
Category:	**Core**	**Credit Assigned**	**L** | **T** | **P** | **C** **3** | **0** | **2** | **4**
Pre-Requisite (if Any)	**None**	**Type of Course**	**Computer Science and Engineering**

Course Outcomes:

1. Evaluate different programming paradigms
2. Identify the advantages using certain programming constructs of a programming language over the other programming languages.
3. Identify the challenges in the implementation aspects behind different programming constructs.
4. Design and develop programs using imperative (or procedural), an object-oriented, a functional, and a logical programming language using various programming constructs.

Course Contents:

Module 1:

Definition of Programming language, Syntax, semantics. High - level languages. Implementation of high-level languages, Compilers and Software interpreters. Data elements, identifiers binding, binding time, binding identifiers to names, binding of attributes, importance of binding time. Concept of r-value and l-value. Effect of environment on a language. Language paradigms.

Module 2:

Data type, elementary data type, structured data type, elements of specification and implementation of data type. Implementation of elementary data types : integer, real, character, Boolean and pointer. Implementation of structured data types. Vectors & arrays, records and files. Type checking, type conversion and initialization.

Module 3:

Evolution of data type concept. Abstract data type, encapsulation. Design and implementation of new data types through subprograms. Subprogram definition and activation, their implementation, parameter passing, generic subprograms.

Module 4:

Sequence control structures used in expressions and their implementation. Sequence control structures used between statements or group of statements and their implementation.
Sequence control structures used between subprograms, recursive and non recursive subprogram calls. Data control, referring environment dynamic and static scope, static chain implementation and display implementation.

Module 5:

Type definition as mechanism to create new abstract data types, type equivalence, type definitions

with parameters. Defining new abstracts data types Storage management issues, like static and dynamic allocation, stack based allocation and management, Heap based allocation and management

Text:

1. Pratt Terence, “Programming Languages, Design and Implementation”, PHI
2. Sethi Ravi, “Programming Languages”, Addison Wesley

<table>
<tr><td>Course Code:</td><td>CSP 202</td><td>Course Title:</td><td colspan="4">IT Workshop-II</td></tr>
<tr><td>Category:</td><td>Core</td><td>Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td>0</td><td>0</td><td>4</td><td>2</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>None</td><td>Type of Course</td><td colspan="4">Computer Science and Engineering</td></tr>
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Course Outcomes:

1. Able to assess the technology and business trends impacting mobile applications.
2. Able to analyze the characterization and architecture of mobile applications.
3. Able to design and develop mobile applications using an application development framework namely, Android Studio.
4. Able to design and develop database for the mobile applications.

Course Contents:

Module 1:

The Java Environment: Java Source File Structure, Compilation, Executions. Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Datatypes, Operators Assignments. Object Oriented Programming Class. Fundamentals including Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects, Constructor & initialization code block, Access Control, Modifiers, methods Nested, Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism, Method Overloading, Recursion, Dealing with Static Members, Finalize () Method, Use of "this" reference, Use of Modifiers with Classes & Methods.

Module 2:

Package Organizing Classes and Interfaces, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention. 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, Checked and Un-Checked Exceptions.

Module 3:

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, cripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips.

Module 4:

Concept of Threading, Needs of Multi-Threaded Programming, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, Critical Factor in Thread and DeadLock. Event Handling, Two Event Handling Mechanisms, The Delegation Event Model, Events, Event Sources, Event Listeners, Event Classes, The MouseEvent Class. Database Programming using JDBC Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases.

Module 5:

Python for data Science: Python data types, Python Lists, Conditional Statements, Functions, packages, Numpy, matplotlip, control flow and pandas

Text Books:

1. Naughton & Schildt "The Complete Reference Java 2", Tata McGraw Hill
2. Deitel "Java- How to Program:" Pearson Education, Asia
3. Horstmann & Cornell "Core Java 2" (Vol I & II) , Sun Microsystems
4. Ivor Horton's "Beginning Java 2, JDK 5 Ed., Wiley India.
5. Java Programming for the absolute beginners By Russell, PHI Learning
6. Learning Python, 5th Edition by Mark Lutz, O'Reilly Media, 2013. ISBN 978-1-4493-5573-9
7. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinny, O'Reilly Media, 2012. ISBN 978-1-4493-1979-3

Course Code:	**CSL 301**	**Course Title:**	**Database Management System**			
Category :	**CORE**	**Credit Assigned :**	**L**	**T**	**P**	**C**
			3	**0**	**2**	**4**
Pre-Requisite (if Any) :	**NONE**	**Type of Course :**	**Computer Science and Engineering**			

Course Outcomes:

1. Student will be able to design and develop database using ER model with various SQL constraints and apply normalization for consistency in database.
2. Student will be able to write queries using relational algebra, tuple and domain relational calculus, and SQL to retrieve information from database based on data centric applications.
3. Student will be able to analyze and apply the concept of storage management and query processing to fine tune the performance of database at the time of information retrieval.
4. Student will be able to analyze and apply the conception of transaction processing, concurrency control and recovery mechanism in database.

