Year-1 Term-1

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5	CSTE 1106	Introduction to Computer Application Lab	1	2	
6	PHYS 1101	Electromagnetism, Oscillations, Heat and Optics	3	3	
7	PHYS 1102	Physics Lab	1	2	
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9	ENG 1101	English Language	2	2	
10	ENG 1102	English Language Lab	1	2	
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12	BAN 1101	বাংলাভাষা	0	3	
		Total	**21.5**	**30**	

COURSE CODE: **CSTE 1101**COURSE TITLE: **STRUCTURED PROGRAMMING LANGUAGE**

Course Code: **CSTE 1101**Course Title: **Structured Programming Language,** 3Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1, Term 2

Rationale: This course has been designed to develop the students' ability to solve computing problems using structured programming languages.

Course Objectives:

- Solve computing problems using programming concepts
- Analyze and apply debugging and testing techniques to locate and resolve errors and to determine the effectiveness of a program.
- Proficiently use fundamental programming elements including: variable declaration, use of data types and data structures, loop structures, console and file I/O, and functions.
- Learn the basic concept of ACM problem solving techniques and programming contests.
- Apply the programming concept in accomplishing projects in a team.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course contents**	**Outcome** (at the end of the session, student should be able to)	**Teacher Learning strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	**Programming Language:**Computer programming, programming languages, Compilation vs. Interpretation, Problem solving techniques, Data Flow Diagram	Appreciate the evolution of programming languages. Differentiate between compiler and interpreter base program. Learn the basic concept of problem solving. Maps out the flow of information for any process or system	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, physical environment and methodology with the students. Demonstrate problem solving techniques	Answer basic questions, quizzes, Homework, exams.

2.	**Basic program structure:** Variable declarations including common data types (e.g. int, float, char etc.); Constants and its use I/O operations including formatted I/O Operators: Assignment, arithmetic, relational, logical and bitwise expressions including precedence and Associativity Example problems using variables and expressions	Use the basic data types with visualization of how data are stored in the memory and their memory representations. Use various expressions in their program and solve simple arithmetic problems	Lecture and discussion with basic data type, concept of variable and showing their memory representation graphically. Demonstrate various operators and build expression using them. Students will be asked to translate arithmetic and algebraic statement using programming language. Example on using variables and constants and expressions	Answer basic questions, quizzes, Homework, exams.
3.	**Control Structures & Statements:** Boolean expressions Conditional statements (e.g., if/else, switch case). Nested conditional Structures Standard/structures programming practices for decision structures.Continue and Break statements Example problems using control structures	Use the Boolean expressions with real life problem. Use control statement with various Boolean expressions and solve simple logical problems and get control over program flow. Use continue and break statement with various logical problems	Lecture and discussion with problems, which corresponds to the program flow and logic control. Demonstrate various control structure with flow chart and show how to solve decision making problem using them. Students will be asked to write and analyze program that involved decision making.	Answer basic questions, quizzes, Homework, exams.
4.	**Loop Structures:** The While, The For, The Do While Loops, Nesting of loops, Switch, Continue, Break statements, Jumps in loops, GoTo statements.	Use the loop structure and their control flow. Use nested loops and solve problems using them. Determine loop operation usage from the programming problem	Lecture and discussion with problems that require iterations. Demonstrate repetition essentials, counter controlled repetition, for repetition statement, break and continue.	Answer basic questions, quizzes, Homework, exams.
5.	**Complex data type (Array):** Array syntax, rules and variable declaration, One-dimensional, Multi-dimensional arrays, Strings as arrays; initializing arrays Processing array using Loops. Example problems	Define the tabular data using array. Use array for solving programming problems	Lecture and discussion with tabular data, sorting and searching arrays. Multidimensional array Examples using array.	**Class Test 1**(topics of the week's 1-4)

	using arrays and records			
6.	**Pointer:** Basic concept of pointers Array and pointer Processing array using Pointer, 2D array and pointer, Dynamic memory allocation using malloc Function Sample problems using Pointer	Create pointer and use them to process array in programming problems Create dynamic array and use them in problem solving	Lecture and discussion on Basics of pointers. Array-pointer referencing duality. Strings. Dynamic memory management. Discuss sample problems using pointer and dynamic memory management.	Answer basic questions, quizzes, Homework, exams.
7.	**Functions:** Different part of a function. Argument passing and returning results.Passing array and pointer to function. Call by value and call by Reference, Swapping, Recursion, Variables in scope & Command line arguments. Sample problems using functions	Write function both for pass by value and pass by reference. Understand scope of variables and the command line arguments. Appreciate problem solving using function.	Lecture and discussion on function definition and function call. Function prototypes and header files. Demonstrate the mechanism of recursion and swapping. Example function writing for programming problems.	Answer basic questions, quizzes, Homework, exams.
8.	**Structure:** Basic concept of structure, structure array, pointers for structure,passing structure to function, returning structure from function Self-referential structure Example problems using structure	Create structure for representing real-life tabular data Visualize self-referential structure	Lecture and discussion on basics of structure, structure array, and pointers for structure Example problem using structure	Answer basic questions, quizzes, Homework, exams.
9.	**Union & Enumerated Data type:** Basic concept of Union, Passing Union to function, returning union from function,Basic concept of Enumerated data type, Example problems using Union & Enumerated data types	Use enum and union in proper way. Create union for representing real-life tabular data	Lecture and discussion on basics of union and enum data type. Example problem using union and enum data type	**Class Test 2**(topics of the week's 5-8)

10.	**File management:** (This will be covered in the lab early due to project activity) Create, read, write and update files,Sequential files, unformatted files, Text & Binary files,Case problems using file IO	Understand the concept of file and file manipulation.	Lecture and discussion on file manipulation (e.g., CRUD on File)	Answer basic questions, quizzes, Homework, exams.
11.	**Computer Graphics:** Graphics programming: lines, Drawing & Filling images, patterns, drawing and filling shapes, Palettes & Colors & Text in graphics. Example problems using graphics	Understand the use of graphics in programs properly. Represent images, shapes, and text in programs.	Lecture and discussion on basics of graphics in programs. Example problem using graphics	Answer basic questions, quizzes, Homework, exams.
12.	**Macros, C preprocessor, Compilers controlled directives:** Basic concept of using macros,Importance of preprocessor,Benefit of using compiler-controlled directives,Example problems using Macros, C preprocessor, Compilers controlled directives.	Understand the concept of Macros, C preprocessor and the use of compiler-controlled directives.	Lecture and discussion on Macros, C preprocessor	**Class Test 3** (topics of the weeks9-12)
13.	Miscellaneous and Final exam preparation	Learn about latest trends and the better answering methods in final exam.	Lecture and discussion on miscellaneous subjects	Exercise the answering methods in final exam.

Recommended books:

1. Programming in ANSI C by E. Balagurusamy, McGraw Hill.
2. Teach yourself C by H. Schildt, McGraw Hill.
3. Theory and problems of programming with C by Byron S. Gottfried, Schaum's Outline Series, McGraw Hill.
4. C How to Program by H. M. Deitel and P. J. Deitel, Pearson Education.

COURSE CODE: **CSTE 1202**, COURSE TITLE: **STRUCTURED PROGRAMMING LANGUAGE LAB**

Course Code: **CSTE 1102**, Course Title: **Structured Programming Language Lab**, 3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 1, Term 2
Rationale: This course provides an introduction to structured programming language and solve problems using programming concepts.
Course Objectives: ➢ In the course, students will perform experiments to verify practically the theories andconcepts develop in CSTE 1101. ➢ Solve computing problems using programming concepts ➢ Learn the basic concept of ACM problem solving techniques and programming contests.

➢ Apply the programming concept in accomplishing projects in a team.				
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Codeblocks.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Basic Program Structure** • Data types • Operators • Memory allocation • Various expressions • Simple arithmetic problems	• Write programs on basic program structure.	Discussion and practice	-Home task -Quiz
2	**Control Structures & Statements** • If/else • Switch • Nested conditional structure • Continue and break	• Write programs on different control structures.	First lecture and then Practice	Answer basic questions, quizzes, Homework, exams.
3	**Loop Structures** • Loop structure • Loop control flow • Nested loop • Loop operation	• Write programs on loop structure	Lecture and discussion with problems.	Quiz 1 (Topic of the 1-2 weeks)
4	**Array** • Array declaration • Array initialization • Array processing	• Write programs on array initialization, and different dimensional array processing.	Lecture and discussion with problems.	Homework
5	**Pointer** • Pointer of array • Array of pointer • Dynamic memory allocation	• Write programs on pointer, and pointer manipulations.	Practice with a real-life problem.	Answer basic questions, quizzes, Homework, exams.
6	**Functions** • Function declaration • Argument passing • Call by value • Call by reference • Swapping • Recursion	• Write programs on function declaration • Write programs on Argument passing, call by value, and call by reference • Demonstrate examples of swapping and recursion.	Lecture and discussion with problems.	Homework
7-8	**Structure, Union, and Enumerated** • Structure declaration • Structure array • Pointers for structure • Structure passing to	• Write programs on Structure and its manipulations. • Write programs on Union and its manipulations.	Lecture and discussion with problems.	Quiz 2 (Topic of the 4-6 weeks)

	function • Self-referential structure • Union declaration • Union passing to function • Enumerated data type	• Write programs on enumerated data types.		
9	**File Management** • Create files • Read files • Write files • Update files • Sequential files • Text and binary files • Unformatted files	• Write programs on creating, reading, writing, and updating files. • Write programs on text, binary files, and unformatted files.	Practice with a real-life problem. .	Answer basic questions, Homework
10	**Computer Graphics** • Line drawing • Filling images • Patterns • Shapes • Text in graphics	• Write programs on line drawing, filling images, patterns, shapes, and text in graphics.	Practice with a real-life problem.	Homework
11	**Macros, C preprocessor, Compilers controlled directives** • Macros • Preprocessor • Library creating	• Write programs on micros, and preprocessor • Write programs on creating C library.	Lecture and discussion with problems.	Answer basic questions, Homework Quiz 3 (Topic of the 9-12 weeks)
12	**Project**	• Submit a project using the concepts of structured programming language.	Evaluate each project.	Presentation, Project showcasing.
13	**Final Lab Exam (Lab and Viva)**			

COURSE CODE: **CSTE 1103**, COURSE TITLE: **ELECTRIC CIRCUIT ANALYSIS**

Course Code: **CSTE 1103**, Course Title: **Electric Circuit Analysis**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 1, Term 1
Rationale: This course is designed to develop the fundamental concepts regarding the analysis of electrical circuits and enable the students to have a thorough knowledge of the working principle and characteristics of all electrical machines.
Course Objectives: ➢ To acquaint students with the basic concepts and properties of electrical circuits and networks ➢ To teach students how to analyze both DC and AC electrical circuits ➢ To familiarize students with the working method and applications of electrical machine ➢ To introduce students to power system protection and switchgear
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.
Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy(activities directed to achieve outcomes)	Assessment Strategy(How they are developed)
1.	**Circuit Models:** Characteristics & applications of linear circuit elements, Ideal, and non-ideal sources: Voltage and Current. Series, Parallel and Compound circuit analysis. Loading effects: Ammeter and Voltmeter.	Demonstrate basic proficiency in building basic electrical circuits and operating fundamental electrical engineering equipment.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2.	**Circuit Theorem and DC analysis:** Ohm's law, Voltage and current divider rule, Kirchhoff's Laws.	Use Kirchhoff's laws, circuit theorems and node voltage methodology to solve simple DC as well as AC circuits.	Lecture and discussion on theory and problems.	Answer basic questions, quizzes, Homework, exams.
3.	**Circuit Theorem and DC analysis:** Mesh and Nodal analysis, The matrix form of Mesh and Nodal equations, Use of Cramer's rule, Bridge networks, T-Pie and Pie-T Conversions.	Choose proper analysis methods and use them to solve DC circuits.	Lecture and discussion on theory and problems.	Answer basic questions, quizzes, Homework, exams.
4.	**Circuit Theorem and DC analysis:** Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.		Lecture and discussion on theory and problems.	Exercise with various mathematical problems.
5.	**Transients and Time Domain analysis:** Transient in RC, RL, and RLC circuits. Pulse repetition rate and duty cycle. Average value. RC response to square wave inputs.	Solve simple 1st order transient circuits.	Lecture and discussion on theory and problems.	**Class Test 1** (topics of the week's 1-4)
6.	**AC Circuits:** Periodic functions, average &RMS values, Steady state behavior with sinusoidal, excitation, phasor representation, reactance and impedance, series and parallel AC circuits, resonance,	Apply simple steady state sinusoidal analysis to circuits.	Lecture and discussion on theory and problems related to AC circuits.	Answer basic questions, quizzes, Homework, exams.
7.	**AC Circuits:** Power in AC circuits, power factor, the principle of generation of single phase & Three phase voltages, Power in Balanced three-phase AC systems.	Demonstrate a basic understanding of phasors and phasor diagrams for AC circuit analysis.	Lecture and discussion on theory and problems related to AC circuits.	Answer basic questions, quizzes, Homework exams.
8.	**Networks:** Two port network and its parameters. Equivalent circuits. Analog filter design: Elementary filter theory,	Recognize, analyze, and sketch characteristics for different types of filter.	Lecture and discussion on theory and problems related to analog filter.	Answer basic questions, quizzes, Homework,

	Characteristics impedance. A low-pass filter, High pass filter, Band-pass filter, Band-elimination filter.			exams.
9.	**Magnetic Circuits:** Flux, MMF, reluctance, analogous electric circuits, simple calculations for composite magnetic circuits.	Explain different terms related magnetic circuit and analyze a simple magnetic circuit	Lecture and discussion on theory and problems related to magnetism	**Class Test 2** (topics of the week's 5-8)
10.	**Generator:** Introduction, construction, EMF equation, classification.	Understand the basic construction and operation of DC and AC machine	Lecture and discussion on theoretical background of generator	Answer basic questions, quizzes, Homework, exams.
11.	**Motor:** Basics of DC motor, Induction motor (single & three phase) & Synchronous motor, Stepper motor.		Lecture and discussion on theoretical background of different types of motor	Quizzes, Homework, exams.
12.	**Switchgear:** Switch, Fuse, Circuit Breaker, Relay.	Develop an ability and skill to design the feasible protection systems for power system	Lecture and discussion on switchgear	**Class Test 3** (topics of the week's 9-11)
13.	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Introductory Circuit Analysis by Robert L.Boylestad, Prentice Hall.
2. A Textbook of Electrical Technology by B.L. Theraja, S. Chand.
3. Fundamentals of Electric Circuits by C. K. Alexander, M. N O.Sadiku,

COURSE CODE: **CSTE 1104**, COURSE TITLE: **ELECTRIC CIRCUIT ANALYSIS LAB**

Course Code: **CSTE 1104**, Course Title: **Electric Circuit Analysis Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 1, Term 1

Rationale: This lab course is designed to give students ability todesign, build, and implement basic AC and DC circuits.

Course Objectives:

- Provide hands-on experience to the students so that they are able to puttheoretical concepts to practice.
- Give a specific design problem to the students, which after completion they will verify using the simulation software (PSPICE or Multisim) or hardwired implementation.
- Understand the concept of circuit laws.
- Solve the electrical network using mesh and nodal analysis by applying network theorems.
- Analyze the transient response of series and parallel A.C. circuits.
- Build a foundation of basic knowledge required for electrical machines and protection system.
- Acquire teamwork skills for working effectively in groups.
- Develop technical writing skills important for effective communication.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual,

Question bank, Previous questions.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1.	To familiar with the operation of different electrical instruments.	gain significant experience with electrical instruments such as function generators, digital multimeters, oscilloscopes, and power supplies etc.	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Answer basic questions about different types of instruments.
2, 3, 4, 5	To verify the following theorems using breadboarding and simulation software (PSPICE): i. KCL and KVL theorem, ii. Superposition theorem, iii. Thevenin's theorem, iv. Norton's theorem and v. Maximum power transfer theorem	Explain the concept of circuit laws and network theorems and apply them to laboratory measurements. Become proficient with computer skills (eg.,PSPICE or Multisim) for the analysis and design of circuits	Through lecture, laboratory, and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are due at the beginning of the lab period. Respected Teacher will be evaluated in lab period.
6, 7	To design and construct of low pass and high pass filter and drawtheir characteristics curves.	Explain the concept of electrical filter and apply them to electrical circuit.	Through lecture, laboratory, and out-of-class assignments.	
8, 9	Study the frequency response of an RLC series and parallel circuit and find its resonant frequency.	Explain the concept of series and parallel circuit and apply them to AC circuit.	Through lecture, laboratory, and out-of-class assignments.	
10, 11	Study the basic construction of Generator, Motor, Transformer and different types of switchgear.	Reflect a basic understanding of generator, motor and transformer operation.	Through lecture, laboratory, and out-of-class assignments.	
12	Submit a mini project in a group			
13	**Final Lab Exam (Job, Quiz and Viva)**			

COURSE CODE: **CSTE 1106**, COURSE TITLE: **INTRODUCTION TO COMPUTER APPLICATIONLAB**

Course Code: **CSTE 1106**, Course Title: **Introduction to Computer ApplicationLab**, 2 Hours/Week, 1 Credit, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 1, Term 1
Rationale: This lab course is designed to give students ability tohands-on experience with computer hardware, Operating systems, Office tools, Databases, Internet, Computer networks, and Troubleshooting mechanism.
Course Objectives: ➢ Provide hands-on experience to the students so that they are able to put theoretical concepts to practice. ➢ Understand the concepts of operating system ➢ Build a foundation of strong knowledge required for Word, Spread Sheet, Presentation package, and Database related different problems.

- Use different computer network model practically.
- Analyze and solve different problems of hardware troubleshoot and computer software.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Eclipse IDE.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	**HARDWARE** • Assemble Hardware Components (Desktop and Laptop).	• Students will able to assemble hardware components	Discussion and practice	-Home task -Quiz
2	**OPERATING SYSTEM** • Basics of computer • DOS • Windows • Linux • Mac	• Students will learn basics of computer • They will learn how to operate DOS, Windows, Linux, and Mac	First lecture and then Practice	Answer basic questions, quizzes, Homework, exams.
3	**WORD PROCESSOR** • Popular word processors • Create a test file complete with figures, columns, and tables.	• Students will learn to use a popular word processor to create a camera-ready test file complete with figures, columns, and tables.	Lecture and discussion with problems.	Homework
4	**SPREAD SHEET** • Popular Spread Sheet • Maintain a small data base • Minor book keeping • Statistical and graphical analysis of data.	• Students will learn to use a popular Spread Sheet to maintain a small data base. • They will learn to analyze statistical and graphical data.	Lecture and discussion with problems.	Quiz 1 (Topic of the 1-3 weeks)
5	**PRESENTATION PACKAGE** • Multimedia slides • Animation.	• Students will learn how to create multimedia slides and animation.	Practice with a real-life problem.	Answer basic questions, quizzes, Homework, exams.
6-7	**DATABASE APPLICATION** • Microsoft Access Topics: Database basics, Field, Table, Keys, ER Diagram, Form, Report, and Query.	• Students will learn how to create Field, Table, Keys, ER Diagram, Form, Report, and Query in Microsoft Access.	Lecture and discussion with problems.	Homework
8-9	**INTERNETAND COMPUTER NETWORK** • Browsing Concepts • Searching in the web • Email • Cable	• Students will learn how to browse, and search in the web. • They will learn about Email, Cable Configurations:Straight cable, Cross Cable etc.	Lecture and discussion with problems.	Quiz 2 (Topic of the 4-7 weeks)

	Configurations:Straight cable, Cross Cable etc. • LAN setup and IP address configuration.	• They will learn how to setup LAN and IP address configuration.		
10-12	**HARDWARE TROUBLESHOOTING** • Installing/binding a new computer system • Installing operating system and other software. • Formatting and partitioning the hard disk. • Precaution • Preventive maintenance • Troubleshooting hardware and software components.	• Student will learn how to Install/bind a new computer system, Installing operating system and other software. • They will learn how to format and partition the hard disk. • They will learn about precaution, preventive maintenance, troubleshooting hardware and software components.	Practice with a real-life problem. .	Answer basic questions, Homework Quiz 3 (Topic of the 8-9 weeks)
13	**Final Lab Exam (Job, Quiz and Viva)**			

COURSE CODE: **PHYS1101**, COURSE TITLE: **ELECTROMAGNETISM, OSCILLATIONS, HEAT AND OPTICS**

COURSE ID: **PHYS1101**, COURSE TITLE: **Electromagnetism, Oscillations, Heat and Optics**, 3 Hours/Week, 3 Credits, Total Marks:100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1, Term 1

Rationale: This course is designed to get idea about electric and magnetic field, oscillation and thermodynamics.

Course Objectives:

- Make the students familiarize with the idea of fundamental laws of electric field and magnetic field, electric potential, capacitor, inductor, laws of thermodynamics and oscillation.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	Coulomb's Law; Electricfield; Gauss'sLaw and itsapplication;Electric potential;	Using Coulomb's and Gauss's law, how one can calculate electric field. Idea of electric potential and relation with electric field.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes,	Answer basic questions, quizzes, Homework, exams.

			examinations . Topic wise lecture delivery.	
2	Capacitors and capacitance: Capacitors with dielectrics, Dielectricsanatomicview,Charginganddischargingofacapacitor;	Capacitor and it's electric behavior.		
3	Magneticfield:Magneticinduction,Magneticforceonacurrentcarrying conductor,Torqueonacurrentcarryingloop,Halleffect;.	Basic idea of Magnetic field.		Answer basic questions, quizzes, Homework , exams.
4	Faraday'sLawof electromagneticinduction;Lenz'sLaw;Self-induction;Mutualinduction; Magneticpropertiesofmatter:Hysteresiscurve;Maxwellequations	Magnetic induction and related laws.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework , exams.
5	DifferentialequationofaSimpleharmonicoscillator,Totalenergya nd average energy, Combination of simple harmonic oscillations, Lissajous' figures,spring-masssystem,Timeperiodoftorsionalpendulum;	Understand simple harmonic motion and its practical example.	Exercise with various mathematical problems.	**Class Test 1**(topics of the week's 1-4)
6	Damped oscillation:Determinationofdampingcoefficient;Forcedoscillation: Resonance,Two-bodyoscillations,Reducedmass.	Get idea about different types of oscillatory motion.	Lecture and discussion with problems.	
7	Differentialequationofa progressivewave,Powerandintensityofwavemotion;Stationarywave: Groupvelocityandphasevelocity;Dopplereffect.	Get concept about different types of wave.		
8	Kinetictheoryofgases:Deductionofgaslaw,Principleofequi-partitionof energy,Equationofstate-Andrew'sexperiment,	Explain kinetic theory of gases and to deduce the laws of gases.		Answer basic questions, quizzes, Homework , exams.
9	VanderWaalsequation, Criticalconstants,Transmissionofheat-Conduction,Convectionand Radiation.Lawsofthermodynamics	Understand physical significance of Vander Waal's equation and laws of thermodynamic s.		**Class Test 3** (topics of the week's5-8)
10	Interferenceoflight,Young'sdoubleslitexperiment,FresnelBi-prism,	Understand interference of	Lecture and discussion	Answer basic

	lnterferenceatwedgeshapedfilms,Newton'srings,Interferometer;	light and different experiment on interference.	with problems.	questions, quizzes, Homework exams.
11	Diffractionoflight:FresnelandFraunhoferdiffractions,Diffractionbys ingle slit,Diffractionfromacircularaperture,	To get idea about Fresnel and Fraunhofer diffraction.		Answer basic questions, quizzes, Homework, exams.
12	Resolvingpowerofoptical instruments,DiffractionatdoubleslitandN-slits-diffractiongrating;	Understand of resolving power and diffraction of different slits.	Understandin g and solving the problem.	
13	Polarization:Productionandanalysisofpolarizedlight,Brewster'sLa w, MalusLaw,Polarizationbydoublerefraction,Retardationplates,N icol prism,Opticalactivity,Polarimeters,Polaroids.	Production of polarized light using different techniques.		**Class Test 3** (topics of the week's 9-12)

Recommended Books:

1. PhysicsVol-l&2byD.Halliday&R.Resnick,WileyEasternPrivateLtd.
2. FundamentalsofPhysicsbyDavidHallidayandRobert Resnick, JonnWiley&Co.
3. VibrationsandWaves–TheMITIntroductoryPhysicsSeriesbyA.P.French,CBS.
4. Heat and thermodynamics by Brijlal and N. Subrahmanyam
5. Physics for engineer by Dr. Giasuddin Ahmed.

COURSE CODE: **PHYS 1102**, COURSE TITLE: **PHYSICS LAB**

Course Code: **PHYS 1102**, Course Title: **Physics Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 1, Term 1

Rationale: Self conducting experiments in the field of general physics, processing and physical understanding of the results, and writing laboratory reports on the experiment.

Course Objectives:

- Independently conducting experiments in the field of general physics (handling measuring devices and instruments).
- Explain physical phenomena in the tests performed (a connection between physical laws and their application).
- Statistical analysis of results obtained by experiment, interpretation of the results.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1.	To familiar with the operation of different instruments.	gain significant experience with various equipment	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and	Answer basic questions about different types of instruments.

			evaluation method.	
2, 3, 4, 5	1. Determination of unknown resistances and verification of the laws of resistances by P.O Box. 2. Comparison of EMF of two Cells. 3. Determination of the thermal conductivity of a bad conductor by Lee's method.		Through lecture, laboratory, and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are due at the beginning of the lab period. Respected Teacher will be evaluated in lab period.
6, 7, 8	4. Determination of mechanical equivalent of heat by an electrical method. 5. Determination of the focal length of i. a convex lens by displacement method and ii. a concave lens by an auxiliary lens method.		Through lecture, laboratory, and out-of-class assignments.	
9, 10	6. Determination of the refractive index of a liquid by a plane mirror and a pin method using a convex lens. 7. Measurement of the refractive index of the material of a prism with the help of a spectrometer.		Through lecture, laboratory, and out-of-class assignments.	
11, 12	8. Determination of the radius of curvature of a planoconvex lens by Newton's method.		Through lecture, laboratory, and out-of-class assignments.	
13	**Final Lab Exam (Job, Quiz and Viva)**			

COURSE CODE: **MATH-1101**, COURSE TITLE: **DIFFERENTIAL AND INTEGRAL CALCULUS**

Course Code: **MATH-1101**, Course Title: **Differential and Integral Calculus**,2 Hours/Week, 2 Credits, Total Marks: 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1, Term 1

Rationale: This course has been designed to develop the students' ability to realize the application of Differential and Integral Calculus in Science and Engineering aspects, specially analyzing and developing algorithms in Computer Science and Telecommunication Engineering.

Course Objectives:

- Make the students familiarize with various types of Differentiation and Integration
- Analyze functions and theorems using Mathematica.
- Apply functions and Theorems in engineering solutions.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Mathematica, MATLAB, Question bank, Previous questions.

	LESSON PLAN (AS PER WEEK):			
Week	**Course Contents**	**Learning Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	**Differential Calculus:** Limits, continuity and differentiability;	Realize importance and application of differential Calculus.	Lecture and discussion with objectives, outcomes of the course.	Answer basic questions, quizzes, Homework, exams.

2	Successive differentiation of various types of functions;	Solve functions	Lecture and discussion with characteristics parameters of functions. Analyzing functions.	quizzes, Homework, exams.
3	Leibnitz's Theorem; Rolle's Theorem; Mean value Theorem;		Lecture and discussion with solution of problems using Mathematica.	Explanation, quizzes, Homework, exams.
4	Expansion of functions; Evaluation of indeterminate forms by L' Hospitals rule;	Apply theorem and functions	Do.	Exercise with various mathematical problems.
5	Euler's Theorem; Tangent and Normal; Maximum and minimum values of functions of single variable; Curvature, Asymptotes		Do.	**Class Test 1** (topics of the week's 1-4)
6	Partial differentiation;	Realize importance and application of Partial differentiation.	Do.	Exercise with Mathematica. Homework,exams.
7	**Integral Calculus:** Definitions of integration; Integration by the method of substitutions;		Do.	Do.
8	Integration by parts; Standard integrals; Integration by the method of successive reduction;		Do.	Do.
9	Definite integrals and its use in summing series;		Do.	**Class Test 2**(topics of the week's5-8)
10	Walli's formula, Improper integrals, Beta function and Gamma function;	Solve and apply integration.	Do.	Exercise with Mathematica.
11	Area under a plane curve; Area of the region enclosed by two curves;		Do.	Do.
12	Volume of solids of revolution; multiple integrals and its application.	Apply in engineering solutions.	Do.	**Class Test 3**(topics of the week's9-12)
13	Review topics and Final exam preparation.		Discussion on miscellaneous topics.	

Recommended Books:

1. Erwin Kreyszig," Advanced Engineering Mathematics", Wiley Eastern
2. Babu Ram," Engineering Mathematics", Pearson Education
3. H. K. Dass "Higher Engineering Mathematics", S. Chand& Co.
4. B.S. Grewal, "Engineering Mathematics", S. Chand & Co.,
5. Das & Mukherjee, "Differential Calculus", U.N. Dhar& Sons Private Ltd.
6. Das & Mukherjee, "Integral Calculus", U.N. Dhar& Sons Private Ltd.

COURSE CODE: ENG **1101**, COURSE TITLE: **ENGLISH LANGUAGE**

COURSE CODE: ENG **1101**, COURSE TITLE: **ENGLISH LANGUAGE**, 2 Hours/Week, 2 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 1, Term 1
Rationale: This course is designed to provide advanced preparation to students wishing to take the IELTS

exam,who may be required to show an improvement in their performance to gain entry onto theirchosen higher study program in different countries. At the same time, students will improve theirgeneral English languagereading and writing skills.

Course Objectives:

- To prepare you to take the IELTS by discussing, practicing, and analyzing each section of the test.
- To improve your IELTS test-taking skills and strategies in each section of the test.
- To review particular grammatical patterns that occur regularly on the IELTS.
- To simulate actual test-taking conditions so that you become familiar with and more comfortable with test situations.
- To improve the quality and quantity of writing you produce under time pressure.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1.	**English phonetics:** the places and manners of articulation of the English sounds;	Comprehend English speech soundsystem, stress and intonation.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2.	**Grammar:** Grammatical principles, modals, phrases & idioms, affixes, sentence structures, why & yes/no questions, conditional sentences.	Understand basic grammar principles.	Lecture and discussion on theory and problems.	Answer basic questions, quizzes, Homework, exams.
3.	**Vocabulary building:** technical and scientific vocabulary; Correct and precise diction, affixes, the level of appropriateness. Colloquial and standard, informal and formal	Use appropriate language and vocabulary for specific tasks	Lecture and discussion on theory and problems.	Answer basic questions, quizzes, Homework, exams.
4, 5, 6, 7, 8	**Technical Writing:** (i) Paragraph writing. Interpreting from table /data/ wagon wheel / graph /figure (At least 150 words) (ii) Opinion based essay writings (At least 250 words) (iii) Business letters, job application, memos, quotation, tender notice, research reports, research projects, Press release, proof reading and editing, designing questionnaires and understanding survey, journal writing.	Write clear and coherent passages, effective letters for job application and complaints, technical reports.	Lecture and discussion on theory and problems.	**Class Test 1**(topics of the week's 1-3)
9, 10, 11,	**Reading:** Reading approaches, Comprehension of technical & non-technical materials-	Enhance reading comprehension.	Lecture and discussion on theory and problems.	**Class Test 2** (topics of the week's 4-8)

12	skimming, scanning, inferring& responding to context Passages must be paragraph types with letter marks (A, B, C, D……..) Options:- Write correct letter in boxes from letter marks (A, B, C, D……..) passages which match with each sentence Or, Matching with events from letter marks (A, B, C, D……..) passages Or, List of headings Or, Statements agree with information (True/False/Not Given) Or, Fill up with appropriate word from the passages without list Or, Fill up with appropriate word from the passages with list (synonyms word) Or, multiple choice			
13.	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	**Class Test 3** (topics of the week's 9-12).

Recommended Books:

1. John M. Lennon: Technical Writing
2. A.J. Thomson and A.V. Martinet: A Practical English Grammar
3. A. Ashley: Oxford Handbook of Commercial Correspondence
4. J. Swales: Writing Scientific English
5. Robert J. Dixson: Complete Course in English
6. Rajendra Pal & J.S. Korlahalli: Essentials of Business Communications
7. Cambridge IELTS 1-10, Cambridge University Press, 2011.

COURSE CODE: ENG **1102**, COURSE TITLE: **ENGLISH LANGUAGE LAB**

COURSE CODE: ENG **1102**, COURSE TITLE: **ENGLISH LANGUAGE LAB**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 1, Term 1
Rationale: This course is designed to provide advanced preparation to students wishing to take the IELTS exam,who may be required to show an improvement in their performance to gain entry onto theirchosen higher study program in different countries. At the same time, students will improve theirgeneral English language speakingand listening skills.
Course Objectives: ➢ To prepare you to take the IELTS by discussing, practicing, and analyzing each section of the test. ➢ To improve your IELTS test-taking skills and strategies in each section of the test. ➢ To simulate actual test-taking conditions so that you become familiar with and more comfortable with test situations. ➢ To improve the quality and quantity of listening and speaking you produce under time pressure.
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1.	To familiar with the test system of IELTS.	gain significant experience with practical system.	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Answer basic questions.
2, 3, 4, 5, 6, 7, 8	**Spoken English**: Introduction to phonetic symbols, dialogue, responding to particular situations, extempore speech, and cue card on situational condition/himself/herself.	Recognize the different sections and requirements of the IELTS speaking test. Introduce self and converse confidently on a topic, for example, family, hobbies, or work. Use appropriate stress, intonation and speed patterns in their conversation. Use the appropriate vocabulary and grammar to express their ideas	Through lecture, laboratory, and out-of-class assignments.	Answer basic questions.
9, 10, 11, 12	**Listening:** Fill in the gap, multiple choice, etc. from CD recorder	Recognize the format and question patterns in an IELTS listening test. Identify specific information and roles of speakers. Identify the main ideas of an aural text. Identify numbers, dates, time, letters, etc. correctly. Understand the implications of information provided in aural texts. Accurately transfer information gathered from listening to written answers within the set time limit.	Through lecture, laboratory, and out-of-class assignments.	Answer basic questions.
13.	**Final Lab Exam (Speaking & Listening)**			

Recommended Books:

1. Cambridge IELTS 1-10, Cambridge University Press, 2011.

COURSE CODE: **BLWS 1101**, COURSE TITLE:**HISTORY OF THE EMERGENCE OF INDEPENDENT BANGLADESH**

Course Code: **BLWS 1101**, Course Title:**History of The Emergence of Independent Bangladesh**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1, Term 1

Rationale: History of the emergence of Independent Bangladesh is a basic part of our national history. It is a mandatory course for all Departments and Institutes of NSTU. This knowledge will be needed in various job sectors.

Course Objectives:

- To make the student knowledgeable about the emergence of Bangladesh.
- To prepare them to face the question on Bangladesh Affairs in various job interviews.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

Week	Course Content	Learning Outcomes (Students will be able to)	Teaching-Learning Strategy	Assessment Strategy
1	**Introducing:** History of the Emergence of Independent Bangladesh and its Scope	answer the scope and limitations of the course.	Delivering Lecture	Oral Test
2, 3	**Description of the Country and its People** • Description of the Country and its People • Ethnical Composition • Language	• narrate the geographical condition of Bangladesh. • describe the anthropological identity of *Bangalis*and small ethnic groups of Bangladesh. • write on the advancement of Bangla language.	• Delivering Lecture • Power Point (PP) projection • Presenting through image, audio and video. • Showing the evolution of Bangla fonts.	• Written Test • Assignment
4, 5	**Partition of the Sub-Continent 1947, Structure of Pakistan, Disparity, the Language Movement and the Rule of Ayub-Yahia Khan (1958-1971)** • Lahore Resolution,1940 • The creation of Pakistan 1947 • Central and Provincial Structure • Economic, Social and Cultural Disparity • Misrule of Pakistan and Struggle for Democratic Politics • The Language Movement : Context and Phases • Rise of Nationalism and the Movement for Self-Determination Fall of Ayub Khan and Yahia Khan's Rule, Abolition of One	• explain partition of the Sub-Continent 1947. • differentiate the economic condition of two wings of Pakistan. • write on the language movement of 1948 and 1952. • discuss on the military rule of Ayub and Yahia Khan.	• Delivering Lecture • Showing reverent images and videos.	• Written Test • Oral test • Assignment

	Unit, Universal Suffrage, LFO			
6, 7	**Rise of Nationalism and the Movement for Self-Determination** • The Six Point Movement of Sheikh Mujibur Rahman • Reactions, Importance and Significance of the Six Point Movement • The Agartala Case, 1968 • Students' 11-Points Movement The Mass-Upsurge of 1969	• narrate the six-point movement and its consequences. • discuss about the Agartala Case and mass upsurge of 1969.	• Delivering lectures • Showing relevant image and video • Group discussion	• Written Test • Presentation • Assignment
8, 9	**Election of 1970, Non-cooperation Movement of March 1971 and the Declaration of Independence by Bangabandhu** • Election Result and Central's Refusal to Comply • The Non-cooperation Movement, the 7th March Address, Operation Searchlight • Declaration of Independence by Bangabandhu and His Arrest The Proclamation of Independence and the Formation of Bangladesh Government	• analyze the election of 1970, non-cooperation movement of March 1971 and the declaration of Independence by Bangabandhu	• Delivering lectures • Showing relevant image and video • Panel discussion •	• Written Test • Short Question Assignment
10, 11	**The War of Liberation and Formation of Independent Bangladesh** • The Spontaneous Early Resistance and Subsequent Organized Resistance (Mukti Fouj, Mukti Bahini, Guerillas and the Frontal Warfare • Genocide, Repression of Women, Refugees • Publicity Campaign in the War for Liberation (*Swadhin Bangla Betar Kendra*, the Campaigns Abroad and Formation of Public Opinion • The Anti-Liberation Activities of the Occupation Army, the Peace Committee, AL-Badar, Al-	• analyze the formation and role of *Mukti Bahini, FF, Mujib Bahini,* local forces and other guerillas. • narrate Crime Against Humanity being held in the Liberation War of Bangladesh. • interpret the role of anti-Liberation forces in 1971. • describe the trial of Bangabandhu and its reactions. • explain the role of India as well as Indo-Bangladesh	• Delivering lectures • Showing relevant images and videos • Role play •	• Written Test • Assignment • Presentation • Debating

	Shams, Rajakars, Pro-Pakistan Political Parties and Pakistani Collaborators, Killing of the Intellectuals • Trial of Bangabandhu in Pakistan and Reaction of the World Community • The Contribution of India in the Liberation War and the Role of International Communities Formation of Joint Command and the Victory	joint force in the Liberation War.		
12, 13	**Reconstruction of Bangladesh after 1971** • Bangabandhu's returning to Bangladesh 10 January 1972 • Formation of the Constitution • Reconstruction of the War-Ravaged Country Conspiracy of the Anti-Liberation Activists and the Murder of Bangabandhu	• analyze the role of Bangabandhu in reconstructing the war-ravaged country. • explain the formation of constitution. • explain the assassination of Bangabandhu and its aftermath.	• Lecture • Demonstration • Audio-video projection.	• Written Test • Assignment Panel Discussion

Recommended Books:

1. Harun-or-Roshid, The Foreshadowing of Bangladesh: Bengal Muslim League and Muslim Politics, 1906-1947, The University Press Limited, Dhaka 2012.
2. RounaqJahan, Pakistan: Failure in National Integration, The University Press Limited, Dhaka 1977.
3. TalukderManiruzzaman, Radical Politics and the Emergence of Bangladesh, Mowla, Brothers, Dhaka2003.
4.সালাহ্উদ্দিনআহমেদ ও অন্যান্য (সম্পাদিত), বাংলাদেশের মুক্তি সংগ্রামেরইতিহাস ১৯৪৭-১৯৭১, আগামীপ্রকাশনী, ঢাকা ২০০২।
5. সিরাজুল ইসলাম (সম্পাদিত), বাংলাদেশেরইতিহাস ১৭০৪-১৯৭১, ৩ খন্ড, এশিয়াটিক সোসাইটিঅববাংলাদেশ।
6.শেখ মুজিবুর রহমান, অসমাপ্ত আত্মজীবনী, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১২।
7. সিরাজউদ্দিনআহমেদ,একাত্তরের মুক্তিযুদ্ধ: স্বাধীনবাংলাদেশেরঅভ্যুদয়, ইসলামিক ফাউন্ডেশন, ঢাকা ২০১১।
8. ড. হারুন-অর-রশিদ, বঙ্গবন্ধুর অসমাপ্ত আত্মজীবনী পুনর্পাঠ, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১৩।
9. ড. আতফুলহাইশিবলী ও ড. মোঃমাহবুবররহমান, বাংলাদেশেরসাংবিধানিকইতিহাস ১৭৭৩-১৯৭২, সূবর্ণ প্রকাশনী।
10.ড. মোঃমাহবুবররহমান, বাংলাদেশেরইতিহাস ১৯৪৭-১৯৭১, সময়প্রকাশনী, ঢাকা ২০১২।
11. সৈয়দ আনোয়ার হোসেন, বাংলাদেশের স্বাধীনতাযুদ্ধে পরাশক্তির ভূমিকা, ডানাপ্রকাশনী, ঢাকা ১৯৮২।
12. আবুলমালআবদুলমুহিত, বাংলাদেশ: জাতিরাষ্ট্রের উদ্ভব, সাহিত্য প্রকাশ, ঢাকা ২০০০।
13. ড. হারুন-অর-রশিদ,বাংলাদেশ: রাজনীতি, সরকার ও শাসনতান্ত্রিকউন্নয়ন ১৭৫৭-২০০০, নিউ এজ পাবলিকেশন্স।
14. আতিউররহমান, অসহযোগ আন্দোলনেরদিনগুলি: মুক্তিযুদ্ধেরপ্রস্তুতিপর্ব, সাহিত্য প্রকাশ, ঢাকা ১৯৯৮।

কোর্স কোড: BANG-1101 কোর্সেরনাম :বাংলাভাষা ও সাহিত্য

কোর্স কোড: BANG-1101 কোর্সেরনাম :বাংলাভাষা ও সাহিত্য ৪ ঘণ্টা/সপ্তাহ, ক্রেডিট: ৩, মোট নম্বর ১০০ (উপস্থিতি =০৫, শ্রেণিমূল্যায়ন=২৫, ফাইনালপরীক্ষা=৭০)
কোর্সটির যৌক্তিকতা (Rationale): প্রায়োগিকজীবনেবাংলাভাষারযথাযথ ব্যবহারএবং শুদ্ধ বাংলাচর্চারবিকাশে কোর্সটি যেমনকার্যকরিঠিক তেমনিব্যাকরণেরপ্রাথমিকবিষয়গুলোর সাথে সাহিত্যেরমাধ্যমে শিক্ষার্থীদেরমানবিকমূল্যবোধজাগ্রতকরার প্রাসঙ্গিকতায় কোর্সটিএকটি যৌক্তিক ভিত্তিরপ্রতিষ্ঠিত।

কোর্সটিরউদ্দেশ্য (Course Objectives)**:**

- শিক্ষার্থীদেরভাষাগত দক্ষতাবৃদ্ধিরপাশাপাশিপ্রাত্যহিকজীবনে শুদ্ধ উচ্চারণেরব্যবহারবিকাশ ।
- ব্যাকরণেরপ্রাথমিকজ্ঞানঅন্বেষণেরমাধ্যমে প্রমিতবানানরীতিরব্যবহার ও লেখন দক্ষতাবৃদ্ধি।
- সাহিত্যেরঅন্তর্নিহিতরস আস্বাদনেরমাধ্যমে শিক্ষার্থীদেরমানবিকমূল্যবোধজাগ্রতকরা।

শিখনউপকরণ(Resources Used)**:** হোয়াইট বোর্ড, মার্কার, মাল্টিমিডিয়া, গ্রন্থ, বিগতবছরেরপ্রশ্ন

পাঠপরিকল্পনা (Lesson Plan)

সপ্তাহ	কোর্সেরবিষয় (Course Content)	শিখনপ্রাপ্তি (Learning Outcomes)	শিখনপদ্ধতি (Teaching Learning Strategy)	মূল্যায়নপদ্ধতি (Assessment Strategy)
০১	• ভাষা: সংজ্ঞা, প্রকৃতি ও বৈশিষ্ট্য •বাংলাভাষারপ্রাথমিকপরিচয় বৈশিষ্ট্য ও রূপবৈচিত্র	-ভাষাসম্পর্কিতবাস্তবিক ও ব্যবহারিকজ্ঞানলাভ। -বাংলাভাষারপূর্বাপরপরিচয়প্রাপ্তি।	বক্তব্য উপস্থাপন	কুইজ
০২	• বাংলাধ্বনি ও অক্ষরেরপ্রাথমিকপরিচয় • স্বরধ্বনি ও ব্যঞ্জনধ্বনির বৈশিষ্ট্য ও শ্রেণিবিন্যাস	- ধ্বনি ও অক্ষরেরমধ্যে প্রার্থক্য নির্ণয়। - স্বরধ্বনি ও ব্যঞ্জনধ্বনির মৌলিক বৈশিষ্ট্য নির্ধারণ।	বক্তব্য এবংশ্রুতিগ্রাহ্য বাংলাধ্বনি প্রযুক্তি সহযোগে উপস্থাপন	শ্রেণি উপস্থাপনা ও গ্রুপআলোচনা
০৩	• উচ্চারণস্থান ও উচ্চারণরীতিঅনুযায়ীবাংলাধ্বনিবিশ্লেষণ	-বাংলাধ্বনির শুদ্ধ উচ্চারণব্যবহারবিধিসম্পর্কিতধারণালাভ।	বক্তব্য এবংশ্রুতিগ্রাহ্য বাংলাধ্বনি প্রযুক্তি সহযোগে উপস্থাপন	শ্রেণি উপস্থাপনা ও গ্রুপআলোচনা
০৪	• বাংলাশব্দ ও বাক্যেরপ্রাথমিকপাঠএবংবাংলাশব্দ ও বাংলাবাক্য গঠনপ্রক্রিয়া	-শব্দেরসংজ্ঞা, প্রকৃতি, বৈশিষ্ট্য ও বাংলাশব্দগঠনসম্পর্কিতধারণালাভ। - বাক্যেরসংজ্ঞা, প্রকৃতি, বৈশিষ্ট্য ও বাংলাবাক্য গঠনসম্পর্কিতধারণালাভ।	বক্তব্য উপস্থাপন	শ্রেণি পরীক্ষা-০১
০৫	• বাংলাবানানেরসংস্কারেরধারাক্রম: বিশ্বভারতী, কলকাতাবিশ্ববিদ্যালয় পশ্চিমবঙ্গ বাংলাআকাদেমি, বাংলাএকাডেমি,ঢাকা।	-বাংলাবানানেরপূর্বাপরইতিহাসসম্পর্কিতজ্ঞানলাভ। -বাংলাবানানেরপ্রমিতরীতিসম্পর্কিত তথ্য লাভএবং শুদ্ধ বানানচর্চারবিকাশ।	বক্তব্য উপস্থাপন	বানাননিয়েকুইজ
০৬	•বাংলাসাহিত্যেরসংক্ষিপ্তইতিহাস	- বাংলাসাহিত্যেরইতিহাসেরগতিপ্রকৃতিবিশ্লেষণকরারমধ্য দিয়েবাঙালিরপূর্বাপরজীবনধারারপরিচয়লাভ।	বক্তব্য উপস্থাপন	বাননিয়েকুইজ
০৭	• নির্বাচিতকবিতা (১,২,৩) এর বিষয়বিন্যাস,কবিপরিচিতি, মূলভাববিশ্লেষণ,চরিত্র-চিত্রণ	-কবিতার আঙ্গিকে সাহিত্যেরধারাক্রমের সাথে যোগাযোগ স্থাপন	বক্তব্য উপস্থাপন	গ্রুপআলোচনা
০৮	নির্বাচিতকবিতা (৪,৫,৬) এর বিষয়বিন্যাস,কবিপরিচিতি, মূলভাববিশ্লেষণ,চরিত্র-চিত্রণ	- কবিতার আঙ্গিকে সাহিত্যেরধারাক্রমের সাথে যোগাযোগ স্থাপন	বক্তব্য উপস্থাপন	গ্রুপআলোচনা
০৯	ছোটগল্পেরসংজ্ঞা,নির্মান কৌশলনির্বাচিত গল্প-০১ এর বিষয়বিন্যাস, লেখকপরিচিতি, মূলভাববিশ্লেষণ,চরিত্র-চিত্রণ	- গল্পের আঙ্গিকে সাহিত্যেরধারাক্রমের সাথে যোগাযোগ স্থাপনেরমধ্য দিয়েসমাজব্যবস্থার নানাদিকতুলেধরা।	বক্তব্য উপস্থাপন	শ্রেণি পরীক্ষা-০২
১০	নির্বাচিত গল্প-০২ এবং ০৩ এর বিষয়বিন্যাস, লেখকপরিচিতি, মূলভাববিশ্লেষণ,চরিত্র-চিত্রণ	- গল্পের আঙ্গিকে সাহিত্যেরধারাক্রমের সাথে যোগাযোগ স্থাপনেরমধ্য দিয়েসমাজব্যবস্থার নানাদিকতুলেধরা।	বক্তব্য উপস্থাপন	অ্যাসাইনমেন্ট
১১	প্রবন্ধেরনির্মান কৌশল ও নির্বাচিত প্রবন্ধ-০১ এর বিষয়বিন্যাস,	-প্রবন্ধের আঙ্গিকে সাহিত্যেরধারাক্রমের সাথে যোগাযোগ স্থাপনেরমধ্য দিয়েসমাজব্যবস্থার	বক্তব্য উপস্থাপন	অ্যাসাইনমেন্ট