Course Contents:

Module 1:

Database system concepts and Architecture - concept of relational database, Relational data model, Relational algebra, SQL-the relational database standard, ER and EER model.

Module 2:

Database design theory - Functional dependencies and normalization, relational database design algorithms, practical database design and demoralization, Relational constants, programmatic ways for implementing constraints, triggers, Chase algorithm.

Module 3:

Physical database design - Concept of physical and logical hierarchy, storage structures like cluster, index organized table, partitions, various table storage parameters and block storage parameters, concept of index, B-trees, hash index, function index, bitmap index.

Module 4:

Process and memory management in database - Various types of tasks in database, database buffer management, log buffer management code reuse, concept of two tier and N-tier

architecture, data dictionary and catalog information database recovery technique. Arier Algorithm for recovery.

Module 5:
Query optimization and performance tuning - Various techniques for query optimization, strong and weak equivalence, cost base optimization, Use of different storage structures in query optimization.

Module 6:
Transaction Processing - Transaction and system concepts, Desirable properties of transaction, Schedules and recoverability, serializability of schedules, concurrency control, lock base protocols and time stamp based protocols, read consistency.

Text Books:
1.Fundamentals of Database Systems : Elmasiri and Navathe, Addisson Wesley, 2000
2.Principles of Database Systems : Ullman , Golgotia Publications 1988

Course Code :	**CSL302**	**Course Title :**	**Computer Networks**			
Category :	**DC**	**Credit Assigned :**	**L**	**T**	**P**	**C**
			3	**0**	**2**	**4**
Pre-Requisite (if Any) : Nil	**NONE**	**Type of Course :**	**Computer Science & Engineering**			

Course Outcomes:
On completion of the course, students will be able to:
1. Analyse various issues and their solutions at different layers of network architecture
2. Design and develop various networking algorithms
3. Apply networking protocols on a given network to analyze their working
4. Apply networking concepts to build real world networking systems using most important protocols in use today

Course Contents:
Module 1:
Introduction to Computer Networks, Network Architecture: Layering and Protocol, Internet architecture, Implementing Network Software: Application Programming Interface (Socket), Delay x bandwidth product.

Module 2:
Classes of Links, Framing, Error Detection: cyclic redundancy check, Internet checksum algorithm. Reliable transmission: Stop-and-wait, Sliding Window, Ethernet and Multiple Access Networks (802.3), Wi-Fi/802.11

Module 3:
Datagram and virtual circuit switching, Bridges and LAN switches, Basic Internetworking (IP): Internetwork, Global addresses, Datagram forwarding in IP, Subnetting and Classless addressing,

Module 4: Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Virtual Networks and tunnels, Distance-vector (RIP), Link-state (OSPF), Routing areas, Interdomain routing (BGP).

Module 5:
Simple demultiplexer (UDP), Reliable byte stream (TCP): End-to-end issues, segment format,

Connection establishment and termination, Sliding window, Triggering transmission and Adaptive retransmission, TCP Congestion Control: Additive increase/ Multiplicative decrease, Slow start, Fast retransmission and fast recovery. Resource allocation in TCP

Module 6: Introduction to applications and related Protocols: Electronic mail (SMTP, MIME, IMAP), World Wide Web (HTTP), Name service (DNS).

Text Books:

1. Larry L. Peterson, Bruce S. Davie, "Computers Networks: A systems approach", Morgan Kaufmann, 5th Edition.

Reference Books:

1. Tanenbaum A. S, "Computer Networks", PHI
2. James F. Kurose and Keith W. Ross: Computer Networking: A Top-Down Approach Featuring the Internet, 3rd Edition.
3. William Stallings, "Data and Computer Communications", PHI 6th Edition
4. Behrouz A Forouzan, "Data Communication and Networking", 4th Edition
5. Simon Haykin, "Communication Systems", John Wiley 4th Edition
6. Douglas Comer, "Computer Networks and Internets", Addison Wesley 2nd Edition
7. Peterson, Simon, "Computer Networks: A Systems Approach", Pearson Education, Asia

Course Code:	**CSL 303**	**Course Title:**	**Theory of Computation**			
Category :	**CORE**	**Credit Assigned :**	**L**	**T**	**P**	**C**
			3	**1**	**0**	**4**
Pre-Requisite (if Any) :	**NONE**	**Type of Course :**	**Computer Science and Engineering**			

Course Outcomes:

1. Solve computational problems based on computability and complexity.
2. Design computational models for various grammar and languages.
3. Prove the grammar, language, and automata by using formal mathematical methods.
4. Apply the concepts of theory of computation in developing engineering applications such as compiler design.