	লেখকপরিচিতি, মূলভাবএবংবাস্তবিকপ্রয়োগেরযথাযথ বিশ্লেষণ	নানাত্রুটিবিচ্যুতিতুলেধরেতা থেকে সমাধানের পথ নির্ণয়।		
১২	নির্বাচিত প্রবন্ধ-২ এবং ৩ এর বিষয়বিন্যাস, লেখকপরিচিতি, মূলভাবএবংবাস্তবিকপ্রয়োগেরযথাযথ বিশ্লেষণ	প্রবন্ধের আঙ্গিকে সাহিত্যেরধারাক্রমের সাথে যোগাযোগ স্থাপনেরমধ্য দিয়েসমাজব্যবস্থার নানাত্রুটিবিচ্যুতিতুলেধরেতা থেকে সমাধানের পথ নির্ণয়।	বক্তব্য উপস্থাপন	শ্রেণি পরীক্ষা-০৩
১৩	রিভিউক্লাস	- কোর্সটিসম্পর্কে সামগ্রিকধারণাপ্রদান	বক্তব্য উপস্থাপন	গ্রুপআলোচনা

সহায়কগ্রন্থ

১। ভাষা ও সাহিত্যেরযুগলবন্দি। চন্দনআনোয়ার ও শুভেন্দু সাহা (রচনাও সম্পা.)
২। আধুনিকভাষাতত্ত্ব । আবুলকালামমনজুর মোরশেদ
৩। ধ্বনিবিজ্ঞান ও বাংলাধ্বনিতত্ত্ব । মুহম্মদ আবদুলহাই
৪। সাধারণভাষাবিজ্ঞান ও বাংলাভাষা । রামেশ্বর শ
৫। ধ্বনিবিজ্ঞানেরভূমিকা। জীনাতইমতিয়াজআলী
৬। বাঙ্গালা ভাষারইতিবৃত্ত। মুহম্মদ শহীদুল্লাহ
৭। ভাষারইতিবৃত্ত। সুকুমার সেন
৮। ভাষাপ্রকাশবাংলাব্যাকরণ। সুনীতিকুমারচট্টপাধ্যায়
৯। বাংলাভাষা ও সাহিত্যেরইতিহাস। সৌরভসিকদার
১০। বাংলাভাষারশত্রুমিত্র। হুমায়ুনআজাদ।
১১। বাংলাসাহিত্যেরইতিহাস । সুকুমার সেন
১২। বাংলাসাহিত্যেরইতিহাস । আনিসুজ্জামান সম্পাদিত
১৩। আশারছলনেভুলি : গোলামমুরশিদ
১৪। রবীন্দ্রসাহিত্যেরভূমিকা :নীহারঞ্জনরায়
১৫। রবীন্দ্র ছোটগল্পেরসমাজতত্ত্ব । ক্ষেত্র গুপ্ত
১৬। কাজীনজরুলইসলাম :কবি ও কবিতা । আবদুলমান্নান সৈয়দ
১৭। নজরুলেরজীবন ও কর্মে প্রেম । চন্দনআনোয়ার
১৮। আধুনিকবাংলাকাব্য পরিচয়। দীপ্তিত্রিপাঠী
১৯। জীবনানন্দ দাশেরকবিতা : নন্দনতাত্ত্বিকবিচার। মাহবুবসাদিক
২০। সৈয়দ শামসুলহকেরসাহিত্যকর্ম : মোস্তফাতারিকুলআহসান
২১। শামসুররাহমান : নিঃসঙ্গ শেরপা : হুমায়ুনআজাদ
২২। রুদ্র মুহম্মদ শহিদুল্লা : স্মারকগ্রন্থ। হিমেলবরকদ সম্পাদিত
২৩। ছোটগল্পের দর্শন ও নিদর্শন । মাসুদ রহমান
২৪। মানিক বন্দ্যোপাধ্যায়ের ছোটগল্প :সমাজচেতনা ও জীবনেররূপায়ণ
২৫। সেলিনা হোসেনেরকথাসাহিত্যে দেশ কালজাতি । মাসুদুজ্জামান ও বরেন্দু মণ্ডলসম্পাদিত
২৬। হাসানআজিজুলহকেরকথাসাহিত্য :বিষয়বিন্যাস ও নির্মাণকৌশল । চন্দনআনোয়ার
২৭। আখতারুামানইলিয়াস :নির্মাণবিনির্মাণ
২৮। সৈয়দ ওয়ালীউল্লাহ :জীবন ও সাহিত্য। সৈয়দ আবুলমকসুদ
২৯। বেগম রোকেয়া : সময় ও সাহিত্য । মোরশেদ শফিউলহাসান
৩০। মুসলিমসাহিত্য সমাজ : সমাজচিন্তা ও সাহিত্যকর্ম । খোন্দকারসিরাজুলহক
৩১। বীরবল ও বাংলাসাহিত্য । অরুণকুমারমুখোপাধ্যায়।

Year-1 Term-2

Sl.#	Course Code	Course Title	Credit	Credit Hours	Page No.
1	CSTE 1201	Data Structures and Analysis	3	3	
2	CSTE 1202	Data Structures and Analysis Lab	1.5	3	
3	CSTE 1203	Numerical analysis	3	3	
4	CSTE 1204	Numerical analysis Lab	1	2	
5	CSTE 1205	Discrete Mathematics	3	3	
6	CSTE 1207	Electronic Devices and Circuits	3	3	
7	CSTE 1208	Electronic Devices and Circuits Lab	1	2	
8	MATH 1203	Ordinary and Partial Differential equations	2	2	
9	HUM 1201	Industrial Management and Accountancy	3	3	
10	CSTE 1226	Viva Voce	1	0	
		Total	**21.5**	**24**	

COURSE CODE: **CSTE 1201**, COURSE TITLE: **DATA STRUCTURES AND ANALYSIS**

Course Code: **CSTE 1201**, Course Title: **Data Structures and Analysis**,3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 2, Term 1	
Rationale: This course is designed to teach students the fundamental data structures and algorithms and also implement them by developing program. It will also make them understand basic techniques of algorithm analysis	
Course Objectives: ➢ Understand the behavior of basic data structures array, linked list, stack, queue, tree and graphs. ➢ Develop programs that implement data structure. ➢ Measure the complexity of some familiar searching and sorting algorithms.	
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials.	
	Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Basic of data structure:** Concept and importance of data and data structure. Major operations of data structures.Notations, Asymptotic Notation for complexity of algorithms.	Know the importance of data structure and algorithms and also demonstrate a thorough understanding of how data structures impact the performance of algorithms. Know the basic terminology of linear data structure array, link lists, stack, queue and nonlinear data structure tree, graph.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes.
2	**Arrays:** Maximization, ordered lists, sparse matrices, representation of arrays.	Know how data and records are kept in array to perform different types of operations like traversing, inserting, deleting, searching and sorting. Implement basic matrix operations.	Lecture and discussion on characteristics, memory allocation and different operations of array.	Answer basic questions, quizzes, Homework, exams.
3	**Stacks and Queues:** Different types of stacks and queues: Circular, dequeues, etc; evaluation of expressions, multiple stacks and queues;	Implement stack, queue using array and linked list. Comprehend the expression formats of prefix, infix and postfix and also evaluate postfix expressions by using stacks. Understand the application of stack and queue.	Lecture and discussion on characteristics, and different operations of stack and queue.	Answer basic questions, quizzes, Homework, exams.
4	**Recursion:** Direct and indirect recursion, depth of recursion; Simulation of Recursion, Removal of recursion.	Know the basic understanding of recursion. Apply recursive technique to solve some algorithms.	Lecture and discussion with problems.	Exercise with problems.
5	**Linked Lists:** Singly linked lists, linked stacks and queues, the storage pool, polynomial addition, equivalence relations, sparse matrices, doubly linked lists and dynamic storage management, generalized lists, garbage collection, and compaction.	Organize a list of data in linked list. Implement linked list using linear array and pointer. Do basic operations like traverse, insertion, deletion, reverse, search and swapping two nodes using linked list.	Lecture and discussion on characteristics, memory allocation and different operations of linked list.	**Class Test 1**(topics of the week's 1-4)
6	**Trees:** Basic terminology,	Learn basic terminology of tree. Organize data in different types of	Lecture and discussion with	Answer basic questions,

	binary trees, binary tree representations, binary tree traversal; Extended binary trees: 2trees, internal and external path lengths.	trees. Perform operations using array based and linked list-based trees. Implement binary search tree, AVL search tree, B tree and Huffman's Algorithm.	problems.	quizzes, Homework, exams.
7	Huffman codes/algorithms; threaded binary trees, a binary tree representation of trees; Application of Trees: Set representation, decision trees, games trees: Counting binary trees.	Explain and implement Huffman coding. Explain decision trees, binary trees.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
8	**Graphs:** Introduction, definitions and terminology, graph representations, traversals, connected components and spanning trees, shortest path and transitive closure, activity networks, topological sort and critical paths, enumerating all paths.	Learn what a graph is and how it is used. Will also learn some graph algorithms such as shortest path and minimum spanning tree. Represent graph using two-dimensional array and linked list and do practical operations on graph data. Implement BFS and DFS traversal methods.	Lecture and discussion with problems	Answer basic questions, quizzes, Homework, exams.
9	**Sorting:** Efficiency considerations, O notation, Bubble sort, Quick sort, Selection sort, Binary Tree sort heap, Heap sort, Heap as a priority queue,	Explain how different sorting algorithms work**.** Implement some sorting algorithms and also measure their complexity.	Lecture on steps on different sorting algorithms. Discussion with problems.	**Class Test 2**(topics of the week's5-8)
10	**Searching:** Insertion sort, Shell sort, Merge sort, Radix sort.Sequential searching, indexed sequential searching, Binary search, Interpolation search, Binary tree searching, Insertion and deletion,	Explain how different searching algorithms work**.** Implement some searching algorithms and also measure their complexity.	Lecture on steps on different searching algorithms. Discussion with problems.	Answer basic questions, quizzes, Homework, exams.
11	Optimum search trees, Height balanced trees, Single and double rotations, Multi way, Search trees, B-trees,	Understand the basic concept of B and B+ tree and hash function. Implement B and B+ tree.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.

	B+ trees, Hashing methods of resolving clashes, Methods of choosing Hash functions.			
12	**Symbol Tables:** static tree tables, dynamic tree tables;	Implement symbol tables. Search for an item having a specified key, insert an item, remove a specified item, Count the number of items, Print the list of items	Lecture and discussion with problems	**Class Test 3**(topics of the week's9-12)
13	Hash Tables: Hashing functions overflow handling, theoretical evaluation of overflow techniques.	Explain the basic of hash tables. Develop program to create has table to store data. Implement symbol tables using hash table.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Theory and Problems of Data Structures by S. Lipschutz, McGraw Hill
2. Data Structures and Algorithm analysis in C++ by M.A. Weiss,Addison Wesley
3. R Sedgewick, Algorithms in C, Parts 1-4 Fundamentals, Data Structures, Sorting, Searching, Addison Wesley
4. Algorithms + Data Structures = Programs by Niklaus Wirth, Prentice Hall
5. Fundamentals of Data Structures by E. Horowitz and S. Sahni, Galgotia

COURSE CODE: **CSTE 1202**, COURSE TITLE: **DATA STRUCTURES AND ANALYSIS LAB**

Course Code: **CSTE 1202**, Course Title: **Data Structures and Analysis Lab**,3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 2, Term 1

Rationale: This course is designed to implement and develop programs on fundamental data structures and algorithms. It will also make them understand basic techniques of algorithm analysis.

Course Objectives:

- Understand the behavior of basic data structures array, linked list, stack, queue, tree and graphs.
- Develop programs that implement data structure.
- Measure the complexity of some familiar searching and sorting algorithms.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Code Blocks IDE

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1-3	**Arrays** A program which will store data in a linear array. Program to travers, insert, delete in a linear array. To find a given target number using linear search from the list of numbers.	Know how data and records are kept in array to perform different types of operations. Implement searching and sorting algorithms. Differentiate different searching and sorting	Discussion and practice	Answer basic questions, quizzes, Homework, exams.

	To find a given target number using Binary Search from the list of number. To find the maximum and minimum value in a given list of numbers. To sort the given data using selection sort. To sort the given data using Bubble sort. To sort the given data using Insertion sort. To sort the given data using Quick Sort. Implement basic matrix operations.	algorithm.		
4-6	**Stacks and Queues** Implement stack, queue using array and linked list. To perform all stacks operation. To perform all the queue operations. Write a C code to implement queue and dequeue using array. To sort the given data using Merge sort. Write a program to create a Stack and different functionality related to it (i.e. Push( ), Pop( ), Peak( ), Traverse( )). Implement it using linked Structure.	Implement stack, queue and their operations. Comprehend the expression formats of prefix, infix and postfix and also evaluate postfix expressions by using stacks. Understand the application of stack and queue.	Discussion and practice.	Answer basic questions, quizzes, Homework, exams. Quiz 1 (Topic of the 1-3 weeks)
7	**Recursion** Problems to solve using recursive technique.	Apply recursive technique to solve problems.	Lecture and discussion with problems.	Exercise with problems.
8-9	**Linked Lists** Program which will store data in linked list. Program which will implement linked list using linear array and pointer. Program which will do some basic operations in a singly linked list like traverse, insertion, deletion, reverse, search and swapping.	Implement the basic operations of linked list.	Discussion and practice	Answer basic questions, quizzes, Homework, exams.
10-11	**Trees** Write a C code to implement binary search tree insertion, deletion, search, and traverse operations. Write program for Huffman algorithm.	Perform operations using array based and linked list-based trees.	Lecture, discussion with problems and practice.	Answer basic questions, quizzes, Homework, exams. Quiz 2 (Topic of the 4-9 weeks)

12	**Graphs** Implement BFS and DFS traversal methods. Implement minimum spanning tree algorithm.	Represent graph using two-dimensional array and linked list and do practical operations on graph data.	Discussion and practice	Answer basic questions, quizzes, Homework, exams. Quiz 3 (Topic of the 10-13 weeks)
13	**Final Lab Exam (Lab and Viva)**			

COURSE CODE: **CSTE 1203**, COURSE TITLE: **NUMERICAL ANALYSIS**

Course Code: **CSTE 1203**Course Title: **Numerical Analysis,** 3Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1, Term 2

Rationale: The course deals with the concept of numerical computation on computer and analysis of errors and accuracy of different numerical solutions.

Course Objectives:

- To understand the fundamental concept of digital computing, including number representation and arithmetic's operations.
- To provide the student with numerical methods of solving the non-linear equations, interpolation, differentiation and integration.
- To apply numerical methods to obtain approximate solutions to mathematical problems.
- To understand the basic concepts of concrete mathematics.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Numerical analysis:** Computer Number Systems; Overflow and underflow; Approximation in numerical computation; Truncation and round off errors;	Learn number representation and linkage between error, accuracy and stability of a number.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2	**Numerical analysis:** Propagation and control of round off errors; Chopping and rounding off errors; Pitfalls (hazards) in numerical computations (ill conditioned and well-conditioned problems).	Understand the propagation of error through complex numerical algorithms.	Lecture and discussion and analyze the accuracy.	Answer basic questions, quizzes, Homework, exams.
3	**Numerical Solution of System of Linear Equations**: Gauss elimination method; Matrix Inversion; Operations Count;	Apply appropriate numerical method to determine approximate solutions to system of linear equation.	Lecture and computation of linear equation solution methods.	Answer basic questions, quizzes, Homework.
4	**Numerical Solution of System of Linear Equations**: LU Factorization Method (Crout's Method); Gauss-Jordan Method; Gauss-Seidel Method; Sufficient Condition of Convergence.	Apply appropriate numerical method to determine approximate solutions to system of linear equations.	Lecture and decomposition of linear systems	Answer basic questions, quizzes, Homework, exams.
5	**Numerical Solution of Algebraic and**	Apply appropriate numerical method to	Lecture and discussion on non-	**Class Test 1** (topics of the

	Transcendental Equations: Iteration Method; Bisection Method; Secant Method;	determine approximate solutions to non-linear equations.	linear equations solution.	week's 1-4)
6	**Numerical Solution of Algebraic and Transcendental Equations:** Regula-Falsi Method; Newton-Raphson Method.	Apply appropriate numerical method to determine approximate solutions to non-linear equations.	Lecture and discussion on non-linear equations solution.	Answer basic questions, quizzes, Homework, exams.
7	**Interpolation:** Lagrange's Interpolation, Newton's forward & backward Interpolation Formula.	Find interpolation for given point using Lagrange's and Newtons methods.	Lecture and problem solving on interpolation.	Answer basic questions, quizzes, Homework, exams.
8	**Interpolation:** Extrapolation; Newton's Divided Difference Formula; Error; Problems.	Find divided difference, and error computation of given solution.	Lecture and discussion on divided difference and problem solving.	Exercise with various mathematical problems.
9	**Numerical Differentiation:** Use of Newton's forward and backward interpolation formula only.	Find differentiation using numerical method from given data.	Lecture and analysis on numerical differentiation with problems.	**Class Test 2** (topics of the week's 5-8)
10	**Numerical Integration:** Trapezoidal formula (composite); Simson's 1/3rd formula (composite); Romberg Integration (statement only); Problems.	Find integration for given areas using numerical methods.	Lecture and discussion on numerical integration methods with problems.	Answer basic questions, quizzes, Homework, exams.
11	**Numerical Solution of Initial Value Problems of First Order Ordinary Differential Equations:** Taylor's Series Method; Euler's Method; Runge-Kutta Method (4th order);	Find numerical solutions of initial value problems of first order ordinary differential equations.	Lecture and analysis of Differential equations.	Quizzes, Homework, exams.
12	**Numerical Solution of Initial Value Problems of First Order Ordinary Differential Equations:** Modified Euler's Method and Adams-Moulton Method.	Learn improved numerical methods to find solutions of initial value problems of first order ordinary differential equations.	Lecture and discussion on Differential equations.	**Class Test 3**(topics of the weeks9-11)
13	**Concrete Mathematics:** Recurrence, Sums, Number Theory, Discrete Probability.	Understand basic number theory, recurrence solution of different problems.	Lecture and discussion on concrete mathematics.	Exercise the answering methods in the final exam.

Recommended Books:

1. Introductory Methods of Numerical Analysis by S. S. Sastry, Prentice-Hall.
2. Numerical Methods for Engineers by Steven C. Chapra,Raymond P. Canale, McGraw-Hill.
3. Concrete Mathematics by Donald L. Graham, Donald. Knuth, Oren Patashnik, Prentice Hall.

COURSE CODE: **CSTE 1204**, COURSE TITLE: **NUMERICAL ANALYSIS LAB**

Course Code: **CSTE 1204**, Course Title: **Numerical Analysis Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (ClassAttendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 1, Term 2

Rationale: This course provides practical knowledge of computation of numerical problems using computer programming.

Course Objectives:

- To understand the fundamental concept of digital computing, including number representation and arithmetic's operations.
- To provide the student with numerical methods of solving the non-linear equations, interpolation, differentiation and integration.
- To apply numerical methods to obtain approximate solutions to mathematical problems.
- To understand the basic concepts of concrete mathematics.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, C/C++ compiler, programming problems.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1, 2	Write a program to compute $y = e^{-x^3/2}$ for $0.1 \leq x \leq 2$ in steps of 0.1 Write a program to compute $y = 5x^3 + e^{-2x}$ for $0.1 \leq x \leq 2$ in steps of 0.1 Write a program to compute the value of i) e^x ii) $\ln(1+x)$ iii) $\ln(1+x)$ from Maclaurin expansion truncated after the 6^{th} term.	Learn numeric computation and error calculation.	Lecture and practice	-Home task -Quiz
3	Write a program to find a real root of a nonlinear equation using Bisection method, False position method, Newton-Raphson method. a) ex – 3x = 0 b) x3 - 6x + 4 = 0 c) x log10 x - 1.2 = 0	Find practical knowledge and numerical solution of non-linear system.	Lecture and practice	-Home task -Quiz
4	The matrix **A** is said to be of size $\boldsymbol{m \times n}$**.** Where **m** represents number of columns and **n** represents number of rows. If $m = n$, the matrix is said to be a square matrix of order **n.** Write a program to perform the following matrix operations i. Enter some numbers and represent these numbers as a	Understand Matrix representation using programming language.	Lecture and practice of matrix.	Quiz 1 (Topic of the 1-3 weeks)

	matrix form according to given number of columns and rows. ii. Represent the above matrix **A** as an upper-triangular. iii. Represent the above matrix **A** as a lower-triangular matrix iv. Represent the above matrix **A** as a diagonal matrix. Write a program to find (i) the determinant of a square matrix **A** and also find (ii) the transpose, adjoint and inverse matrix of a square matrix **A**.			
5, 6	Write a program to solve a system of linear equations using Matrix Inversion method. Write a program to solve a system of linear equations using simple Gaussian elimination method. Write a program to solve a system of linear equations using simple Gaussian-Seidel method (iterative method).	Solve different linear system equation using practical knowledge.	Discussion and practice on non-linear equations solution.	Homework
7-9	The following values of f (x) are given. x = 1 2 3 4 5 ; y = f(x) 1 8 27 64 125 Write a program to find the values of y when x = 1.7 by using Newton's forward interpolation formula and when x = 4.7 by using Newton's backward interpolation formula. Write a program to find numerical solution using Lagrange's equation and Newtons formula for unequal interval.	Find missing value from a given data set.	Discussion and practice about interpolation.	Quiz 2 (Topic of the 4-6 weeks)
10-11	Write a program to solve the following Differential Equation by using Euler's method. dy / dx = x3 + y, y (0) = 1. Compute y (0.02) taking h = 0.01. Write a program to solve the following Differential Equation by using Runge – Kutta method. dy / dx = x + y, y (0) = 1. Compute y (0.1) and y (0.2) taking h = 0.1.	Solve first order differential equation using C/C++.	Discussion and practice.	Homework.

12	Write a program to integrate a tabulated function using the trapezoidal rule. Write a program to integrate a tabulated function using the Simpson's 1/3 rule.	Solve practical problem of numerical integration.	Discussion and problem solving on numerical integration.	Answer basic questions, quizzes, Homework, exams.
13	Write a program to find GCD of two or more numbers. Tower of Hanoi problem, Pizza cutting problem etc. Note: Basic Number Theory/probability related problems.	Practical analysis of concrete mathematics problems.		Answer basic questions, Homework Quiz 3 (Topic of the 8-13 weeks)

COURSE CODE: **CSTE 1205**, COURSE TITLE: **DISCRETE MATHEMATICS**

Course Code: **CSTE 1205**, Course Title: **DISCRETE MATHEMATICS**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1, Term 2

Rationale: This course has been designed to develop the students' ability to realize the mathematical reasoning, combinatorial analysis, discrete structures, algorithmic thinking, applications and modeling.

Course Objectives:

- Students must understand mathematical reasoning in order to read, comprehend and construct mathematical arguments.
- An important problem-solving skill is the ability to count or enumerate objects.
- A course in discrete mathematics should teach students how to work discrete structures include sets, permutations, relations, graphs, trees and finite-state machines.
- Certain classes of problems are solved by the specification of an algorithm.
- Discrete mathematics has applications to almost every conceivable area of study.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	Introduction to sets, elements and notations; universal set, empty set and subsets; all set operations; Venn diagrams, set identities, classes of sets; computer representation of sets.	**Set and set operations.** To provide foundations for mathematics. To identify and use set properties and set notations. To learn the basic concept of set theory, types of sets and operations of sets. To solve exercises, objective type problems and supplementary problems.	Overall discussion with the students must be needed about the course contents including the objectives, course outcomes, examinations, physical environment and methodology. An interactive approach must be needed to teach the set theory and all sets operations in	Answer basic questions, group discussion, homework.

			classroom. Demonstrate problem solving techniques.	
2	Definition of function, different types of functions. Graphs of functions, floor functions and celling functions. Inverse functions, Euler's function and compositions of functions. Function relations.	**Functions and function applications.** To understand the definition of a function and different types of functions. To recognize and use the graphs of the basic functions. To draw the compositions of functions and relations of functions graphically.	Delivering lecture and overall discussion with the students must be needed about several topics of functions interactively in classroom. Demonstrate different graphs of functions, composition of functions and relations of functions. Several examples will be solved in classroom.	Problems must will be solved correctly in classroom. Home works and assignments must be submitted regularly.
3	Definition of recurrence relations, solving linear homogeneous recurrence relations with constant coefficients. Definition of generating functions, useful facts about power series and using generating functions to solve recurrence relations.	**Recurrence relations & generating functions.** To understand the definition of recurrence relations & generating functionsuse the Boolean expressions with real life problem. To solve linear homogeneous recurrence relations with constant coefficients. To power series and recurrence relations using generating functions.	Delivering lecture and overall discussion with the students must be needed about several topics of recurrence relations & generating functions interactively in classroom. Demonstrate various calculations to solve recurrence relations of functions, power series and recurrence relations using generating functions. Showing several problem-solving techniques to the students in the classroom.	Answer basic questions, group discussion, assignments.
4	Representations of integers, binary expansions, hexadecimal expansions. Algorithms for integer operations, modular exponentiation. Euclidean algorithm.	**Integer and algorithms.** To calculate binary and hexadecimal expansions. To understand the algorithms to find out modular exponentiation. To understand Euclidean algorithm to find out the greatest common divisor.	Demonstrate various calculations to solve binary and hexadecimal expansions. Demonstrate algorithms to find out modular exponentiation and the greatest common divisor.	Exercise with various mathematical problems.
5	Principle and applications of	**Inclusion- exclusion & Binomial coefficients.**	Showing several problem-solving	**Class Test 1**(topics of the

	Inclusion-exclusion. Binomial theorem, examples, PASCAL'S IDENTITY and TRIANGLE.	To solve different examples on principle of inclusion-exclusion. To calculate binomial coefficients from different expressions. To draw PASCAL'S Triangle using PASCAL'S IDENTITY.	techniques to the students to solve several problems on principle of inclusion-exclusion.in the classroom. Demonstrate techniques to draw PASCAL'S Triangle using PASCAL'S IDENTITY.	week's 1-4)
6	Basic concept of permutation, examples, permutations with repetitions. Basic concept of combination, examples, combinations with repetitions.	**Permutations and Combinations.** To solve different problems using permutation principle with different arrangements and ways. To different problems using combination principle with different arrangements and ways.	Lecture and discussion on basic concepts of permutation and combination principles. Discuss on sample problems using permutation and combination principles.	Q & A session, group discussion, assignments.
7	Introduction of graphs, types of graphs, graph terminology, bipartite graphs, application of graph, representing graphs.	**Graph terminologies.** To solve different problems using graph terminologies. To know about bipartite graph and application of graph and representing graphs as adjacency matrices and incidence matrices.	Lecture and discussion on graph terminologies, bipartite graph, application of graph and representing graphs in different ways.	Answer basic questions, home works.
8	Graph isomorphism, connectivity, Euler path, shortest path algorithm, graph coloring.	**Graph applications.** To solve different properties of graphs. To know about different types path and graph coloring.	Lecture and discussion on graph properties, different types path and graph coloring.	Answer basic questions, group discussion, assignments.
9	Introduction to tree, rooted tree, binary tree, tree parameters, properties of tree, Tree traversal algorithms.	**Tree terminologies.** To know about different tree terminologies. To understand know about traversal algorithms solve related exercises.	Lecture and discussion on tree terminologies, different types traversal algorithms to solve related exercises.	**Class Test 2**(topics of the week's 5-8)
10	Infix, prefix and postfix notations and algorithms, binary tree representation, spanning tree, minimum spanning tree.	**Binary and spanning trees.** To design binary trees by using infix, prefix and postfix algorithms. To design minimum spanning tree by using Prim's and Kruskal's algorithms. .	Lecture and explanation on infix, prefix and postfix algorithms to design binary trees and also Prim's and Kruskal's algorithms to design minimum spanning tree.	Problems must will be solved correctly in classroom. Home works and assignments must be submitted regularly.

11	Cryptology and coding theory, Finite fields and Latin Squares, Finite geometry and designs, Basic ideas of public key cryptology and the theory of error correcting codes, Hamming code.	**Finite Geometries.** To understand cryptology, finite fields and Latin squares, finite geometry designs, Hamming and other codes.	Lecture on design and applications of cryptology, finite fields and Latin squares, finite geometry designs, Hamming and other codes.	Q & A session, group discussion, assignments.
12	Random variables, Functions of random variables, Sequences of random variables, Stochastic processes, Markov chains, Markov processes and queuing theory.	**Random Variables and Stochastic Processes.** To understand the pros and cons of random Variables and stochastic processes.	Lecture and explanation on the pros and cons of random Variables and stochastic processes.	**Class Test 3**(topics of the week's 9-12)
13	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Discrete Mathematics and its application by Kenneth H. Rosen, McGraw-Hill.
2. Theory and Problems of Discrete Mathematics by Seymour Lipschutz, Schaum's Series, McGraw-Hill.
3. Discrete Mathematics structures with applications to Computer Science by J. P. Tremblay and R. Manohar, Mc-Graw Hill.
4. Elements of Discrete Mathematics by C.L. Liu, McGraw-Hill.

COURSE CODE: **CSTE 1207**, COURSE TITLE: **SEMICONDUCTOR DEVICES AND CIRCUITS**

Course Code: **CSTE 1207**, Course Title: **Semiconductor Devices and Circuits**,3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 1, Term 2
Rationale: This course is designed to understand the construction, working and uses of unipolar and bipolar devices, Oscillator, Operational amplifier and pnpn devices.
Course Objectives: ➢ Make the students familiarize with unipolar and bipolar transistor. The construction, working, characteristics and practical application of unipolar and bipolar devices will be introduced to students. ➢ To give knowledge how transistor is biased and signal is amplified. To analyze various amplifier circuit and their uses. ➢ To give the concept about positive and negative feedback in electronic circuit, practical feedback circuit and oscillator circuits. ➢ To give idea about voltage regulator, industrial electronic devices and optoelectronics devices.
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	**Semiconductor and PN junction:** Electronic structure of the elements, Energy band diagram of insulators, semiconductors & metals. Thep-njunction, Clipping and clamping circuits, different types of diodes	Comparison of conductor, semiconductor and insulator. Construction, working principle and uses of pn junction. How diode use for clipping and clamping circuit. The concept of load line. Applications of diodes for voltage regulation.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations.Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams
2	**Principle of bipolar transistor** Junction transistor, npn and pnp transistors, principle of transistor action, potential distribution through a transistor, transistor current components, emitter efficiency.	Transistor construction and operation in different configurations.	Lecture and discussion with problems	Answer basic questions, quizzes, Homework, exams.
3	**Characteristics of transistor:** Transistor as an amplifier, transistor characteristics in CB, CE and CC configurations. Concept of load line. Dynamic transfer curves of Ge and Si transistor.	Variation of collector, emitter and base current in different configurations. Relation between amplification factors. What is load line and why this is important.	Lecture and discussion with characteristics parameters of transistor families individually.	Answer basic questions, quizzes, Homework, exams.

4	**DC Biasing and Load line:** The operating point, capacitive coupling, the static and dynamic load lines, bias stability, thermal stability. Analyzing of different types biasing circuit.	Operation of transistor using fixed bias, emitter bias and voltage divider bias and which bias is good for transistor stability. The importance of load line to operate transistor	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
5	**Transistor as an amplifier:** Classification of amplifier, BJT small signal amplifier circuit analysis in three configuration using different biasing circuit. Push-pull amplifier.	Explanation of different types of amplifier and their applications.	Lecture and discussion with problems.	Exercise with various mathematica l problems.
6	**BJT AC analysis and Transistor model:** BJT transistor modeling, the r_e transistor model, the hybrid equivalent model	To know the actual behavior of a semiconduct or device using different model under specific operating conditions.	Transistor modeling.	**Class Test 1**(topics of the week's 1-4)
7	**Oscillator:** Feedback and circuit requirements for oscillation, Nyquest criterion. Sinusoidal oscillators, Barkhousen criterion, phase shift oscillators, resonant circuit oscillators, Colpitt's and Hartly's oscillator, Wein bridge oscillator, Crystal oscillator, frequency stability.	Explanation of feedback connection, circuits and amplifier. Explanation of different types of oscillator circuit, operation and their applications. Understandin g series and parallel resonant circuit.	Lecture, discussion and design.	Answer basic questions, quizzes, Homework, exams.
8	**Operational amplifier:** Basic differential amplifier, differential amplifier circuits, differential amplifier with current mirror and active load.	Explain operational	Lecture on design and applications of	Answer basic questions,

	Basics of operational amplifier.	amplifier with basic properties, application of operational amplifier and design new Op-Amp based circuit.	the circuits.	quizzes, Homework, exams.
9	The ideal OpAmp, Study of OpAmp parameters, OpAmp circuits, Active filters, Voltage regulation.	Use of OpAmp as filter circuit. Explanation of voltage regulation.	Lecture on design and applications of the circuits.	**Class Test 2**(topics of the week's5-8)
10	**Field effect transistor:** JFET:construction, operation, static currecteristics, small signal model and parameters.	Explain FET and its characteristics, uses and application.	Lecture on design and applications of the circuits.	Answer basic questions, quizzes, Homework, exams.
11	**MOSFET:** MOSFET:different types,operation, characteristics curves,DC biasing of depletion type and enhancement type MOSFET.	Explanation of depletion type and enhancement type MOSFET, characteristics and applications.	Lecture on design and applications of the circuits.	Quizzes, Homework, exams.
12	**Industrial electronic devices:** Thyristors, SCR, TRIAC, UJT, PUT, DIAC, Shockley diode. LED,LiquidCrystaldisplays(LCD)Photodiodes,Phototransistors,Opto- isolators,Solarcells.	Analyze and explain pnpn based circuit and their applications, design new multilayered devices based on the explanations and probable applications.	Lecture on design and applications of the circuits.	**Class Test 3**(topics of the weeks9-11)
13	Unregulatedpowersupply,regulatedpowersupply,regulatorICs,regulator circuits. Introduction, Advantage, Drawback, Scale of integration, Classification by structure and function of integrated circuit, How ICs are made?	Explore practical power supply circuits, concept of voltage regulation. Construction and uses of integrated circuit.	Lecture and discussion of power supply and integrated circuit.	

		Classification and function of integrated circuit.		

Recommended Books:

1. ElectronicDevicesandCircuitsbyJacobMillmanandChristosC.Halkias,McGraw-HillInc.
2. ElectronicPrinciplesbyAlbertPaulMalvino,CareerEducation.
3. ElectronicDevicesandCircuitTheorybyRobertL.Boylestad,PrenticeHall.

COURSE CODE: **CSTE 1208**, COURSE TITLE: **ELECTRONIC DEVICES AND CIRCUITS LAB**

Course Code: **CSTE 1208**, Course Title: **Electronic Devices and Circuits Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 1, Term 2

Rationale: This lab course is designed to understand the concepts, working and characteristics of Different Diodes, BJT and FET Transistors, amplifiers and compensation techniques of transistors.

Course Objectives:

- Verify the working of different diodes, transistors, CRO probes and measuring instruments. Identifying the procedure of doing the experiment.
- Design the circuits with basic semiconductor devices (active & passive elements), measuring instruments & power supplies that serves many practical purposes.
- Construct, analyze and troubleshoot the designed circuits.
- Measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	To familiar with electronic devices and Laboratory Equipment.	gain significant experience with electrical instruments such as function generators, digital multimeters, oscilloscopes, and power supplies etc.	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Answer basic questions about different types of instruments.
2, 3, 4, 5	Determination of unknown signal frequency and voltage by using Oscilloscope. Study of lead identification and testing of diode, BJT, FET, and MOSFET. To study of V-I Characteristics curve of a General Diode and Zener diode. To study of Full-Wave Rectification circuit (Bridge &		Through lecture, laboratory, and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are due at the beginning of the lab period. Respected

	Center tap) and Half-wave circuit. To study of Clipper and Clamper circuit and draw the output waveshape.			Teacher will be evaluated in lab period.
6, 7	To study of Common Emitter (CE), Common Collector (CC) and Common Base (CB) Transistor Amplifier circuits.		Through lecture, laboratory, and out-of-class assignments.	
8, 9	To study of output characteristics of a FET. To study of JFET as an amplifier.		Through lecture, laboratory, and out-of-class assignments.	
10, 11	To study of output characteristics of a JFET. Study of MOSFET as a switch.		Through lecture, laboratory, and out-of-class assignments.	
12	Submit a mini project in a group			
13	**Final Lab Exam (Job, Quiz and Viva)**			

COURSE CODE: **MATH 1203**, COURSE TITLE: **ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**

Course Code: **MATH 1203**, Course Title: **Ordinary and Partial Differential Equations**, 2 Hours/Week, 2 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 1, Term 2

Rationale: Ordinary and Partial Differential Equations (4:4:0). First- and second-order equations; series solutions; Laplace transform solutions; higher order equations; Fourier series; second-order partial differential equations.

Course Objectives:

- During this course students will obtain knowledge of approaches to modeling by differential equations, basic theorems on existence of solutions and methods for analytical solving linear and non-linear ordinary and partial differential equations.
- Furthermore, students will develop skills in using Lie group analysis for solving nonlinear ordinary and partial differential equations.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1-2	**Introduction** • Direction Fields • Solution of Some Differential Equations • Classification of Differential Equation	Formulate and solve differential equation problems in the field of Engineering.	Lecture and discussion with detailed information about topic.	Answer basic questions and Homework.
3-4	**First Order Differential Equations** • Linear Equations with Variable Coefficient • Separable Equations • Modeling with First Order Equations	Use computational tools to solve problems and applications of Ordinary Differential Equations.	Lecture and discussion with detailed information about topic.	Answer basic questions and Homework.

	• Differences between Linear and Nonlinear Equation. • Autonomous Equations and Population Dynamics • Exact Equation			
5-8	**Second Order Linear Differential Equations** • Homogenous Equations with Constant Coefficients. • Fundamental Solutions of Linear Homogeneous Equation. • Complex Roots of the Characteristic Equations Repeated Roots; • Reduction of Order Nonhomogeneous Equations.	Use computational tools to solve problems and applications of second order Ordinary Differential Equations.	Lecture and discussion with problems.	**Class Test 1**(topics of the week's 1-4)
9-11	**Higher Order Linear Equations** • General Theory of 11-th Order Linear Equations. • Heterogeneous Equations with Constant Coefficients.	Use computational tools to solve problems and applications of higher order Ordinary Differential Equations.	Lecture and discussion with detailed information about topic.	**Class Test 2**(topics of the week's 5-8)
11-13	**The Laplace Transform** • Definition of the Laplace transforms. • Solution of initial Value Problems • Step Functions. • Differential Equations with Discontinuous Forcing Functions. • Impulse Function.		Lecture and discussion with detailed information about topic.	**Class Test 3**(topics of the week's 9-11)

Recommended Books:

1. Elementary differentiate equations and boundary value problems. 9th Ed. W.E. Boyce and RCDiprima, John Wiley and Sons Inc.

COURSE CODE: **HUM 1201, C**OURSE TITLE: **INDUSTRIAL MANAGEMENT AND ACCOUNTANCY**

Course Code: **HUM 1201, C**ourse Title: **Industrial Management and Accountancy, 3** Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1 Term 2
Rationale: This course has been designed to develop the students' ability to realize the different business operations and working with different business methods.
Course Objectives: ➢ Make the students familiarize with business concepts. ➢ Analyze and Apply different strategies of marketing.

➢ Effective use of basic accounting in different application design.				
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.				
	Lesson Plan (as per week):			
Week	**Course contents**	**Outcome** (at the end of the session, student should be able to)	**Teacher Learning strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	**Business concepts:** Business and Industry, Business and society, Business environment, Ethical issues of business	Explain the basic concepts of business and industry. Discuss different types of business and industry, the objectives of business, and how business affects society.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, physical environment and methodology with the students. Brief discussion about business.	Answer basic questions, quizzes, Homework, exams.
2.	**Management and Organizational concepts** Management principles and functions, Levels of management, Roles of management, Scientific management and core management skills, Corporate activities, Corporate Social responsibilities, Concept of business management, Organizational Structure of the industrial organization	Explain the basic concepts of management and its functionality and corporate activities. Discuss levels and roles of management, and different skills, activities, and responsibilities of management.	Lecture and discussion with detailed information about management and its principles, functions, levels, roles, responsibilities and skills.	Answer basic questions, quizzes, Homework, exams.
3.	**Management Strategy:** Strategy formulation in IT industry, technological development strategy and planning,SWOT analysis, PPM,Competitive superiority, Customer satisfaction, alliance, merger, acquisition and integration.	Explain the basic concepts of strategies, strategies formulation in IT industry, technological development strategy and planning. Use PPM, superiority and SWOT analysis for proper maintenance of management.	Lecture and discussion about management strategies, SWOT analysis, planning and how it connects with IT industries.	Answer basic questions, quizzes, Homework, exams.
4.	**Marketing Strategy:** Market and marketing, Market research, Sales/product planning, Sales promotion, Customer satisfaction survey, Business strategy and goal evaluation, Business	Explain the basic concepts of marketing, market research, business strategies and management system. Improve sales and different strategies for sales promotion. Survey customer satisfaction and evaluate goal	Lecture and discussion about marketing and customer's satisfaction survey.	Answer basic questions, quizzes, Homework, exams.

	management system.	of the business.		
5.	**Human Resource Management and Industrial Relations:** Concept of HRM, HRM functions and model, recruitment, selection Industrial relations and disputes, handling of grievances, labor welfare, Workers' participation, Motivation, leadership, collective bargaining, training and trade union, Payment, job satisfaction and job enrichment	Explain the basic concepts of HRM functions and model. Know the recruitment and selection procedure. Explain industrial relations, workers' participation and payment procedure.	Lecture and discussion about HRM and its functions and models, workers payment recruitment and job enrichment.	**Class Test 1**(topics of the week's 1-4)
6.	**Health, Safety and Industrial Environment:** Accidents, Safety consciousness, publicity, procedures, and measures. Environmental pollution, control acts for air, water, solid waste and noise.	Explain Classification, causes and effects of accidents, safety consciousness, basics of environmental pollution, and various acts and management techniques for controlling the pollution.	Lecture and discussion about safety, accidents and environment pollution.	Answer basic questions, quizzes, Homework, exams.
7.	Project and project management,Project life cycle, scope management, proposal,Project scheduling, budgeting and procurement, Project monitoring and evaluation.	Explain the basic concepts of project and how to manage industrial projects through scheduling, budgeting and monitoring.	Lecture and discussion about project management and its life cycle, scope, scheduling, budgeting.	Answer basic questions, quizzes, Homework, exams.
8.	service and service management, Service management in IT industry, IT-IL system diagram, framework, Service support, delivery, facility management, System audit and internal control.	Explain the basic concepts of service and its management. Find service management in IT industry. Explain IT-IL diagram, framework, service support, delivery, facility management. Audit different system and control internal affairs.	Lecture and discussion about service management and its impact on IT industry.	Answer basic questions, quizzes, Homework, exams.

9.	**Materials Management:** Material in industry, inventory control model, ABC analysis, safety stock, reorder, level, economic ordering quantity, Stores equipment, Purchasing procedures, Bin card, cardex, material handling, Manual lifting, hoist, cranes, conveyors, trucks and fore trucks.	Explain materials used in industry, inventory control procedure, safety stock, economic ordering and ABC analysis. Record stores equipment, purchasing procedures.	Lecture and discussion about materials management and its purchasing procedures, records and handling.	**Class Test 2**(topics of the week's5-8)
10.	**Operations research and Industrial Engineering:** Operation research, charts, and diagram of understanding operations, job analysis, operational planning, decision-making, problem solving methods, Standardization organizations and specifications (ISO).	Explain the basic concepts of operation research, charts, and diagram of understanding operations. Describe different methods of job analysis and operational planning, decision making, and problem solving. Explain standardization and examples of standardization.	Lecture and discussion about operations research, methods of job analysis and decision making and concepts of standardization	Answer basic questions, quizzes, Homework, exams.
11.	**Basics ofAccounting:** Concepts of accounting, Accounting equation, classification of account, Double entry system, Accounting cycle journal, ledger and trial balance, Preparation of financial statements, Financial statement analysis and interpretation: ratio analysis	Explain briefly the history, scope, nature, purpose, classification of accounting. Describe double entry system and rules for determining debit and credit. Work with accounting cycle journal, ledger and trial balance. Analyze financial statement and interpretation ratio.	Lecture and discussion about accounting, its cycle journal, ledger, trial balance and financial statement analysis.	Quizzes, Homework, exams.
12.	**Cost Accounting:** Cost concept, Contribution margin, ratio analysis, Break-even analysis, CVP relationship	Explain cost concepts, meaning of costs, different types of costs, ratio analysis, break-even analysis and CVP relationship in Graphical Form and target net profit analysis.	Lecture and discussion on Cost concepts, break-even analysis and CVP relationship	**Class Test 3** (topics of the week's9-12)
13.	Miscellaneous and Final exam preparation	Learn about latest trends and the better answering methods in final exam.	Lecture and discussion on miscellaneous subjects	Exercise the answering methods in final exam.

Recommended books:

1. Management by Harold Koontz and Heinz Weihrich, McGraw-Hill.
2. Business Organization and Management by M. C. Shukla, S. Chand.
3. Operation Management by Krajewski and Ritzman, Addison-Wesley.
4. Accounting Principles by JJ Weygandt, DE Kieso, PD Kimmel, Latest Edition, John Wiley.
5. Managerial Accounting by Garrison, R H and Noreen, EW, 10th Edition, McGraw-Hill.
6. Introduction to Management Accounting by Horngren, CT and Gary L Sundem, Prentice.
7. Advanced Management Accounting by Kaplan, RS & AA Atkinson, Prentice Hall.

COURSE CODE: **CSTE 1226, C**OURSE TITLE: **VIVA VOCE**

<table>
<tr><td colspan="2">COURSE CODE: CSTE 1226, COURSE TITLE: VIVA VOCE, 0 Hours/Week, 1 Credits, Total Marks 100, Year 1, Term 2</td></tr>
<tr><td colspan="2">Rationale: This course has been designed to develop the students' ability to realize practical situation of job environment.</td></tr>
<tr><td colspan="2">Course Objectives:
➢ Prepare the students to face interview both at the academicand the industrial sector</td></tr>
<tr><td>COURSE CONTENTS</td><td>OUTCOME(Student should be able to)</td></tr>
<tr><td>VIVA VOCE (Viva based on major/minor coursesof Year-1)</td><td>Evaluate overall technical knowledge and industry readiness.
Able to go under a virtual environment of technical interview.
Able to analyze various application of Computer Science &Telecommunication Engineering inreal-life problem solving.</td></tr>
</table>

Year-2 Term-1

Sl.#	Course Code	Course Title	Credit	Credit Hours	Page No.
1	CSTE 2101	Object Oriented Programming with C++	3	3	
2	CSTE 2102	Object Oriented Programming with C++ Lab	1.5	3	
3	CSTE 2103	Algorithm Design and Analysis	3	3	
4	CSTE 2104	Algorithm Design and Analysis Lab	1.5	3	
5	CSTE 2105	Digital Logic Design	3	3	
6	CSTE 2106	Digital Logic Design Lab	1	2	
7	CSTE 2107	Computer Architecture and Organization	3	3	
8	CSTE 2108	Computer Architecture and Organization Lab	1	2	
9	MATH 2105	Matrices, Vector Analysis and Co-ordinate Geometry	3	3	
10	HUM -2103	Principles of Economics	2	2	
		Total	**22**	**27**	

COURSE CODE: **CSTE 2101**, COURSE TITLE: **OBJECT ORIENTED PROGRAMMING WITH C++**

Course Code: **CSTE 2101**, Course Title: **Object Oriented Programming with C++**,3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 2, Term 1

Rationale: This course is designed to introduce with Object Oriented Programming. It covers OOP design, implementation and real-life problem-solving using OOP.