Course Contents:

Module 1:

Preliminaries - Sets, operations, relations, transitive closure, countability and diagonalisation, induction and proof methods- pigeon-hole principle and simple applications - concept of language - grammars and production rules - Chomsky hierarchy.

Module 2:

Regular grammars, deterministic finite automata - non determinism, conversion to deterministic automata- e-closures, minimization of automata

Module 3:

regular expressions, regular sets, Pump lemma for regular sets- closure properties of regular sets, decision properties for regular sets,

Module 4:

Context - free languages, parse trees and ambiguity, reduction of CFGS, Chomsky and Griebach normal forms, push - down Automata (PDA), non determinism, acceptance by two

methods and their equivalence, CFLs and PDAs – Pumping lemma for context free languages, Closure and decision properties of CFLs.

Module 5:
Turing Machines variants, recursively enumerable (r.e.) sets, recursive sets, TM as computer of function, decidability and solvability, Halting Problem, reductions, Post correspondence Problem (PCP) and unsolvability of ambiguity problem of CFGs.

Module 6:
primitive recursive and partial recursive functions Church -Turing thesis - convergence of view points of what "computability" is : Semi formal treatment.

Text Books:

1. Martin John, "Introduction to languages and the theory of computation", TM
2. Hotwani Hopcroft, Ullman, "Introduction to Automata Theory, Languages and computation", Pearson Education

Reference Books:

1. Michael Sipser, "Introduction to the theory of Computation", 3rd edition, Cengage Learning

Course Code:	**HUL 301**	**Course Title:**	**Technical Communication**			
Category :	**OPEN**	**Credit Assigned :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Pre-Requisite (if Any) :	**NONE**	**Type of Course :**	**Humanities**			

Course Outcomes:

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

1. Define the importance and objectives of technical communication according to effectively practice ethical principles of communication.
2. Recognize the role of audience in effective communication.
3. Explain skills to produce effective research and workplace documents.
4. Define skills to enhance visual appeal of documents and basic grammar rules/ mechanism to bring accuracy in writing.
5. Recognize skills that would make them effective communicators during and after their placement.

Course Contents:

Defining technical writing – Basics of Technical Communication – Barriers to Communication – Objectives Audience Recognition and Involvement, Grammar, Punctuation, Spellings and Mechanics of Writing

Correspondence: Memos - Letters – Job Search

Visual Appeal – Document Design – Graphics – Electronic Communication – Email – Online help and Websites

Technical Application: Descriptions – Instructions and User Manuals

Report Strategies: Research - Summary – Types of Reports

Oral Presentations and Group Discussion

Text Book:

1. Gersen S J and S M Gersen, Technical Writing: Process and Product, Pearson Education Asia

Reference Books:

1. Rutherford: Basic Communication Skills for Technology, Pearson Education Asia
2. Lesikar et al: Lesikar's Basic Business Communication, Tata McGraw Hill
3. Shirley Taylor: Communication for Business, Pearson Education Asia

Course Code:	**CSL 304**	**Course Title:**	**Compilers**			
Category :	**CORE**	**Credit Assigned :**	**L**	**T**	**P**	**C**
			3	**0**	**2**	**4**
Pre-Requisite (if Any) :	**(CSL 303) Theory of Computation**	**Type of Course :**	**Computer Science and Engineering**			

Course Outcomes:

1. Identify the parsing and grammar transformation techniques in the phases of compiler design.
2. Analyse the lexical, syntactic and semantic structures of a language.
3. Design a scanner, parser, and semantic analyser for language translation.
4. Design a language by applying the concepts of language processor.

Course Contents:

Module 1:

compilers and translators, phase structure of a typical compiler, Number of passes, ideas about lexical analysis, syntax analysis, code optimization and code generation, design of lexical analyzer.

Module 2:

Lexical Analysis - Role of lexical analyzer, recognition of tokens, A language of specifying lexical analyzers, Design of a lexical analyzer generator and tool for study of lex.

Module 3:

Syntax specification of programming languages, Design of top-down parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR,LR parsers. Dealing with ambiguity of the grammar. Study of syntax directed definitions and syntax directed translation schemes as notational frame work to specify the translations. Using syntax directed translation schemes for translation of expressions, controls structures, declarations, procedure calls.

Module 4:

Storage allocation and run time storage administration, symbol table management, Error detection and recovery, error recovery in LR parsing, error recovery in LL parsing, Automatic error recovery in YACC.

Module 5:

Introduction to Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, setting up data flow equations to compute reaching definitions, available

expressions, Live variables. Problems in code generation , simple code generator code generation from DAG, Peephole optimization

Module 6:
Assembler, Microprocessor - Concept of assembler, design of single pass and two pass assembler, forward reference, design of output file of assembler, concept of macro, macro call within macro, macro definition within macro, recursive macro calls, design of macro processor.