Course Objectives:

- Introduce with the core concept of Object-oriented Programming
- To think and analyze real life problem in OOP way.
- Make familiar with OOP tools and implement OOP solution of real-life problem in C++.
- Make familiar with some advance features of OOP.
- Work in team environment.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)

1.	**Fundamentals of object-oriented Design:** Data Abstraction, Encapsulation, classes, Inheritance and Polymorphism, class Hierarchies. Designing and object-orientedsystem; Identifying the classes, Assigning Attributes and Behavior, finding relationship between classes, arranging classes into hierarchies: A design example.	Understand the basic terminology and concept of OOP. Explain basic principle of object-oriented programming.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, exams.
2.	**A first look at C++:** Using streams for input and output, Standard Template Library (STL).	Take input and show output using stream concept. Use some common libraries such as: vector, stack, queue, iterators.	Lecture on characteristics and basic operations. Some standard template libraries will be introduced.	Homework (stream concept and STL), exams.
3.	**C++ enhancements to C:** Default Function Arguments, Placement of variable declarations, the scope resolution operation, the "Const" Qualifier, overloaded functions, OODBMS	Write function and overload functions. Explain the scope of variables. Know the need of scope resolution operation. Explain object-oriented database.	Lecture and discussion with problems solution.	Answer basic questions, exams.
4.	**References:** References as Aliases, references and pointers similarities and differences, references as function parameters, references as return values.	Understand how references work. Explain the similarity and differences between pointers and references.	Lecture and discussion with problems.	Homework (Reference), exams.
5.	**Introduction to classes:** Declaring and using classes, class members, creation and destruction of objects, accessing data members, returning a reference.	Understand class concept. Learn how class is declared and access its members Learn about constructors and destructors	Lecture and discussion on class and object. Accessing class members.	**Class Test 1**(topics of the week's 1-4)
6.	"Const" objects and member function. Classes and dynamic memory allocation: New, delete operators.	Write member methods and access them. Allocate memory dynamically.	Lecture and discussion on dynamic memory allocation of objects.	Answer basic questions, quizzes, Homework (Memory Allocation).
7.	**'this' pointer, Static and Friend:** "this" pointer, Static members, friends, array of class objects.	Explain the use of this pointer. Use static members and static functions. Learn about friend class and friend function. Declare and use the array of	Lecture on this pointer, static variable and static functions, friend function, and friend class. Explain their use and necessity.	Answer basic questions, examples.

		objects.		
8.	**Inheritance and polymorphism:** Derived class and base class, derived class constructors, overriding member functions, public, protected and private inheritance.	Understand the basic concept of inheritance. Know in which order constructors and destructors are called in inheritance. Know how to override functions in derived classes. Explain the public, protected and private mode of inheritance.	Lecture on basic of inheritance. Explain inheritance with real life example.	Answer basic questions, quizzes, examples.
9.	Virtual functions, abstract classes, polymorphism, classification of inheritance, classes within classes.	Understand Run time polymorphism using virtual function. Explain the purpose of abstract class and when a class is declared as abstract class. Explain the different types of inheritance supported in C++. Explain the nested classes.	Lecture on the types of inheritance and how to override methods in inheritance using virtual function and application of nested classes.	**Class Test 2**(topics of the week's5-8)
10.	**Operator overloading:** Overloading unary operator, overloading a binary operator, data conversion.	Explain types of overloading. Know how to overload unary and binary operator.	Lecture on operator overloading with problems solution.	Answer basic questions, examples.
11.	**File processing:** File processing – formatted – unformatted and random files. Microsoft foundation classes: Strings, data structure.	Understand how to process different types of files. Use IO Stream in C++ Know how to process string. Know some basic data structures.	Lecture on file processing using IO stream. String processing and some basic data structure.	Homework, examples.
12.	**Templates and Lists:** Generic actions & types, function templates, class templates, sequential lists, virtual function nuances.	Understand the basic of generic programming. Explain template function and template class. Difference between overloading and template. Explain about lists. Know why virtual functions are used.	Lecture on the characteristics of generic programming and implement it by template with some problem's solution.	**Class Test 3**(topics of the week's9-11)
13.	**Interface and Exception Handling:** Interface and Exception Handling.	Know how to implement interface. Know how to write interface. Explain the basic of exception handling. Know how to handle different types of exception.	Lecture and discussion on the use of interface and how to handle exception using some problems solution.	Exercise the answering methods in final exam.

Recommended Books:

1. C++ program Design- An introduction to Programming and Object-Oriented Design by James P. Cohon/ Jack W. Davison.
2. Object Oriented Programming in Microsoft C++ by RoberLafore, Galgotia Book House.
3. Object Oriented Programming in Microsoft C++by E. Balagurusamy, TMH.
4. C++ How to Program. Introduction to Object Oriented Design with the UML by Deitel&Deitel, Pearson Education.
5. Programming with C++ by Schaum's Outline Series
6. C++- Unleashed The comprehensive Solutions by J. Liberty
8. C++- The Complete Reference by Herbert Schildt, TMH.

COURSE CODE: **CSTE 2102**, COURSE TITLE: **OBJECT ORIENTED PROGRAMMING WITH C++ LAB**

<table>
<tr><td colspan="5">Course Code: CSTE 2102, Course Title: Object Oriented Programming with C++ Lab, 3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 2, Term 1</td></tr>
<tr><td colspan="5">Rationale:This course teaches C++ as a first step to real programming and offers a solid foundation for the novice to become a competent programmer. It covers OOP design, implementation and real-life problem-solving using OOP.</td></tr>
<tr><td colspan="5">Course Objectives:
➢ Think and analyze real life problem in OOP way.
➢ Make familiar with OOP tools and implement OOP solution of real-life problem in C++.
➢ Develop object-oriented programs using C++.
➢ Perform experiments to verify practically the theories and concepts develop in CSTE 2101.</td></tr>
<tr><td colspan="5">Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Code Blocks IDE.</td></tr>
<tr><td></td><td colspan="4">Lesson Plan (as per week):</td></tr>
<tr><td>Week</td><td>Course Contents</td><td>Outcome (at the end of the lesson, student should be able to)</td><td>Teaching Learning Strategy (activities directed to achieve outcomes)</td><td>Assessment Strategy(How they are developed)</td></tr>
<tr><td>1-2</td><td>A first look at C++
Performing various C++, I/Operations;
Different input and output technique using streams concept.
String related problems.
Standard Template Library (STL): vector, List, stack, queue, iterators.</td><td>• Write programs on basic operations in C++.
• Process string related problems.
• Use some common libraries.</td><td>Discussion and practice</td><td>-Home task
-Quiz</td></tr>
<tr><td>3-4</td><td>Encapsulation
Problems related to creation of classes generating output. Writing member variable, member functions, constructor and destructor.
Problems related to different access specifiers.
Problems using array of objects, pointers and</td><td>• Identify class and objects.
• Bind different components of classes.</td><td>Discussion, practice and case study</td><td>Answer basic questions, quizzes, Homework, exams.</td></tr>
</table>

	references;			
5-6	**Inheritance** Experiments related to Introducing Inheritance and verification; Inheriting classes and sharing base classes functions;	• Write code using inheritance relationships.	Discussion, practice and case study	Quiz 1 (Topic of the 1-4 weeks)
7-8	**Polymorphism** Problems related to creation of Overloaded functions and constructor. Problems related to overloading relational and logical operators. Problems related to Method overriding. Test of achieving runtime polymorphism.	• Implement polymorphism by writing code.	Discussion, practice and case study	Homework, quizz
9-11	**Advance Topic** Problems related to: Static, Pure Virtual Function, Abstract Class, Interface, Exception Handling and Template function.	• Able to understand the functionality of these advance topics. • Handle exception. • Write generic program.	Discussion, Practice with a real-life problem.	Quiz 2 (Topic of the 5-8 weeks)
12	**Problem Solving Activities** Using random access files for solving problems; Problems related to sharing common algorithms and procedures for different datatype; Problems on ACM. To perform also other experiments relevant to this course.	• Enhance problem solving ability.	Practice with a real-life problem. .	Answer basic questions, Homework Quiz 3 (Topic of the 9-13 weeks)
13	**Final Lab Exam (Lab and Viva)**			

COURSE CODE: **CSTE 2103**, COURSE TITLE:**ALGORITHM DESIGN AND ANALYSIS**

Course Code: **CSTE 2103**, Course Title: **Algorithm Design and Analysis,** 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 2, Term 2
Rationale: This course has been designed to develop the students' ability to realize the internal functionality of Digital Electronic circuits and hence the logic functions, analyses and applications.

Course Objectives:

- Analyze the asymptotic performance of algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply algorithmic design paradigms like: greedy, dynamic programming and methods of analysis to real life problems.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, PDF books, Slides, e-Tutorials, PowerPoint.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	**Introduction with algorithm:** The role of algorithm in computing: -What is algorithm? -Algorithm as a technology - Analyzing algorithm - Designing algorithm	Argue the correctness of algorithms using inductive proofs and loop invariants will be familiar with Substitution and master Method.	Lecture and discussion with some basic questions on complexity analysis time and space complexity.	Answer some basic question on complexity analysis and Solve some basic problems.
2	**Growth of functions** - Asymptotic notation - Standard notation and common function	Familiar with notation and they will learn how to find the complexity of an algorithm and represent it. Find the performance of any algorithm.	Lecture and discussion on the complexity of the algorithm, analysis and finding the complexity.	Answer basic questions, quizzes.
3	**Review**: Basic data structure: stack,queue, BST, Heap, Priority queue, tree traversal, Union find, segment tree , interval tree.	Familiar with basic data structures.	Lecture and discussion on the complexity of the data structures, usefulness, and the basic differences between them.Discussion should be followed by some interesting problems on different data structure.	a. Answer some interesting questions on data structures. b. Solving some real-life problems.
4-5	Sorting Paradigms: **a. Divide and conquer approach** - What is divide and conquer approach? - Analyzing the divide and conquer algorithm. **b. Heapsort** - Heaps - Maintaining the heap property - Building a heap - The heapsort algorithm **c. Quicksort** - Description of quicksort - Performance of quicksort	**Introduction with sorting algorithm.** a) Will be familiar with sorting algorithm. b) Can be able to find its complexity. c) Analysis these algorithm's performances. d) Compare one algorithm with another.	a) Lecture and discussion with problems. b) Explain with example step by step. c) Show real life example.	Class Test 1 (topics of the week's 1-4)

	- Analysis of quicksort			
6	Search Paradigms: **a. Linear Search** -Description of linear search -Performance of linear search -Analysis of linear search **b. Binary Search** -Description of binary search -Performance of binary search -Analysis of binary search	**Introduction with searching algorithm.** a) Will be familiar with searching algorithm. b) Can be able to find its complexity. c) Analysis these algorithm's performances. d) Compare one algorithm with another.	a) Lecture and discussion with problems. b) Explain with example step by step. c) Show real life example.	Discussion, give assignment, make problem one group and another group will find its solution, quizzes.
7-8	Dynamic Programming - What is dynamic programming? - How it works? - Elements of dynamic programming - Example Analysis (Rod cutting problem, Matrix chain multiplication, Longest Common Subsequence)	a) Introduction to dynamic Programming (DP). b) Analysis of DP. c) Practice with example. d) Analysis DP with complexity.	• General techniques will be taught in the lecture. • Exercises will be given in the tutorial and the lecturer (with the participation. • Assignments will be given to the students.	**Class Test 2** (topics of the week's 5-7)
9	Greedy Algorithm - How greedy algorithm differs from dynamic programming - Elements of the greedy strategy	a) Introduction to dynamic Programming (DP). b) Analysis of DP. c) Practice with example. d) Analysis DP with complexity.	Apply the algorithms and design techniques to solve problems. •Some algorithms will be given and the students will be asked to estimate the running time of the algorithms.	Answer basic questions, quizzes, Homework
10-11	Graph Algorithms: BFS, DFS, Advance dfs, Exhaustive bfs, MST, Shortest path algorithms, detecting negative cycles, DAG.	a. Students will be familiar with graph algorithm. b. Students should practice algorithm step by step with example. c. Analysis performances.	a. General techniques will be taught in the lecture. b. Exercises will be given in the tutorial and the lecturer. c. Assignments will be given to the students.	**Class Test 3** (topics of the week's 8-11)

12-13	a. Problem solving paradigms: greedy, divide and conquer, dynamic programming , recursive memorization, 2 pointer idea, complete search, using binary search and ternary search b. How to formulate a solution using these	b. Can be able to participate programing contest. c. Able to solve hard problem. d. Develop logic.	a. Practice with UVA online. b. Can participate online programming contest.	Problem solving.

Recommended Books:

2. Introduction to Algorithms - Cormen, Thomas, Charles Leiserson, Ronald Rivest, and Clifford Stein
3. Computer Algorithms, Henry F. Korth
4. Algorithm, Schaums Outline Series
5. Anny V.Levitin. Introduction to the design and analysis of Algorithms

COURSE CODE: **CSTE 2104**, COURSE TITLE:**ALGORITHM DESIGN AND ANALYSIS LAB**

COURSE CODE: **CSTE 2104**, COURSE TITLE: **ALGORITHM DESIGN AND ANALYSIS LAB** 3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 2, Term 2				
Rationale: Practical implementations of the Algorithms that are learned from the course CSTE-2204.				
Course Objectives: ➢ Design and develop programs. ➢ Debug and test their execution with realistic and challenging data. ➢ Conduct experiments to get time and storage efficiency of the program codes.				
Resources Used: Multimedia, Whiteboard, Marker, e-Tutorials, Compiler, PowerPoint Slides.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1-2	**Design and Analysis of Algorithms**	**Introduction with algorithm.** Argue the correctness of algorithms using inductive proofs and loop invariants will be familiar with Substitution and master Method.	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	Assignment
3-4	**Sorting Algorithms** a. Bubble Sort b. Insertion Sort c. Selection Sort d. Quick Sort	• Student will be familiar with basic data structures. • Can be able to write program. • Develop their problem-solving logic.	• Discussion about the problem. • Students will be given to do some problem to solve. • Analysis the complexity.	Solve problem from exercise book and online.

5-6	**Design Strategies Divide & Conquer** a. Merge sort b. Binary search	• Finding the maximum and minimum of a sequence of numbers. • Can be able to write program. • Develop their problem-solving logic.	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	Solve problem from exercise book and online.
7-8	**Search Paradigms:** a. Linear Search b. Binary Search	• Understand searching problems with examples. • Can be able to write program. • Develop their problem-solving logic.	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	Quiz 1(1 to 3 week)
9-10	**Dynamic Programming**	• Matrix chain multiplication. • Longest common subsequence. • Travelling salesman problem.	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	Solve problem from exercise book and online.
11	**Greedy Algorithm**	• Finding the shortest path between two vertices using Dijkstra's algorithm. • Finding the minimal spanning tree in a graph using Prim's /Kruskal's algorithm, etc.	• Statement of the problem. • Find a strategy to solve it. Write program with C++or JAVA	Solve problem from exercise book and online.
12	**Graph Algorithms:** - Spanning Tree - Shortest path algorithms - DAG.	• Understand searching problems with examples. • Can be able to write program. • Develop their problem-solving logic.	• Discussion about the problem. • Students will be given to do some problem to solve. • Analysis the complexity.	Solve problem from exercise book and online.
13	**Final Lab Exam (Lab and Viva)**			

COURSE CODE: **CSTE 2105**, COURSE TITLE: **DIGITAL LOGIC DESIGN**

Course Code: **CSTE 2105**, Course Title: **Digital Logic Design**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 2, Term 1
Rationale: This course has been designed to provide the students an in-depth understanding of digital circuits and systems which is fundamental to the student's ability to become a successful digital designer and computer engineer.
Course Objectives: ➢ To provide the students with a basic understanding of digital and logic circuits with its different components. ➢ To provide students with a knowledge of problem-solving with digital logic circuits & systems. ➢ To familiarize the students with building blocks of combinational and sequential circuits to enable them to develop circuit solutions to problems and to understand the design and operation of hardware models of digital systems.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1.	**Introduction:** Digital and analog systems, The introductory concept of number systems and codes. Digital representation, Digital circuit, and Logic circuit. **Logic Gates, Boolean Algebra and Minimization**: Boolean constants and variables, truth tables. Basic Logic gates.	➢ To differentiate between digital and analog systems. ➢ To learn how to convert a number to different number systems. ➢ To familiar with logic gates, truth table, and logical algebra.	Lecture and discussion on detailed information about the course, including the objectives, course outcomes, examinations. Lecture delivery on the basics of digital and analog systems, number systems and logic gates.	Answering basic questions, quizzes, Homework etc.
2.	**Logic Gates, Boolean Algebra and Minimization**: Universality of NAND and NOR gates, Describing logic circuits algebraically, Evaluating logic circuit outputs, Boolean theorems, DeMorgan's theorems. Implementing logic circuits from boolean expressions, Alternate logic-gate representations.	➢ To learn how to implement logic gates and logical expression using NAND and NOR gates. ➢ To describe logic circuits algebraically. ➢ To implement a logic circuit from Boolean expression.	Lecture and discussion on the universality of NAND and NOR gates and the implementation of logic circuits. Exercise sample problems on logic circuit implementation.	Answering basic questions, quizzes, Homework etc.
3.	**Combinational Logic Circuits Design**: Sum-of-product and product-of-sum forms, Simplifying logic circuits, algebraic simplification, Karnaugh map method.	➢ To learn how to express a logical expression in SOP and POS form. ➢ To simplify the logic circuit and Boolean expression using algebraic and K-Map simplification.	Lecture and discussion on SOP and POS logical expression, logic simplification using algebraic and K-Map techniques. Exercise with various logical problems.	Answering basic questions, quizzes, Homework etc.
4.	**Combinational Logic Circuits Design**: Designing combinational logic circuits, Exclusive OR and Exclusive NOR circuits, Logic circuits with multiple outputs, Designing logic circuits without a truth table, Parity generator and checker circuit, Enable/Disable circuits, Programmable logic devices (PLD), Hardware description languages- HDL, VHDL.	➢ To design combinational logic circuits. ➢ To design logic circuits with multiple outputs. ➢ To learn how to design a parity generator and checker circuit. ➢ To learn some hardware description languages like HDL, VHDL etc.	Lecture and discussion with examples on combinational logic circuits with single and multiple outputs, parity generator, and checker circuits. Lecture on the basics of hardware description language.	Answering basic questions, quizzes, Homework etc.
5.	**Flip-Flops (FF)**: NAND gate latch, NOR gate latch, D latch,	➢ To understand the basics of FF and	Lecture on the basics on FF and latch with	CT-1 (topics of the week's 1-4)

	Clock signals and clocked Flip-Flops, Clocked S-C FF.	latch. ➢ To design a Clocked S-C FF.	the introduction of S-C FF.	
6.	**Flip-Flops (FF)**: Clocked J-K FF, Clocked D FF, Master-slave FF, FF applications, FF synchronization, Data storage and transfer, Frequency division, and counting. **Arithmetic circuits**: Adder circuits, Half adder (HA), Full adder (FA), Carry propagation, Parallel adder, carry look-ahead adder, The 2's complement addition, and subtraction system, The BCD adder circuit, Cascading BCD adder, Binary multiplier.	➢ To design clocked J-K, D and Master-slave FF. ➢ To learn about FF applications. ➢ To design the different types of adder circuits like HA, FA, Parallel adder and carry look-ahead adder etc.	Lecture and discussion on the design of J-K, D and Master-Slave FF. Lecture on the design of HA, FA, Parallel adder, Carry look-ahead adder and BCD adder.	Answering basic questions, quizzes, Homework etc.
7.	**Counters and Registers**: Asynchronous counter: Ripple counters, Counters with mod numbers<2^n, IC asynchronous counters, Asynchronous down counter, Asynchronous up/down counter, Propagation delay in ripple counters.	➢ To understand the basics of counter and registers. ➢ To design the different types of asynchronous up and/or down counter for the different mod number.	Lecture and discussion on the basics of a counter with the design and implementation of different types of an asynchronous counter. Exercise on related topics.	Answering basic questions, quizzes, Homework etc.
8.	**Counters and Registers**: Synchronous counter, Synchronous down counter, Synchronous up/down counters, decoding a counter, Decoding glitches, Cascading BCD counters, Shift-registers, Counter applications: frequency counter, digital clock.	➢ To design the different types of synchronous up and/or down counter for the different mod number. ➢ To design a digital clock.	Lecture on the design and implementation of different types of synchronous counter and a digital clock circuit. Exercise on related topics.	Answering basic questions, quizzes, Homework etc.
9.	**MSI Logic Circuits**: Decoders, BCD-to-decimal decoders, BCD-to-7-segment decoder/drivers.	➢ To understand the basics of a decoder. ➢ To design different types of decoder circuit like BCD-to-decimal decoders, BCD-to-7-segment decoder etc.	Demonstrate the basics, design, and operations of the different decoder circuit.	CT-2 (topics of the week's 5-8)
10.	**MSI Logic Circuits**: Encoders, Multiplexers and multiplexer applications, Demultiplexers. **Integrated-Circuit Logic Families**: Digital IC terminologies, TTL logic family, TTL series characteristics, open-collector TTL, Tristate TTL, ECL family, MOS digital ICs, MOSFET, CMOS characteristics, CMOS tri-state logic, TTL CMOS-TTL	➢ To design different types of encoder, multiplexer and demultiplexer circuit etc. ➢ To learn about TTL, ECL, and CMOS digital ICs logic families.	Demonstrate the basics, design, and operations of different encoder, multiplexer and demultiplexer circuit. Lecture and discussion on the basics of TTL, ECL, and CMOS digital ICs logic families.	Answering basic questions, quizzes, Homework etc.

	interfacing.			
11.	**Interfacing with the Analog World:** Digital to analog conversion (DAC), D/A conversion circuitry, Summing amplifier, Analog to digital conversion (ADC), A/D conversion circuitry, Digital ramp ADC.	➢ To design different types of ADC and DAC circuit.	Lecture and discussion on the design and operation of ADC and DAC circuit. Exercise on related topics.	Answering basic questions, quizzes, Homework etc.
12.	**Memory Devices**: Memory terminology, general memory operation, semiconductor memory technologies, different types of ROMs, semiconductor RAMs, static and dynamic RAMs, ROM architecture, RAM architecture, **FPGA Concept**.	➢ To design the architecture of RAM and ROM.	Lecture and discussion on the design and operation of RAM and ROM architecture. Exercise on related topics.	CT-3 (topics of the week's 9-12)
13.	Review topics and Final exam preparation.	➢ To learn about the latest trends and the better answering methods in the final exam.	Students will be asked to answer the questions orally on previous lectures and review the contents of the course. Discussion on the better answering methods for the final examinations.	Exercise the answering methods in final exam.

Recommended Books:

1. Digital Systems: Principles and Applications by Ronald J. Tocci, Prentice Hall.
2. Digital Logic and Computer Design by M. Morris Mano, Prentice Hall.
3. An Introduction to Switching Theory and Digital Electronics by V. K. Jain,Khanna Publishers.

COURSE CODE: **CSTE 2106**, COURSE TITLE: **DIGITAL LOGIC DESIGN LAB**

Course Code: **CSTE 2106**, Course Title: **Digital Logic Design Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 2, Term 1

Rationale: This course has been designed to provide the students with practical knowledge of designing digital circuits and systems which is fundamental to the student's ability to become a successful digital designer and computer engineer.

Course Objectives:

- To understand the principles and methodology of digital logic design at the gate level.
- To design and analyze combinational and sequential logic circuits.
- To design and analyze digital circuits for real life problem solving.
- To understand the basic software tools for the design and implementation of digital circuits and systems.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Lab equipment and Manuals, Quartus software.

Lesson Plan (as per week):

Week	**Experiments**	**Outcome** (at the end of the lesson, student should be able)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)

1-2	➢ Verification of the truth tables of the logic gates (AND, OR, NOT, NOR, NAND, Ex-OR, Ex-NOR etc). ➢ Realization of the universality of NAND and NOR gate.	➢ To verify the truth table of logic gates and universality of NAND and NOR gates.	First lecture and then Practice.	Answer basic questions, quizzes.
3-4	➢ Design, construction and testing of a parity generator and checker circuit. ➢ Design, construction and testing of Half Adder & Full Adder circuits.	➢ To design the parity generator and checker circuit and understand its operations. ➢ To design and test the Half adder and Full adder circuit.	Discussion and practice.	Answer basic questions, quizzes.
5-6	➢ Verification of the truth tables of different Flip-Flops. ➢ Realization of D and T Flip-Flops by using J-K Flip-Flop.	➢ To design and understand the operations of different Flip-Flop circuits.	Lecture and discussion on Flip-Flop with tutorials and then practice.	Answer basic questions, quizzes, homework, exams.
7-8	➢ Design, construction and testing of different synchronous counters. ➢ Design, construction and testing of different asynchronous counters.	➢ To design and understand the operations of different Synchronous and Asynchronous counter circuits.	Lecture and discussion on Counter and practice.	Answer basic questions, quizzes, homework.
9-10	➢ Design, construction and testing of a different Decoder circuit using logic gates and Decoder IC. ➢ Design, construction and testing of a different Encoder circuit using logic gates and Encoder IC.	➢ To design and understand the operations of different Decoder and Encoder circuits using logic gates and IC.	Lecture and discussion on Decoder and Encoder circuits with tutorials and then practice.	Answer basic questions, quizzes, homework, exams.
11	➢ Design, construction and testing of a multiplexer by using circuit using logic gate and MUX IC. ➢ Design, construction and testing of different de-multiplexer by using circuit using logic gate and MUX IC.	➢ To design and understand the operations of different Multiplexer and De-multiplexer circuits using logic gates and IC.	Lecture and discussion on the concepts of Multiplexer and De-multiplexer circuits and practice.	Answer basic questions, quizzes, homework.
12	➢ Solving some real-life problems using a combination of different logic gates. ➢ Using software tools for the design and implementation of digital circuits and	➢ To analyze and solve a real-life problem with digital circuits. ➢ To learn how software tools can be used to design and	Lecture and discussion with real life problems. Demonstration on Quartus Software.	Answer basic questions, quizzes, homework, exams.

	systems. ➢ Perform other experiments relevante to this course.	implement digital circuit and systems.		
13	**Final Lab Exam (Job, Quiz and Viva)**			

COURSE CODE: **CSTE 2107**, COURSE TITLE: **COMPUTER ARCHITECTURE AND ORGANIZATION**

Course Code: **CSTE 2107**, Course Title: **Computer Architecture and Organization**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 2, Term 1

Rationale: This course has been designed to provide the students with an in-depth understanding of computer architecture and organization which is fundamental to the students' ability to become a successful computer engineer.

Course Objectives:

- To familiarize students about basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user.
- To familiarize students about hardware design including arithmetic unit, logic unit, shifter and different types of the adder circuit.
- To analyze the processor and memory performance of a digital computer with improvement using instruction level parallelism.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1.	**Introduction**: A brief history of computers, difference between computer architecture & organization, Limitations of computers- Unsolvable problem, Intractable problems, Speed limitations, **Basics of computer organization**: Top level structure of a computer, structure of digital computer-CPU, ALU, I/O devices.	➢ To familiar with computer history and understand the basics of computer architecture and organization. ➢ To learn in detail about computer limitations. ➢ To understand the basic structure of a computer.	Lecture and discussion on detailed information about the course, including the objectives, course outcomes, examinations. Lecture delivery on the history of computers and the basics of computer architecture and organization.	Answering basic questions, quizzes, Homework etc.
2.	Organization of the IAS computer, IBM System/360 and personal computer system, Factors that determine computer performance, Harvard & Von-Neumann architecture, Microcontroller Vs. Microprocessor.	➢ To explain the structure of computers of the different generation. ➢ To analyze and evaluate computer performance. ➢ To differentiate between Harvard & Von-Neumann architecture, Microcontroller & Microprocessor.	Lecture and discussion on computer structure, computer performance, Harvard & Von-Neumann architecture, Microcontroller & Microprocessor etc.	Answering basic questions, quizzes, Homework etc.
3.	**Micro-operations:** Arithmetic	➢ To understand	Lecture and discussion	Answering basic

	micro-operation, Logic micro-operation, Shift micro-operation. **Instruction Set**: Instruction format, instruction types, CPI, IPS, MIPS & FLOPS, addressing modes of Instruction.	different types of micro-operations with an example. ➢ To learn in detail about instruction set, format, types and addressing modes of instruction. ➢ To apply the knowledge of performance metrics to find the performance of systems.	on micro-operations, computer instructions. Exercise on system performance calculation and addressing modes.	questions, quizzes, Homework etc.
4.	**Arithmetic & logic circuits**: Serial adder, Ripple carry adder, carry look-ahead adder, the design of floating-point adder, Arithmetic circuit design, Logic circuit design, ALU design.	➢ To design and understand the operation of arithmetic, logic, and arithmetic logic unit circuit. ➢ To design and understand the operation of different types of the adder circuit.	Demonstration on arithmetic, logic and different types of the adder circuit.	Answering basic questions, quizzes, Homework etc.
5.	Combinational circuit shifter design, Addition-subtraction logic network. **Multiplier & divider**: Unsigned binary multiplication, Booths multiplier, array multiplier, restoring &nonrestoring divider.	➢ To design and understand the operation of addition-subtraction, multiplier, divider and shifter circuit.	Lecture and discussion on addition-subtraction, multiplier, divider and shifter circuit	CT-1 (topics of the week's 1-4)
6.	**I/O devices & system organization**: External devices (keyboards, monitors, CD-ROM drive, HDD, Mouse, light Pen etc.), I/O modules, programmed I/O, interrupt-driven I/O. DMA-I/O processors.	➢ To introduce with the operations of familiar I/O devices and I/O organizations. ➢ To learn different types of I/O modules.	Lecture and discussion on I/O device and I/O modules.	Answering basic questions, quizzes, Homework etc.
7.	**CPU organization**: Fundamentals, Processor-memory communication with & without cache, an overview of CPU functions, Single accumulator-based organization, General register organization, Stack organization.	➢ To learn the basics of Processor-memory communication with & without cache. ➢ To learn different types of CPU organization with instruction formats.	Lecture and discussion on cache memory and CPU organization. Exercise on instruction formats.	Answering basic questions, quizzes, Homework etc.
8.	**Control Unit Design:** Hardwired control, microprogrammed control, nano-program control. Pipeline control Unit-throughput & efficiency, instruction level pipelining different pipelined stages in CPU, pipeline hazards (data, control & structure).	➢ To understand in detail about control unit operation. ➢ To learn the concepts behind pipelining techniques for processor performance improvement.	Lecture and discussion on control unit design and pipelining.	Answering basic questions, quizzes, Homework etc.

	Tristate bus & Bus interconnection: Register transfer & RTL notation.			
9.	**RISC & CISC based architecture**: Examples of RISC processor (SPARC & C490), introduction to superscalar & VLIW architectures.	➢ To understand in detail about different types of processor architecture.	Lecture and discussion on different types of processor architecture.	CT-2 (topics of the week's 5-8)
10.	**Memory organization**: Characteristics of memory systems, memory technology, types of memory-volatile & nonvolatile, ROM, PROM, EPROM, EEPROM, Flash memory, SRAM, DRAM, SDRAM, Content addressable memory.	➢ To learn about memory organization, characteristics, and classification in detail.	Lecture and discussion on memory characteristics with detail classification.	Answering basic questions, quizzes, Homework etc.
11.	**Cache & virtual memory**: Direct, associative & set-associative, Cache hit, Cache miss & Hit ratio, Miss ratio, Miss penalty, instruction cache & data cache, virtual memory paging, Types of cache design-Logical cache, Physical cache. Memory hierarchy and goal in memory hierarchy design.	➢ To understand the concept of cache mapping and cache design techniques. ➢ To understand the concept of memory hierarchy with its goal.	Lecture and discussion on cache mapping and memory hierarchy with exercise.	Answering basic questions, quizzes, Homework etc.
12.	**Multiprocessors**: types, performance, single bus multiprocessors, multiprocessors connected by network, clusters, parallel processing.	➢ To understand the concept of multiprocessor and parallel processing system.	Lecture and discussion on multiprocessor and parallel processing system.	CT-3 (topics of the week's 9-12)
13.	Review topics and Final exam preparation.	➢ To learn about the latest trends and the better answering methods in the final exam.	Students will be asked to answer the questions orally on previous lectures and review the contents of the course. Discussion on the better answering methods for the final examinations.	Exercise the answering methods in final exam.

Recommended Books:

1. Computer Organization and Architecture by W. Stallings, Prentice Hall.
2. Computer Architecture and Organization by J.P. Hayes, McGraw Hill.
3. Computer System Architecture by- M. Morris Mano, Pearson Education.

COURSE CODE: **CSTE 2108**, COURSE TITLE: **COMPUTER ARCHITECTURE AND ORGANIZATION LAB**

Course Code: **CSTE 2108** Course Title: **Computer Architecture and Organization Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 2, Term 1

Rationale: This course has been designed to provide the students with practical knowledge of designing and understanding computers internal components which is fundamental to the students' ability to become a successful computer engineer.

Course Objectives:

- To identify the basic components of computer organization and explain how they work together.
- To familiarize students about the designing of various functional modules of the computer.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Lab equipment and Manuals.

Lesson Plan (as per week):

Week	Experiments	Outcome (at the end of the lesson, student should be able)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	➢ Design, Construction and Testing of Arithmetic Unit (AU) Circuit. ➢ Design, Construction and Testing of Logic Unit (LU) Circuit using MUX IC.	➢ To design and understand the operations of AU and LU circuit.	Lecture and discussion on AU and LU circuit with practical implementation and testing.	Answer basic questions, quizzes.
3-4	➢ Design, Construction and Testing of Logic Unit (LU) Circuit using basic logic gates only. ➢ Design, Construction and Testing of Arithmetic Logic Unit (ALU) Circuit.	➢ To design and understand the operations of ALU circuit.	Discussion with practical implementation and testing.	Answer basic questions, quizzes, homework.
5-7	➢ Design, Construction and Testing of different Adder circuit.	➢ To design different adder circuits like serial adder, parallel adder, carry look-ahead adder etc and understand their operation.	Discussion and practice.	Answer basic questions, quizzes, exams.
8-9	➢ Design, Construction and Testing of Addition-Subtraction Logic Unit. ➢ Design, Construction and Testing of Shifter circuit.	➢ To learn how to design an addition-subtraction logic circuit, shifter circuit and understand their operation.	Discussion and practice.	Answer basic questions, quizzes.
10-11	➢ Design, Construction and Testing of 2-bit, 4-bit magnitude comparator. ➢ Design, Construction and Testing of Registers.	➢ To design a comparator and register circuit with a clear understanding of its operations.	Discussion with practical implementation and testing. Demonstration with e-Tutorials.	Answer basic questions, quizzes.
12-13	➢ Design of a combinational multiplier. ➢ Design of Direct Mapped and Associative cache. ➢ Perform other experiments relevant to this course.	➢ To learn how to design a multiplier, direct mapped cache and associative cache.	Demonstration with e-Tutorials.	Answer basic questions, quizzes, homework, exams.

Course Code: **MATH 2105**, Course Title: **Matrices, Vector Analysis and Coordinate Geometry**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 2, Term 1

Rationale: This course is designed to deal with the concept of matrix, vector and coordinate geometry. It will also show the concept of matrix decomposition and the coordinate transformation from two-dimensional space to three-dimensional space.

Course Objectives:

- To understand the basic matrix transformation and its operations.
- To describe and manipulate vector spaces, subspaces and their bases.
- To understand vector differentiation and vector integration.
- Understanding of the principles and concepts of coordinate geometry.
- To be able to use appropriate formulas to solve coordinate geometry equations.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Matrix Terminology:** Vector presentation by matrix, different types of matrices, algebraic operations on matrices, Transpose of a Matrix, Adjoint and inverse of a matrix,	Find vector representation using matrix. Matrix transformation and its representation.	Lecture and discussion on matrix	Answer basic questions, quizzes, Homework, exams.
2	**Matrix Terminology:** augmented matrix, row operation method, rank of Matrices, Mathematical Problems using Matrix, distinguish between determinant and matrix.	Different matrix operation along with determinate computation.	Lecture and discussion about matrix operation.	Answer basic questions, quizzes, Homework, exams.
3	**Matrix Terminology:** Normal Vector, Orthonormal Vectors, Orthogonality, Gram-Schmidt Orthonormalization Process, co-variance matrix,	Determine the relation between matrix and vector and different properties of vector.	Lecture and problem solving.	Answer basic questions, quizzes, Homework, exams.
4	**Matrix Decomposition:** Eigen Decomposition Theorem, Singular Value Decomposition (SVD).	Apply matrix decomposition using different theorem.	Lecture and practice.	Exercise with various mathematical problems.
5	**Matrix Decomposition:** LU Decomposition, QR decomposition, Cholesky decomposition.	Apply LU, QR and Cholesky algorithm to decompose a matrix.	Lecture and discussion about problems.	**Class Test 1**(topics of the week's 1-4)
6	**Matrix Decomposition:** Physical application of Matrix Decomposition Theorem, Mathematical Analysis of Matrices using MATLAB.	Understand application of matrix decomposition.	Lecture and problem solving.	Answer basic questions, quizzes, Homework, exams.
7	**Vector differentiation:** Derivative of vector function-Velocity and acceleration-Scalar and vector fields-Gradient- It's geometrical interpretation	Compute derivative of vector spaces, subspace and gradients.	Lecture and discussion on vector differentiation.	Answer basic questions, quizzes, Homework (word size expansion, memory location expansion), exams.

8	**Vector differentiation:** Directional derivative-Divergence and Curl-Their physical meaning-Relations involving-Solenoidal and irrotational fields-Scalar potentials (simple problems).	Compute directional derivative, divergence and curl and have knowledge of the physical interpretation of these quantities.	Lecture and problem solving.	Answer basic questions, quizzes, Homework, exams.
9	**Vector Integration:** Line integral, the surface integral and volume integral-work done by a force-Statement and Verification of Green's theorem	Compute lines, curve integrals and circulation, surface integrals	Lecture and discussion on vector integration.	**Class Test 2**(topics of the weeks5-8)
10	**Vector Integration:** Stoke's theorem and Gauss's Divergence theorem-their use in evaluating the Integrals.	To apply Stoke's theorem and Gauss's theorem to compute integral.	Lecture and practice.	Answer basic questions, quizzes, Homework, exams.
11	**Coordinate geometry of two dimensions:** Change of axes, General equation of second degree.	Identify coordinate of a point in a Cartesian system and transform of coordinates.	Lecture and discussion on coordinate geometry.	Quizzes, Homework, exams.
12	**Coordinate Geometry of three dimensions:** a system of coordinates, the distance between two points; Direction cosine and ratio; the angle between two straight lines;	Calculate the length of a line and angle between two lines.	Lecture and discussion on problems.	**Class Test 3**(topics of the weeks9-12)
13	**Coordinate Geometry of three dimensions:** Equation of a plane; Plane through three given points; Angle between two planes; Equation of a straight line through two points.	Calculate the equation for plane in 3D space and angle between two planes.	Problem solving and practice.	Exercise the answering methods in the final exam.

Recommended Books:

1. Vector Analysis and An Introduction to Tensor Analysis by M. R. Spiegel, S. Lipschutz, McGraw-Hill.
2. Analytical Geometry of Three Dimension by Vasistha and Agarwal, Krishna.
3. Advanced Engineering Mathematicsby ErwinKreyszig, Wiley Eastern.

COURSE CODE: **HUM 2103**, COURSE TITLE: **PRINCIPLES OF ECONOMICS**

Course Code: **HUM 2103**, Course Title: **Principles of Economics**,3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 2, Term 1

Rationale: This course provides an introduction to a broad range of economic concepts, theories and analytical techniques.

Course Objectives:

- Understanding the economic problem, specific economic issues, and policy alternatives;
- Understand and apply the economic perspective and reason accurately and objectively about economic matters.
- Promote a lasting student interest in the economic environment in which business operates.
- Acquire the necessary quantitative skills used in economic analyses.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Definition and scope of Economics:** Definition of basic terms-Goods-wants and their classificationwealth-Income–Money Near money- Credit money- Utility, features, and kinds of utility –	Understand the nature and scope of economics. Explain the classification of economics. Explain the money market condition.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, exams.
2	Concept of national income: -Methods of calculating GDP, GNP, NMP etc. at factor cost, at market prices etc.	Explain the major features: national income, economic growth, unemployment, inflation, money and banking, public sector. Explain the economic growth condition of a society of a nation.	Lecture and discussion with practical scenarios.	Answer basic questions, quizzes, exams.
3	Numerical problems on National income, Capital formation, savings and Investment relationship, Economic estimation.	Explain National income capital formation. Understand how to increase the investment situation with the help of savings.	Lecture and discussion with problems solution.	Answer basic questions, exams.
4	Bangladeshi economic growth in rates and their estimation. Bangladeshi economic growth in recent years, saving investment equality, LM, IS curves.	Understand how to relate money market and commodity market in Bangladesh economy.	Lecture and discussion with examples.	Answer basic questions, quizzes, exams.
5	**Basic laws in Economics:** Law of Diminishing marginal utility – Demand, Law of Demand and demand curve-	Relate with consumer preference.	Lecture and discussion with examples.	**Class Test 1**(topics of the week's 1-4)
6	The concept of supply-Supply schedule and supply	Analyze the determinants of supply and demand and the	Lecture and discussion with	Answer basic questions,

	curve.	ways in which changes in these determinants affect equilibrium price and output. Understand the concepts of consumer surplus and producer surplus should also be introduced.	practical scenarios.	quizzes, exams.
7	**Market structure:** Classifications – Pricing under different markets as perfect competition, monopoly, and oligopoly. Pricing under monopolistic competition.	Explain the major features of economics such as: types of market, market mechanism, market failures, competition State assumptions of various market models.	Lecture and discussion with practical scenarios.	Answer basic questions, quizzes, exams.
8	**Inflation:** Measures to control inflation – Monetary measures and fiscal measures – Effects of inflation.	Explain the price condition and employment situation of a nation which helps in policy making.	Lecture and discussion with practical scenarios.	Answer basic questions, quizzes, examples.
9	**Tax:** Classification of Taxes – Direct &Indirect taxes specific and Ad-Valorem taxes	Explain the government policy to increase revenue.	Lecture and discussion with practical scenarios.	**Class Test 2**(topics of the weeks5-8)
10	Personal income- tax – characteristics of a good tax system – Tax evasion.	The government takes tax policy in such way that which will not burden for tax payers.	Lecture and discussion with practical scenarios.	Answer basic questions, quizzes, exams.
11	**Monetary Fund:** Issues & Challenges – International liquidity –	Explain the role of IMF, Foreign reserve management, International reserve account.	Lecture and discussion with examples.	Answer basic questions, quizzes, exams.
12	Special Drawing Rights - Bangladesh & IMF	Explain the relation between governments and other international monetary organization.	Lecture and discussion with practical scenarios.	**Class Test 3**(topics of the week's9-12)
13	**Welfare Economics:** Old Welfare Economics -Pigou's Analysis – New Welfare Economics Pareto's welfare criterion.	Understand the basic elements of welfare economics.	Lecture and discussion with examples.	Exercise the answering methods in final exam.

Recommended Books:

1. Modern Economic theoryby K.KDewtt.
2. Elements of Ecomic Analysis by Prof. G.Narendrababu
3. Money, Banking, Trade & Finance by Sundaran K.P.M

Year-2 Term-2

Sl.#	Course Code	Course Title	Credit	Credit Hours	Page No.

1	CSTE 2201	Object Oriented Programming with JAVA	3	3	
2	CSTE 2202	Object Oriented Programming with JAVA Lab	1.5	3	
3	CSTE 2203	Digital Electronics and Pulse Technique	2	2	
4	CSTE 2204	Digital Electronics and Pulse Technique Lab	1	2	
5	CSTE 2205	Signals and Systems	2	2	
6	CSTE 2207	Electronic Communication	3	3	
7	CSTE 2208	Electronic CommunicationLab	1	2	
9	CSTE 2209	Theory of Computation	3	3	
10	CSTE 2211	Electromagnetic Waves and Radiating Systems	2	2	
11	MATH 2207	Complex Variables, Statistics and Probability	3	3	
12	CSTE 2226	Viva Voce	1	0	
		Total	**22.5**	**25**	

COURSE CODE: **CSTE 2201**, COURSE TITLE: **OBJECT ORIENTED PROGRAMMING WITH JAVA**

Course Code: **CSTE 2201**, Course Title: **Object Oriented Programming with Java**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 2, Term 1

Rationale: This course has been designed to develop the students' ability to use Java as an object-oriented programming language to build several types of application software using GUI.

Course Objectives:

- Identify problems and apply object-oriented programming concept to build information system
- Apply UML notations used in object-oriented applications design.
- Implement common I/O operations using Java
- Implement event-driven graphical user interfaces (GUI) in Java

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

Lesson Plan (as per week):

Week	**Course contents**	**Outcome** (at the end of the session, student should be able to)	**Teacher Learning strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	History of Java, Java Class Libraries, Introduction to Java Programming	Explain the basics of java. Use Java class libraries and run sample java program.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, physical environment and methodology with the students.	Answer basic questions, quizzes, Homework, exams.

2.	**Developing Java application:** Algorithms, Pseudo code, Control structure, if/else selection structure, while repetition structure, assignment operators, increment and decrement operators.	Explain about the algorithms, pseudo code, control structure, if/else selection structure, while repetition structure. Learn about assignment operators, increment and decrement operators.	Lecture and discuss about the algorithms and pseudo code. Using Java IDE to implement if/else, while, and different operators.	Answer basic questions, quizzes, Homework, exams.
3.	**Control structure:** Primitive data types, Common Escape sequence, logical operator, For structure, switch, do/while, break and continue	Explain about the primitive data types, escape sequences, logical operators, for structure, switch, do/while, break, and continue.	Lecture and discussion about different primitive data types, common escape sequences. Using Java IDE to implement for, switch, do/while, break and continue.	Answer basic questions, quizzes, Homework, exams.
4.	**Methods:** Program module in Java, Math class methods, Method definitions, Java API packages, Automatic variables, Recursion, Method overloading, Method of the Applet class	Explain about method definitions, java API packages, recursion, method overloading, and method of the Applet class.	Lecture and discuss methods and the way to implement them in java programs. Implement Java API package, recursion, and method overloading through Java IDE.	Answer basic questions, quizzes, Homework, exams.
5.	**Arrays:** Arrays, Declaring and allocating arrays, passing arrays to methods, sorting arrays, searching arrays, multiple-subscripted arrays	Explain about array declaration, sorting arrays, searching arrays, multiple subscripted arrays, and passing arrays to methods.	Lecture and discuss arrays and implement array in Java IDE.	**Class Test 1**(topics of the week's 1-4)
6.	**Object-based programming:** Time abstract Data type, Class scope, controlling access to members, utility methods, constructors, using Overload constructor,	Explain about Implementing a Time abstract Data type with a class, class scope, controlling access to members, utility methods, constructors, and constructor overloading.	Lecture and discussion about implementing a Time abstract Data type with a class, class scope, constructors, and constructor overloading.	Answer basic questions, quizzes, Homework, exams.
7.	set and get method, software reusability, friendly members, finalize, static class members, Data abstraction and information hiding	Explain about set and get method, software reusability, friendly members, finalize, and static class. Use data abstraction, and information hiding.	Lecture and discuss set and get methods, software reusability, friend, finalize, and static class members. Using Java IDE to implement encapsulation.	Answer basic questions, quizzes, Homework, exams.