Text Books:
1. Principles of Compiler Design: Aho A. V., Ullman J. D., Addison Wesley.

Reference Books:
1. Principles and practice of compiler writing : Aho, Sethi , Ullman , Addison Wesley
2. Compiler Design in C : Alan Holub , PHI
3. Crafting a compiler : Fischer and LeBlanc , Addison Wesley

Course Code:	**CSL 305**	**Course Title:**	**Cryptography and Network Security**			
Category :	**CORE**	**Credit Assigned :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Pre-Requisite (if Any) :	**Computer Networks (CSL 302)**	**Type of Course :**	**Computer Science and Engineering**			

Course Outcomes:
1. Recognizing the fundamentals of cryptography, types of cryptosystems, digital certifications and control mechanisms.
2. To analyse different security methods and protocols related to network and software's.
3. To apply safety measures to protect applications and online services from vulnerabilities.
4. To create an application resisting different types of online and offline attacks.

Course Contents:
Module 1:
Classical Ciphers: Affine, Playfair , Hill Cipher; Modern Block and Stream Ciphers: DES, AES, RC4, A5/1; Block Modes of Operation: ECB, CBC, CFB, OFB, CTR

Module 2:
Asymmetric Key Cryptosystems: RSA; Digital Signatures: DSS; Hash and MAC: SHA-512

Module 3:
Key Management: Digital Certificates, PKI; Authentication: One-Way Authentication, Mutual Authentication, Dictionary Attacks, Centralized Authentication, The Needham-Schroeder Protocol, Kerberos

Module 4:
Network Layer Security: IPSec; Transport Layer Security: SSL/TLS. Non-cryptographic Protocol Vulnerabilities: DoS and DDoS, Session Highjacking and Spoofing, ARP Spoofing and Attacks on DNS

Module 5:

Software Vulnerabilities: Phishing, Buffer overflow, cross site scripting and SQL injection. Viruses, Worms, and other Malware: Virus and Worm Features, Internet Scanning Worms, Mobile Malware and Botnets

Module 6:
Access Control in Operating Systems: Discretionary Access Control, Mandatory Access Control, Role Based Access Control, SELinux and Recent Trends. RFIDs and E-Passports, Electronic payment

Text Books:

1. Forouzan, Cryptography and Network Security, TMH
2. Bernard Menezes, Network Security and Cryptography, Cengage
3. Radia Perlman Network Security: Private Communication in a Public World, Prentice Hall 2002

Reference Books:

1. Bruce Schneier Applied Cryptography , 2nd Edition John Wiley & Sons 1996
2. Douglas Stinson Cryptography Theory and Practice CRC Press 1995
3. Alfred Menezes, Paul van Oorschot, Scott Vanstone Handbook of Applied Cryptography CRC Press 1997
4. Pfleeger and Pfleeger, Security in Computing, Pearson

Course Code:	**MAL-301**	**Course Title:**	**Mathematics in Data Science**			
Category :	**OPEN**	**Credit Assigned :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Pre-Requisite (if Any) :	MAL-201	**Type of Course :**	**Basic Science**			

Course Outcomes: after successful completion of this course student will be able to:

1. To apply linear and multivariate regression.
2. To calculate basic descriptive statistics for measure of central tendency, distribution shape and spread.
3. Presenting quantitative data using appropriate diagrams, tabulations and summaries.
4. To analyse importance of sampling distribution in computing and research development skills
5. To apply appropriate statistical methods in the estimation/prediction of different datasets
6. To construct and analyse null and alternative hypothesis

Course Content:

Module 1:
Regression analysis: Simple linear regression, multivariate regression, Reminder on probability, The regression model with one variable, The general linear model, Inference in the linear model, Regression diagnostics tools, One factor ANOVA, Model Identification, Generalized least squares methods, Instrumental variables and simultaneous equations.

Module 2:
Descriptive Statistics: graphical representation of the data, measures of locations and variability.

Module 3:

Sampling Distributions: Distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions, problems.

Module 4:
Estimation: Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems..

Module 5:
Testing of Hypotheses: Null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for proportions.

Text Book:

1. V.K. Rohatgi and A.K.M. Ehsanes Sateh: An Introduction to Probabability and
   1. Statistics, John Wiley & Sons.
2. Spiegel, M.R.; Theory and problems of Probability and statistics; McGraw-Hill Book Company; 1980.
3. K.S. Trivedi: Probability Statistics with Reliability, Queuing and Computer Science applications, Prentice Hall of India Pvt. Ltd.
4. A First Course in Probability: Ross , Pearson Education India; 9 edition
5. Douglas C Montgomery , Elizabeth A Peck: Introduction to Linear Regression Analysis, Wiley India Pvt Ltd; 3 edition