8.	Superclass and subclass, protected members, constructor, finalize, composition, and inheritance.	Use superclass, and subclass. Explain protected members, and using constructor and finalize in subclasses. Differentiate between composition and inheritance.	Implement inheritance and the way to access inheritance through Java IDE.	Answer basic questions, quizzes, Homework, exams.
9.	polymorphism, dynamic method building, final, abstract superclass and concrete class	Explain polymorphism, and dynamic method building. Use final in methods and classes, abstract superclass, and concrete class in Java program.	Lecture and discuss polymorphism, and dynamic method building. Implement final, and abstract keywords in the Java program.	**Class Test 2**(topics of the weeks5-8)
10.	**String and Exception handling:** String and characters, exception handling, files and stream.	Explain about String class and characters. Learn about exception handling procedures, file operations, and streams.	Using Java IDE to show String, files and exception handling related problems.	Answer basic questions, quizzes, Homework, exams.
11.	**Java API and GUI:** Java API, Utility classes, 2D graphics, GUI, Swing	Make Java API, Utility classes, 2D graphics, and GUI interfaces using java swing.	Implement Java API, utility classes, 2D graphics, and GUI using swing through Java IDE.	Quizzes, Homework, exams.
12**.**	**Multithreading and Interface:** Events, Interface, Multithreading, Collection Framework	Explain about how to create events, and interface. Describe about multithreading, and collection framework.	Implement multithreading, events, and interface through Java IDE.	**Class Test 3** (topics of the week's9-12)
13.	Miscellaneous and Final exam preparation	Learn about latest trends and the better answering methods in final exam.	Lecture and discussion on miscellaneous subjects	Exercise the answering methods in final exam.

RecommendedBooks:

1. Java How to Program by Deitel&Deitel, Prentice Hall.
2. Java: The Complete Reference by H. Schildt, McGraw-Hill.
3. Beginning Java 2 by Ivor Horton: John Wiley & Sons.

COURSE CODE: **CSTE 2202**, COURSE TITLE: **OBJECT ORIENTED PROGRAMMING WITH JAVALAB**

Course Code: **CSTE 2202**, Course Title: **Object Oriented Programming with JavaLab**, 3 Hours/Week, 1.5 Credit, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 2, Term 2
Rationale: This course provides an introduction to object-oriented programming with Java. Pupil will learn how to develop different kinds of applications using java.
Course Objectives: ➢ Experimental verifications of theoretical concepts developed in CSTE 2201. ➢ Implement common I/O operations using Java ➢ Implement event-driven graphical user interfaces (GUI) in Java ➢ Developing Java API and GUI based software.
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Eclipse IDE.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	**Developing Java application** • Algorithms • Data types • Operators	• Write programs using algorithms, different data types, and operators.	Discussion and practice	-Home task -Quiz
2	**Control structure** • If/else • While repetition • For • Switch • Do/while • Break and continue	• Write programs on if/else, while repetition, for, switch, do/while, break, and continue.	First lecture and then Practice	Answer basic questions, quizzes, Homework, exams.
3	**Methods** • Method declaration • Java API packages • Recursion • Method overloading • Method of the applet class	• Write programs on Method declaration, Recursion, method overloading, and method of the applet class	Lecture and discussion with problems.	Quiz 1 (Topic of the 1-3 weeks)
4	**Arrays** • Array declaration • Memory allocation • Array as argument • Sorting arrays • Searching arrays	• Write programs on array declaration, passing array as arguments, sorting arrays, and searching arrays	Lecture and discussion with problems.	Homework
5-6	**Object-based programming** • Time abstract data type • Utility methods • Constructors • Overload constructor • Get and set methods • Friendly class • Data abstraction • Information hiding	• Write programs on abstract data type, Constructors, set and get methods, data abstraction, friendly class, and information hiding	Practice with a real life problem.	Answer basic questions, quizzes, Homework, exams.
7-8	**Object-oriented programming** • Superclass and subclass • Finalize • Inheritance • Polymorphism • Dynamic method building • Final • Abstract superclass and concrete class	• Write programs on superclass and subclass, Finalize, inheritance, polymorphism, Dynamic method building, final, and abstract superclass, and concrete class.	Lecture and discussion with problems.	Quiz 2 (Topic of the 4-8 weeks)

9	**String and Exception handling** • String and characters • Exception handling • Files and stream	• Write programs on String and characters, Exception handling, and Files and Stream.	Lecture and discussion with problems.	Homework
10	**Java API and GUI** • Java API • Utility classes • 2D graphics • GUI • Swing	• Write programs on Java API, Utility classes, 2D graphics, GUI and Swing.	Practice with a real life problem. .	Answer basic questions, Homework
11	**Multithreading and Interface** • Events • Interfaces • Multithreading	• Write programs on events, inheritance, and multithreading	Lecture and discussion with problems.	Answer basic questions, Homework Quiz 3 (Topic of the 9-12 weeks)
12	**Project**	• Submit a project using the concepts of structured programming language.	Evaluate each project.	Presentation, Project showcasing.
13	**Final Lab Exam (Lab and Viva)**			

COURSE CODE: **CSTE 2203**, COURSE TITLE: **DIGITAL ELECTRONICS AND PULSE TECHNIQUE**

Course Code: **CSTE 2203**, Course Title: **Digital Electronics and Pulse Technique**, 2 Hours/Week, 2 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 2, Term 2

Rationale: This course has been designed to develop the students' ability to realize the internal functionality of Digital Electronic circuits and hence the logic functions, analyses and applications.

Course Objectives:

- Make the students familiarize with the internal structure of digital logic circuits
- Analyze and apply debugging and testing techniques to locate and resolve errors and to determine the effectiveness of a logic circuit.
- Effective use of fundamental logic elements including: function generation, application, troubleshooting.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Electronic switch (logic):** Diode logic gates, Transistor switches, Transistor gates, MOS gates;	Explain basic concept on logic gates by using PN junction diode. Use a transistor as a switch, Construct and explain the characteristics of logic circuits by using BJT, MOSFETs	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.

2	**Logic applications:** Logic Families: TTL, ECL, IIL and CMOS logic;Logic families and their sub-families	Compare the properties (temperature, frequency, power, size etc.) of logic families and their sub-families e.g. TTL series 54 & 74LS, ALS, AS, F etc. and CMOS 4000A, 4000B, 4000UB, 54/74C, 54/74HC, 54/74HCT, 54/74AC and 54/74ACT families.	Lecture and discussion with characteristics parameters of logic families individually. Data sheet will be introduced.	Questions about comparison, quizzes, Homework, exams.
3	Propagation delay, product and noise immunity; Open collector and high impedance gates; Electronic circuits for flip-flops, counters and register, memory systems, PLA's;	Explain characteristics and operation time (speed), merits and demerits of Totem pole & open collector output NAND, NOT, Tri-state logic gates. Use FFs the basic building blocks of counter, register, memory. Logic building by PLA.	Lecture and discussion with problems.	Design, development, explanation, quizzes, Homework, exams.
4	**Waveform generator, Oscillator:** LED, LCD, and optically coupled oscillators; Non-linear applications of OP- AMPs; Analog switches	Compare the functions, constructions and applications of LED & LCD. Characteristics, applications of operational amplifier (op- amp), Integrator, differentiator, wave converter, pulse generator, relaxation oscillator, Schmitt trigger by using op-amp.	Lecture and discussion with problems. Circuit design with op-amp.	Exercise with various mathematical problems.
5	**A/D and D/A converter:** Basics of A-D and D-A converters.	Realize the basic functions, constructions, applications of A-D and D-A converters.	Lecture and discussion on types of A/D, D/A converters.	**Class Test 1**(topics of the week's 1-4)
6	A-D and D-A converters with applications; S-H circuits	Explain the functions and applicability of A-D and D-A converters (e.g. flash, counter type, tracking type) and Sample & Hold circuit.	Lecture and discussion with problems, precision of A-D and D-A converters.	Design & construction, quizzes, Homework, exams.
7	**Memory devices:** Memory architecture, mask ROM design, NMOS and CMOS memories, dynamic registers.	Realize and explain the architecture and properties of RAM (static & dynamic), MROM, EPROM, EEPROM. Types &*Applications of ROMs,* Expanding Memory Capacity.	Lecture on design and applications of memory devices. Architecture, properties, word size expansion, memory location expansion.	Design, construction & explanation, quizzes, Homework (word size expansion, memory location expansion), exams.
8	**Waveform shaper:** Linear wave shaping: diode wave shaping techniques, clipping andclampingcircuits, comparator circuits	Design & Explanation of wave shaping circuits, RC. Clippers and clampers circuits and application of all of them.	Lecture on design and applications of the circuits.	Design, construction & explanation, quizzes, Homework, exams.

9	**Transistor switch, Pulse transmission:** Switching circuits; Pulse transformers, pulse transmission.	Transistor as a switch, Transistor at cut-off, Transistor switch in saturation, Transistor switch with inductive/capacitive load. Pulse transformer construction, Character, application. Pulse transmission in Data communication, FSK.	Lecture on design and applications of the circuits.	**Class Test 2**(topics of the week's5-8)
10	**Multivibrator:** Monostable, Bistable and Astable multivibrators, Schmitt trigger by using npn transistors	Design and explanation of multivibrators, Schmitt trigger by npn transistors. Design and explanation ofMonostable,Astablemultivibrators, VCO by555 IC.	Lecture on design and applications of the circuits.	Design, construction & explanation, quizzes, Homework, exams.
11	**Signal generator:** Pulse generation, Blocking oscillators and time-base circuit	Pulse generation (Blocking oscillator), Voltage time-base generator, Current time-base generator.	Lecture on design and applications of the circuits.	Design, construction & explanation.
12	Timing circuits; Simple voltage sweeps, linear current sweeps	Time base waveform generation, sweep circuit using a Transistor, current sweep circuits.	Lecture on design and applications of the circuits.	**Class Test 3**(topics of the week's9-11)
13	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

6. Digital and Pulse Technique by Gyanendra K Mithal, Khanna.
7. High-Speed Pulse and Digital Techniques by Arpad Bama, John Wiley, and Sons.
8. An Introduction to Switching Theory and Digital Electronics by V. K. Jain,Khanna Publishers.
9. Digital Electronics Principles, Devices and Applications by Anil K. Maini.
10. Millman's pulse, Digital & switching waveforms. By Jacob Millman, Herbert Taub.

COURSE CODE: **CSTE 2204**, COURSE TITLE: **DIGITAL ELECTRONICS AND PULSE TECHNIQUE LAB**

Course Code: **CSTE 2204**, Course Title: **Digital Electronics and Pulse Technique Lab**,2 Hours/Week, 1 Credit, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 2, Term 2	
Rationale: This course has been designed to develop the students' ability to realize practically the internal functionality of Digital Electronic Circuits and hence the logic functions, analyses and applications.	
Course Objectives: ➢ Make the students familiarize with the internal structure of digital logic circuits ➢ Analyze and apply debugging and testing techniques to locate and resolve errors and to determine the effectiveness of a logic circuit. ➢ Effective use of fundamental logic elements including: function generation, application, troubleshooting.	
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions, Circuits.	
	Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching earning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	Use a transistor as a switch, Construct and explain the characteristics of logic circuits by using BJT, MOSFETs	**Electronic switch (logic).**	Demonstration with appropriate devices	Answer basic questions, quizzes.
2	Logic Families: TTL, ECL, IIL and CMOS logic;Logic families and their sub-families	**Logic applications.** Compare the properties (temperature, frequency, power, size etc.) of logic families and their sub-families e.g. TTL series 54 & 74LS, ALS, AS, F etc. and CMOS 4000A, 4000B, 4000UB, 54/74C, 54/74HC, 54/74HCT, 54/74AC and 54/74ACT families.	Demonstration with appropriate devices and manual	Do.
3	Design and Construction of a Summing amplifier by using Op-amp**.** Integrator, differentiator, wave converter by using Op-amp. Design and Construction of a Voltage Controlled Oscillator (VCO) by using 555 IC.	**Waveform generator, Oscillator.**	Demonstration with appropriate circuits	Circuit construction and interpretation.
4	D-A converter by using Op-amp**.**	**A/D and D/A converter.**	Do.	Do.
5	Do.			**Class Test 1**(topics of the week's 1-4)
6	Design and Construction of a Schmitt trigger by using NPN transistors./Op-amp.	**Waveform shaper.**	Do.	Circuit construction and interpretation.
7	Design and Construction of Astable/Monostable/Bi-stable multivibrators by using NPN transistors.	**Multivibrator.**	Do.	Do.
8	Design and Construction of Astable/Monostable/Bi-stable multivibrators by using PNP transistors.		Do.	Do.
9	Do.			**Class Test 2**(topics of the week's5-8)
10	Design and Construction of Astable/Monostablemultivibrators by using 555 IC.		Do.	Circuit construction and interpretation.
11	Design and Construction of a Relaxation oscillator by using Op-	**Signal generator.**	Do.	Do.

	amp. /UJT.			
12	Do.			**Class Test 3**(topics of the week's9-12)
13	**Final Lab Exam (Lab and Viva)**			

COURSE CODE: **CSTE 2205**, COURSE TITLE: **SIGNALS AND SYSTEMS**

Course Code: **CSTE 2205**, Course Title: **Signals and Systems**, 2 Hours/Week, 2 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 2, Term 2

Rationale: This course is designed to provide a platform for engineers and designers who would like to work in the most challenging and emerging field of signal processing. The study of signals and systems has opened up a whole new era of solutions to resolve many intricate signal processing problems.

Course Objectives:

- To introduce students the concept and theory of signals and systems needed in computer science and telecommunication engineering fields.
- To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domain.
- To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	**Signal classifications:** Continuous, discrete, stochastic, even-odd signals, mathematical models of ideal signals, Elementary/test signals, power and energy signal.	Recognize, sketch and manipulate basic signals commonly used in engineering applications;	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2.	**Signal classifications:** Response of test signals to LTI systems, representation of signals using impulse function.		Lecture and discussion on different types of signals.	Answer basic questions, quizzes, Homework, exams.
3.	**Systems:** Classification, Properties of system- Linearity, causality, time invariance, memory, stability, and invariability.	Define, state and identify system properties of linearity, time invariance, causality, memory and stability;	Lecture and discussion on different properties of systems.	Answer basic questions, quizzes, Homework, exams.
4.	**Time domain analysis of LTI systems:** Differential equations-system representation, order of the system, solution techniques, zero state	Formulate and solve differential equations describing linear, time invariant (LTI)	Lecture and discussion on differential equation of system response.	Exercise with various mathematical problems.

	and zero input response, system properties;	systems, including both transient and steady-state responses;		
5.	**Time domain analysis of LTI systems:** Impulse response-convolution integral, determination of system properties; state variable- basic concept, state equation and time domain solution.		Lecture and discussion on impulse response of systems.	**Class Test 1**(topics of the week's 1-4)
6.	**Frequency domain analysis of LTI systems:** Fourier series- properties, harmonic representation, system response, frequency response of LTI systems;		Lecture and discussion on how to apply Fourier analysis to periodic and aperiodic signals	Answer basic questions, quizzes, Homework, exams.
7.	**Frequency domain analysis of LTI systems:** Fourier transformation-properties, system transfer function, system response and distortion-less systems.		Lecture and discussion on how to apply Fourier transform techniques to signals and systems.	Answer basic questions, quizzes, Homework exams.
8.	**Applications of time and frequency domain analyses:** Solution of analog electrical and mechanical systems.	Analyze engineering problems by using properties of transform techniques.		Answer basic questions, quizzes, Homework, exams.
9.	**Laplace transformation:** Fourier to Laplace, Properties, inverse transform, solution of system equations, system transfer function.	Define Laplace transforms and manipulate s-domain transfer functions describing LTI systems.	Lecture and discussion on how to analyze LTI systems by transform techniques	**Class Test 2**(topics of the week's 5-8)
10.	**Laplace transformation:** System stability and frequency response and application, Convolution integral and its application, Superposition integral.			Answer basic questions, quizzes, Homework, exams.
11.	**The Z Transformation:** Sampled data system, Definition and properties of Z-transform, ROC,	Apply Z transform techniques to signals and systems	Lecture and discussion on how to analyze LTI systems by transform techniques	Quizzes, Homework, exams.
12.	**The Z Transformation:** Inverse Z-transform, Mapping between Z plane and S plane, Stability, Solution of Difference equations.			**Class Test 3**(topics of the week's 9-12)
13.	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Continuous and Discrete Signals and Systems- S. S. Soliman, M.D. Srinath

2. Signal Processing and Linear Systems- B.P. Lathi
3. Analysis of Linear Systems- David K. Cheng
4. Signals and Systems- Simon Haykin, Barry Van Veen
5. Linear Circuit Analysis:Time Domain, Phasor, and Laplace Transform Approaches-Raymond A. DeCarlo, Pen-Min Lin

COURSE CODE: **CSTE 2207**, COURSE TITLE: **ELECTRONIC COMMUNICATION**

Course Code: **CSTE 2207**, Course Title: **Electronic Communication**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 2, Term 2

Rationale: This course is designed to develop the students' ability to realize on highlighting the concepts and principles pertaining to electronic communication systems. Concepts such as information theory, telephone switching systems, modulation, side band and television signal transmission, radiation and propagation, reception and demodulation which are widely used in the field of analog communication are dealt with in this course.

Course Objectives:

- To introduce the concepts of analog communication systems
- To equip students with various issues related to analogue communication such as modulation, demodulation, transmitters and receiver's performance.
- To explain the concept of switching, signaling and traffic in the telephone networks environment.
- To introduce the basics of picture transmission and reception, analysis and synthesis of composite video signal, receiver and picture tubes and television camera tubes.
- To introduce latest and revolutionary ideas in the field of digital TV, HDTV, and etc.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	**Overview of communication systems**: Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types and transmission capacity.	Understand different blocks in communication system	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2.	**Overview of telecommunication:** history, evolution, convergence of telecommunication and data networks, standards; Noise: Source, characteristics of various types of noise and signal to noise ratio.	Memorize the evolution of telecommunication and how noise affects communication systems using different parameters.	Lecture and discussion on overview of telecommunication	Answer basic questions, quizzes, Homework, exams.
3.	**Information theory**: Measure of information, source encoding, error free communication over a noisy channel, channel capacity of a continuous system and channel	Determine the amount of information per symbol and information rate of a discrete memoryless	Lecture and discussion with mathematical concepts on information theory.	Answer basic questions, quizzes, Homework, exams.

	capacity of a discrete memoryless system.	source		
4.	**Switching system**: Introduction to analog system, digital switching systems-space division switching, blocking probability and multistage switching, time division switching and two-dimensional switching.	Understand the principles and operation of telephone switching systems.	Lecture and discussion on different types of switching systems	Exercise with various mathematical problems.
5.	**Telephone apparatus**: Microphone, speakers, ringer, pulse and tone dialing mechanism, side-tone mechanism, local and central batteries and advanced features. **Telephone Networks**: Subscriber loop systems, switching hierarchy and routing, Transmission plan, Transmission systems, numbering plan, charging plan, signaling techniques, In-channel signaling, Common channel signaling.	Analyze the characteristics of the telephone systems and networks.	Lecture and discussion on mechanism of telephone and how telephone signal propagates in wireless medium.	**Class Test 1**(topics of the week's 1-4)
6.	**Telephone switching systems:** PABX, Centrex, ACDs, call centers, computer integration, PSTN; **Modern telephone services and network**: Internet telephony, facsimile, integrated services digital network, asynchronous transfer mode and intelligent networks. Introduction to ISDN channels & access arrangements, formats, service capabilities and user-network interfaces; Limitations of ISDN, Introduction to B-ISDN.	Develop the concepts and principles about modern telephone systems	Lecture and discussion on how old telephony technology is converted to modern telephony.	Answer basic questions, quizzes, Homework, exams.
7.	**Video transmission and storage**: Introduction, Color representation, Conventional TV transmission systems,	Understand the fundamental concepts of television transmitter and receiver systems, the transmission of video signals	Lecture and discussion on analog television system.	Answer basic questions, quizzes, Homework exams.
8.	**Video transmission and storage**: High definition TV, Digital video, Cable TV networks, Video data compression, Compression standards, Packet video, Hybrid Fiber Coaxial (HFC) Network.	Understand advanced TV technology and describe the operating principles of latest digital TV.	Lecture and discussion on latest trend of TV technology	Answer basic questions, quizzes, Homework, exams.
9.	**Dial-Up MODEMs:** Modem Standards- V.32, V.32bis, V.90, V.92. **Digital Subscriber Line (DSL):** ADSL, HDSL, SDSL, VDSL.		Lecture and discussion on concepts of MODEM and DSL.	**Class Test 2**(topics of the week's 5-8)
10.	**Continuous wave modulation**: Amplitude Modulation (AM), Time Domain Expression and Modulation Index, Frequency Domain (Spectral) Representations, and Transmission	Demonstrate understanding of various analog modulation and demodulation	Lecture and discussion on basics of amplitude modulation.	Answer basic questions, quizzes, Homework, exams.

	Bandwidth for AM. AM for a Single Tone Message, Pharos Diagram of an AM signal, Illustration of the Carrier and Side Band Components.	techniques		
11.	**Continuous wave modulation**: Double Side Band (DSB) Modulation: Time and Frequency Domain Expressions. Square Law Modulators, Balanced Modulators, Ring Modulators. Single Side Band Modulation (SSB), Generation of SSB Using a Side Band Filter, Indirect Generation of SSB. Vestigial Side Band Modulation (VSB). Demodulation for Linear Modulation: Demodulation of AM Signals, Square Laws and Envelops Detectors. Super Heterodyne Receiver for Standard AM Radio, Synchronous Demodulation of AM, DSB and SSB Using Synchronous Detection.	Distinguish between different amplitude modulation schemes with their advantages, disadvantages and applications.	Lecture and discussion on mathematical concepts of amplitude modulation and explain it in time and frequency domain.	Quizzes, Homework, exams.
12.	**Continuous wave modulation**: Angle Modulation: Instantaneous Frequency and Phase, Time Domain Representations for FM and PM, Phasor Diagram for FM and PM, FM and PM Signals for a Single Tone Message, Modulation Index and Phasor Diagrams, Spectral representation of FM and PM for Single Tone Message. Transmission Bandwidth for FM, Carson's rule, Narrow band and Wide Band FM and PM Signals. Generation of FM Using Armstrong Method, Commercial FM Requirements. Demodulation of FM and PM Signals, Limiter Discriminator, Commercial and Stereo FM Radio.	Analyze generation and detection of FM/PM signal.	Lecture and discussion on mathematical concepts of angle modulation and explain it in time and frequency domain.	**Class Test 3**(topics of the week's 9-12)
13.	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Data Communications and Networking by Behrouz A. Forouzan, McGraw-Hill.
2. Principles of Communication Systems by Herbert Taub& Donald L. Schilling, McGraw-Hill
3. Communication System by Simon Haykin,
4. Telecommunications Switching, Traffic and Networks by Flood, John Edward, Prentice Hall, 1995.

COURSE CODE: **CSTE 2208**, COURSE TITLE: **ELECTRONIC COMMUNICATION LAB**

Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 2, Term 2

Rationale: This lab course is designed to give students ability todesign, build, and implement electronic communication related experiment. Through well design experiment, students are able to appreciate the theoretical aspects of electronic communication system.

Course Objectives:

- Provide hands-on experience to the students so that they are able to puttheoretical concepts to practice.
- Understand the concept of analog modulation, analog and digital telephone exchange, and different electronic communication experiment with practical environment.
- Acquire teamwork skills for working effectively in groups.
- Develop technical writing skills important for effective communication.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	To familiar with the operation of different communication equipment.	gain significant experience with communication equipment.	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Answer basic questions about different types of communicati on equipment.
2, 3, 4, 5, 6	**Analog Modulation:** **Using Board:** AM/FM/PM/DSB-SC/SSB-SC transmitter and Receiver	Explain the concept of analog modulation and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are due at the beginning of the lab period. Respected Teacher will be evaluated in lab period.
7, 8	**Telephone:** Analog and digital telephone exchange	Explain the concept of telephone system and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	
9, 10, 11	Acquaint with Simulation program (MATLAB)	Become proficient with computer skills (eg.,MATLAB) for the analysis of circuits.	Through lecture and discussion	
12	Visit different communication related company.			
13	Final Lab Exam (Job, Quiz and Viva)			

COURSE CODE: **CSTE 2209**, COURSE TITLE: **THEORY OF COMPUTATION**

Course Code: **CSTE 2209**, Course Title: **Theory of Computation**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 2, Term 2

Rationale: The course deals with the concept of computability and mathematical models, such as finite automata, grammars and Turing machines, and the relations between these models.

Course Objectives:

- Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
- Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	Formation of Preliminary Concepts Automata, computability, and complexity Mathematical tools Definitions, theorems, and proofs Types of proofs	Give preliminary concepts about computation theory. Give an account of important concepts and definitions for automata and formal languages;	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2	Regular Languages, finite automaton, Examples of finite automata, Designing finite automata,	Understand recursive definitions of regular languages, regular expressions and the use of regular expressions to represent regular languages.	Lecture and discussion about regular expression and its relation with NFA and DFA	Answer basic questions, quizzes, Homework, exams.
3	Equivalence of NFA's and DFA's, The regular operations - Closure under the regular operations	Detailed knowledge and the relationship between regular expressions and finite automata.	Lecture and problem solving on regular expression	Answer basic questions, quizzes, Homework, exams.
4	Regular Expressions. Regular Set, Closure of Regular Expressions, Equivalence with finite automata, Arden's Theorem.	Transform between equivalent deterministic and non-deterministic finite automata and regular expressions;	Lecture and discussion with problems.	Exercise with various mathematical problems.
5	Application of Regular Expressions. Non-regular Languages - The pumping lemma for regular languages.	Get the knowledge about particular regular language's regularity properties.	Lecture and discussion with problems; pumping lemma	**Class Test 1**(topics of the weeks 1-4)
6	**Context-Free Languages:** Formal definition of a context-free grammar - Examples	Apply rigorously formal mathematical methods to prove properties of languages, grammars, and	Lecture and discussion about CFG.	Answer basic questions, quizzes, Homework,

	of context-free grammars. Ambiguity.	automata.		exams.
7	CFG Simplification, Chomsky normal form and Greibach Normal Form (GNF)	Simplifycontext-free grammar and making interconversion between CNF and GNF.	Lecture and discussion on Grammar simplification.	Answer basic questions, quizzes, Homework (word size expansion, memory location expansion), exams.
8	Pushdown Automata, the Formal definition of a pushdown automaton - Examples of pushdown automata, Equivalence with context-free grammars.	transform pushdown automata and context-free grammar.	Lecture and discussion on pushdown automata and its relation with CFG.	Answer basic questions, quizzes, Homework, exams.
9	**Computability Theory:** The Church-Turing Thesis. Turing machine, Nondeterministic Turing machines, Hilbert's problems	design Turing machine and Pushdown automata for a given language.	Lecture and discussion on Turing machine.	**Class Test 2**(topics of the weeks5-8)
10	**Decidability:** Decidable languages, The halting problem–the diagonalization method.	Identify a language is decidable, undecidable or partially decidable.	Lecture and discussion on language decidability.	Answer basic questions, quizzes, Homework, exams.
11	**Complexity Theory:** The Classes P, NP, Examples of problems in these classes. The P versus NPquestion.NP-Completeness, Polynomial time reducibility, The Cook-Levin Theorem.	Understand time and space management of complexity theories. Learn classic results on complexity classes including P and NP.	Lecture and discussion on complexity theory.	Quizzes, Homework, exams.
12	**Examples of NP-Complete Problems:** The vertex cover problem-The Hamiltonian path problem **Examples of NP-Complete Problems:** The subset sum problem. Approximation algorithm, Probabilistic Algorithms.	Learn NP-complete problems and its related problems with application.	Lecture and discussion on NP complete problems.	**Class Test 3**(topics of the weeks9-12)
13	**Applications:** analysis and classification of Biochemical reactions, the complexity of evolved	Understand the application of biochemical reaction in complexity theory.	Lecture and discussion on the application of complexity theory.	Exercise the answering methods in the final exam.

	organisms.			

Recommended Books:

1. Introduction to Automata Theory, Languages and Computation by Hopcroft and Ulman, Addison Wesley.
2. Elements of the Theory of Computation by Lewis and Papadimitriou, Prentice Hall.
3. Compiler design in C by A.J. Holub, Prentice-Hall.
4. Elements of Automata Theory by Jacques Sakarovitch, Cambridge University Press.
5. A Textbook on Automata Theory by P.K. Srimani and S.F.B Nasir, Cambridge University Press.

COURSE CODE: **CSTE 2211**, COURSE TITLE: **ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS**

Course Code: **CSTE 2211**, Course Title: **Electromagnetic Waves and Radiating Systems**, 2 Hours/Week, 2 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 2, Term 2

Rationale: Develop a strong background in electromagnetic theory and understand and use various mathematical tools to solve Maxwell equations in problems of wave propagation and radiation.

Course Objectives:

- Obtain solutions for the one-dimensional wave equations of voltage and current along the line.
- Understand and analyze uniform transmission lines in order to predict and design specified characteristic impedances and propagation constants.
- Calculate load impedance-admittance transformations analytically and with Smith charts.
- Perform single-stub impedance-admittance matching-network calculations.
- Understand and predict plane electromagnetic-wave propagation in free space and dielectrics.
- Predict electromagnetic plane-wave reflection and transmission properties at interfaces between different media.
- Understand electromagnetic radiation from antennas, its application in satellite communications and radar.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Guidedwaves:**Maxwell'sequations;planewavepropagationinisotropicmedia	Derivation of Maxwell equations and wave propagation in conducting and non-conducting media.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations.Topic wise lecture	Answer basic questions, quizzes, Homework, exams.

			delivery.	
2	Reflection;refraction; diffractionandpolarizationof EMwaves;pointingvectorsandpowerflow.	To get idea about the change of electromagnetic field when it passes from one medium to another.	Lecture and discussion of propagation of EM waves in different medium.	Answer basic questions, quizzes, Homework, exams.
3	Wavesbetweenparallel planes,TE,TM,TEMwavesandtheircharacteristics,Attenuationinparallelplaneguides,wave impedances.	Wave propagation between parallel plate. To get concept about TE,TM,TEMwavesandtheircharacteristics.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
4	**Rectangularwaveguides:**TM,TEwavesinrectangularguidesandtheircharacteristics,	Wave propagation in rectangular system and TE, TM characteristics.	Lecture and discussion with problems.	Exercise with various mathematical problems.
5	Wavevelocity,guidewavelength,waveimpedances,fieldconfigurations	Idea of wave velocity and group velocity.	Lecture and discussions.	**Class Test 1**(topics of the week's 1-4)
6	**Transmissionlines:** Transmissionlineequationsandtheirsolution.Transmissionline parameters,characteristicimpedance, propagationconstant,attenuationconstantandphaseconstant,	Understand and analyze uniform transmission lines in order to predict and design specified characteristic impedances and propagation constants.	Lecture,discussions and power point presentation.	Answer basic questions, quizzes, Homework, exams.
7	Waveformdistortion,distortionless transmissionlines,loadingoftransmissionlines,reflectioncoefficientandVSWR.Equivalentcircuitsof transmissionlines,transmissionlinesatradiofrequency,openandshort-circuitedlines,Smithchart, stubmatching.	Calculate load impedance-admittance transformations analytically and with Smith charts.		Answer basic questions, quizzes, Homework (word size expansion, memory

				location expansion), exams.
8	**Potential:**Scalarandvectorpotentials,retardedpotentials,fielddueto acurrentelement, thepowerradiatedandradiationresistanceforfieldduetoadipole,	Understand Retarded potentials and basic of radiation.		Answer basic questions, quizzes, Homework, exams.
9	Thepowerradiatedandradiation resistance,reciprocitytheoremappliedtoantennasgainandapertureofanantenna,radiationintensity, directivityandantennagain.	Understand the basic concepts and characteristics of antennas in the transmit and receive mode.		**Class Test 2**(topics of the week's5-8)
10	**Array:**Twoelementarraysandtheirdirectionalcharacteristics,lineararray analysis,broadsideandend-firearrays,patternmultiplication,binomialarrays,Designofbroadcast arrayforaspecificpattern.	Understand the concepts of array antennas such as analysis and synthesis of radiation patterns.		Answer basic questions, quizzes, Homework, exams.
11	**Antenna:**Basicprinciplesofparabolicreflectors,analysisandpowerpattern, lensantennas,foldeddipole,	Understand and design of parabolic reflector antenna, lens antenna and folded dipole antenna.		Quizzes, Homework, exams.
12	TurnstileandYagiantenna log periodicantenna hornantennas,traveling waveantennas,Cassegrainantenna.	Understand and design broadband antennas such as helixes, spirals, and log periodic antennas, horn etc.		**Class Test 3**(topics of the week's9-12)
13	Review Classes	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Electromagnetic waves and radiating systems by Edward C.Jordan& Keith G. Balmain, Pearson.
2. Elements of Electromagnetics by Matthew N O Sadiku, Oxford University Press.
3. Engineering Electromagnetics byW.H.Hayt& J.A. Buck, McGraw Hill.

COURSE CODE: MATH 2**207**, COURSE TITLE: **COMPLEX VARIABLES, STATISTICS AND PROBABILITY**

Course Code: MATH 2**207**, Course Title: **Complex Variables, Statistics and Probability**,3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 1, Term 2

Rationale: This course is designed to provide an introduction to the theories for functions of a complex variable and also extend and formalize knowledge of the theory of probability and random variables. Provide an introduction to subsequent statistics courses for the information processing.

Course Objectives:

- Begins with the exploration of the algebraic, geometric and topological structures of the complex number field.
- Equipped with the understanding of the fundamental concepts of complex variable theory.
- Analyzing of numerical data using different statistical tools.
- Analyzing complex function and its related problems.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Complex Analysis-Differentiation:** Differentiation of functions of complex variable-Analytic functions- Cauchy-RiemannEquations(cartesianonly)-HarmonicFunction-Orthogonalsystem-velocitypotential.	To get idea about analytic function,Cauchy-Riemann equations and Harmonic function.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2	**Conformalmapping-** Mappingbyw=1/z,w=z2,w=ez,w=z+1/z,w=sinz,w=cosz.BilenearTransformation- fixedpoints-Problemstofindthetransformationwhenthreepointsandtheirimagesaregiven.	Conditions of conformal mapping, general transformations and related problems.	Lecture and discussion about mapping	Answer basic questions, quizzes, Homework, exams.
3	Line integrals-simple problems-Statements of Cauchy's integral theorem,Cauchy'sintegralformula-Formulaforhigherderivatives-Evaluationofintegralsusingtheaboveresults.TaylorseriesandLaurent'sseries(noproof)-simpleproblems.Singularities-Residues-Cauchy'sResiduetheorem(noproof)-problems.Evaluationofrealdefiniteintegrals. $\int_0^{2\pi} f(\sin\theta,\cos\theta)\,d\theta$ $\int_0^{\infty}[f(x)/F(x)]dx$ $\int_0^{\infty}[\sin mx/f(x)]dx$ $\int_0^{\infty}[\cos mx/f(x)]dx$	Solution of complex integrations using Cauchy's theorem and Cauchy's integral formula. Cauchy's residue	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.

		theorem, Taylor and Laurent series problem.		
4	Meaning&Scope,VariablesandAttributes,CollectionandpresentationofStatisticaldata, FrequencyDistributionandGraphicalRepresentation.**AnalysisofStatisticalData:**Location,Dispersion andtheirmeasures.Skewness,Kurtosis,andtheirmeasures.MomentandCumulants	To understand the analysis of statistical data.	Lecture and discussion with problems.	Exercise with various mathematical problems.
5	**Correlation theory:**Linearcorrelation.Measuresofcorrelationanditssignificance.**Regressionandcurvefitting:** Linearandnonlinearregression.Methodsofleastsquares.Curvefitting.	To get idea about the interaction of two variables and data fitting.	Lecture and discussionwith problems.	**Class Test 1**(topics of the week's 1-4)
6	Conceptofprobability,SampleSpace,Events.UnionandIntersectionofEvents.TheprobabilityofEvents. Lawsofprobability.ConditionalProbabilities.Bose-EinsteinStatistics.Baysprobability	Conception about probability.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
7	Basicconcepts.DiscreteandcontinuousRandomvariables. Densityanddistributionfunctions.MathematicalExpectationandvariance.ConditionalExpectationand conditionalvariance.Expectedvaluesandvariancesofthedensitydistributions.MomentsandCumulant generatingfunctions.Characteristicfunction.StudyofBinomial,Poisson,Normal.Geometric,Negative Binomial,Hypergeometric,Multinomial,uniform,exponential,Lognormal,Logarithmic,Betaand Gamma,CauchyandWeibulldistributions	To get idea about random variable and different kinds of distribution.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework (word size expansion, memory location expansion), exams.
8	StudyofBinomial,Poisson,Normal.Geometric,Negative Binomial,Hypergeometric,Multinomial,uniform,exponential,Lognormal,Logarithmic,Betaand Gamma,CauchyandWeibulldistributions	Continue of different distributions		
9	Chebyshev'sInequality,Markovchain (discreteandcontinuous).Queuingtheory– Birthdeathprocessinqueuing.Examplesfromcomputer science.Queuingmodels.(Elementaryconcepts).**SamplingDistributing:**Fisher'sLemma.Studyofχ^2 Distribution,T-Distribution,andF-Distribution,Properties,Uses&Applications.Distributionofsample correlationcoefficientinthenullcase.SamplingDistributionoftheMediansandRange	Markov chain, Queuing theory and properties of χ^2, T and F distribution.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
10	BasicConcepts.Consistentestimates.Unbiasedestimates.Meanandvarianceof estimates.IdeasofEfficiency.TheprincipleofMaximumLikelihood.Illustra	Basic concepts of consistent	Lecture and discussion with	**Class Test 2**(topics

	tionfromBinomial,Poisson &Normal Distributions.	and unbiased estimates.	problems.	of the week's5-8)
11	Statistical decisions; Statistical hypothesis; Critical region, Best criticalregion;Twotypesoferrors;theprocedureofTestofhypothesis;Mostpowerfultest,standard Errors.	Understand the various concepts related to the testing of hypothesis.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
12	**TestofSignificance:**Testofsinglemean&singlevariance.Comparisonoftwo sampleMeans, proportions,andVariances.Bartlett'stestforhomogeneityofvariances.Testforcorrelationand Regressioncoefficients.	Test of single mean, variance, correlation and regression coefficient.	Lecture and discussion with problems.	Quizzes, Homework, exams.
13	An exact test for 2*2 tables. Test for r*c tables. Three-Way contingency tables. Large Sample Test of Significance. Nonparametric Test, One Sample, and two Sample Sign Test. Run Test and Rank Sum Test.	Contingency tables and one sample and two sample sign tests.	Lecture and discussion with problems.	**Class Test 3**(topics of the week's9-12)

Recommended Books:

1. ProbabilitywithStatisticalApplicationsbyMosteller,RourkeandThomas,Addison-Wesley
2. ProbabilitybyS.Lipschutz,McGraw-Hill,
3. ElementsofProbabilityandStatisticsbyF.L.Wolf,McGraw-Hill.

COURSE CODE: **CSTE 2226**, COURSE TITLE: **VIVA VOCE**

COURSE CODE: **CSTE 2226**, COURSE TITLE: **VIVA VOCE**, 0 Hours/Week, 1 Credits, Total Marks 100, Year 2, Term 2	
Rationale: This course has been designed to develop the students' ability to realize practical situation of job environment.	
Course Objectives: ➢ Prepare the students to face interview both at the academic and the industrial sector	
COURSE CONTENTS	**OUTCOME** (Student should be able to)
VIVA VOCE (Viva based on major/minor courses of Year-2)	Evaluate overall technical knowledge and industry readiness. Able to go under a virtual environment of technical interview. Able to analyze various application of Computer Science & Telecommunication Engineering in real-life problem solving.

Year-3 Term-1

Sl.#	Course Code	Course Title	Credit	Credit Hours	Page No.
1	CSTE 3101	Data Communication	3	3	
2	CSTE 3102	Data Communication Lab	1	2	
3	CSTE 3103	Digital Signal Processing	3	3	
4	CSTE 3104	Digital Signal Processing Lab	1	2	
5	CSTE 3105	Database Management System	3	3	
6	CSTE 3106	Database Management System Lab	1.5	3	
7	CSTE 3107	Operating Systems and System Programming	3	3	
8	CSTE 3108	Operating Systems and System Programming Lab	1.5	3	
9	CSTE 3109	Microprocessor, Microcontroller and Interfacing	3	3	
10	CSTE 3110	Microprocessor, Microcontroller and Interfacing Lab	1	2	
		Total	**21**	**27**	

COURSE CODE: **CSTE 3101**, COURSE TITLE: **DATA COMMUNICATION**

Course Code: **CSTE 3101**, Course Title: **Data Communication**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 3, Term 1

Rationale: After understanding electronic communication systems, it isimportant to proceed further on to the concepts related to Data Communication. Thefield of communication is the fastest growing technology and undoubtedly heading towards to a runaway growthin future which makes it important to know how data transfer takes place from one system to another, throughdifferent channels and computer networks. This course is the cornerstone of modern telecommunications

Course Objectives:

- Convey the essentials of data communication and networking including a study of the Open Systems Interconnection (OSI), TCP/IP and Internet models.
- Learn about theoretical bounds on the rates of digital communication system and represent a digital signal usingseveral modulation methods.
- Understanding the concepts of various pulse modulation techniques and methods of generating and decoding, in each of the pulse modulationsystems, along with error detection and correction methods.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1.	**Introduction**: Data communication components, Data representations, Data flow types, Network topologies, Protocols, Standards, **Network Model:** Basics of OSI and TCP/IP model, Functions of different layers of OSI and TCP/IP model.	Understand the fundamental concepts of data communications and networking	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2.	**Data and Signals:** Analog and digital data, Analog and digital signals, Nyquist theorem, Shannon capacity, Performance measurement of data network, Bandwidth-delay product,	Explain how data is converted to signal.	Lecture and discussion on the concepts of analog/digital data and signal.	Answer basic questions, quizzes, Homework, exams.
3.	**Digital Transmission:** Digital to digital conversion- Line coding- NRZ, RZ, Manchester, Differential Manchester, AMI, Pseudoternary, 2B/1Q, 8B/6T, 4D-PAM5, MLT-3, Block coding- 4B/5B, 8B/10B, Scrambling, B8ZS, HDB-3.	Describe and determine the performance of line codes and methods to mitigate inter symbol interference.	Lecture and discussion on the performance of the line coding.	Answer basic questions, quizzes, Homework, exams.
4.	**Pulse modulation**: Sampling– sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling; pulse amplitude modulation (PAM), PWM, PPM;	Analyze and draw graphs to illustrate the different types of pulse carrier modulation techniques:	Lecture and discussion on different types of pulse modulation.	Exercise with various mathematical problems.

5.	**PCM:** Sampling, aliasing, anti-aliasing filter, linear and non-linear quantization, quantization noise, companding, DPCM, DM, multiplexing, Digital hierarchy: T1/E1 system; simplex, half-duplex and full-duplex communication.		Lecture and discussion on the different steps of PCM, DPCM and DM system.	**Class Test 1**(topics of the week's 1-4)
6.	**Modulation Technique:** Digital to analog conversion- ASK, FSK, Various type of PSK such as BPSK. QPSK, 8-PSK, 16-PSK etc.	Understand the generation, detection,constellation diagram, spectrum, bandwidth efficiency,and probability of error analysis of different band pass modulation techniques.	Lecture and discussion on the different types of digital to analog modulation.	Answer basic questions, quizzes, Homework, exams.
7.	**Modulation Technique:** Digital to analog conversion- Various type of QAM such as 8-QAM, 16-QAM etc., GMSK, Probability of Error, Bit error rate performance of all		Lecture and discussion on the different types of digital to analog modulation in terms of bit error rate performance	Answer basic questions, quizzes, Homework exams.
8.	**Bandwidth Utilization-Multiplexing and Spreading:** FDM, WDM, TDM- Synchronous TDM, Statistical TDM, Interleaving, Spread spectrum- FHSS, DSSS.	Understand working of spread spectrum communication system and analyze its performance.	Lecture and discussion on the types of multiplexing and spread spectrum technique.	Answer basic questions, quizzes, Homework, exams.
9.	**Switching:** Circuit switched network, packet switched network, Datagram network, Virtual circuit network.	Understand various types of switching, multiplexing and access techniques.	Lecture and discussion on different types of switching technique.	**Class Test 2**(topics of the week's 5-8)
10.	**Introduction to Coding Theory**: Single bit error, Burst error, Huffman code, Error detecting and correcting Codes; Block coding- Hamming distance, Linear block codes.	Describe and determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel.	Lecture and discussion on the performance of different error control coding technique.	Answer basic questions, quizzes, Homework, exams.
11.	**Introduction to Coding Theory**: Simple parity check code, Hamming codes, Cyclic codes-Cyclic redundancy check (CRC), Checksum, Convolution codes.		Lecture and discussion on the performance of different error control coding technique.	Quizzes, Homework, exams.
12.	**Multiple Access Technique:** FDMA, TDMA, CDMA, SDMA, OFDM, OFDMA, SCFDMA.		Lecture and discussion on the advantage, disadvantage and applications of	**Class Test 3**(topics of the week's 9-12)

			different types of multiple access technique.	
13.	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Data Communications and Networking by Behrouz A. Forouzan, McGraw-Hill.
2. Principles of Communication Systems by Herbert Taub& Donald L. Schilling, McGraw-Hill
3. Modern Digital and Analog Communication Systems by B.P. Lathi and Zhi Ding, Oxford University Press.

COURSE CODE: **CSTE 3102**, COURSE TITLE: **DATA COMMUNICATION LAB**

Course Code: **CSTE 3102**, Course Title: **Data Communication Lab**, 2 Hours/Week, 1 Credits, Total Marks:100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 3, Term 1				
Rationale: This lab course is designed to give students ability todesign, build, and implement data communication related experiment. Through well design experiment, students are able to appreciate the theoretical aspects of data communication system.				
Course Objectives: ➢ Provide hands-on experience to the students so that they are able to puttheoretical concepts to practice. ➢ Understand the concept of analog to digital conversion, digital transmission, digital modulation, error correction and detection method, signal multiplexing, and different types of spread spectrum technique with practical environment. ➢ Acquire teamwork skills for working effectively in groups. ➢ Develop technical writing skills important for effective communication.				
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1.	To familiar with the operation of different data communication equipment.	gain significant experience with data communication equipment.	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Answer basic questions about different types of data communication equipment.
2, 3	**Digital Transmission:** **Line Coding** **Using Board** Unipolar-NRZ/ Bipolar-NRZ/ Unipolar-RZ/ Bipolar-RZ/ Alternate Mark Inversion/ Manchester signal encodes and decode.	Explain the concept of line coding and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are

Course Code: **CSTE 3103**, Course Title: **Digital Signal Processing,**3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 3, Term 1

4, 5	**Digital Modulation:** **Using Board:** ASK/FSK/BPSK/QPSK/QAM transmitter and Receiver	Explain the concept of digital modulation and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	due at the beginning of the lab period. Respected Teacher will be evaluated in lab period.
6, 7	**Analog to Digital conversion:** **Using Board:** PAM/PWM/PPM/PCM modulator-demodulator	Explain the concept of analog to digital conversion and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	
8' 9	**Error Detection-Correction:** Hamming code/Convolutional Code transmitter-receiver.	Explain the concept of error detection-correction and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	
10	**Multiplexing:** FDM/TDM/CDM	Explain the concept of multiplexing and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	
11	**Spread Spectrum:** FHSS/DSSS	Explain the concept of spread spectrum and apply them tolaboratory measurements.	Through lecture, laboratory, and out-of-class assignments.	
12	Acquaint with Simulation program (MATLAB)	Become proficient with computer skills (eg.,MATLAB) for the analysis of circuits.	Through lecture and discussion	
13	Final Lab Exam (Job, Quiz and Viva)			

Rationale: The course deals with the concept of digital signal, systems and its applications, and also about the different operations on digital signals and digital filter design.

Course Objectives:

- To develop the knowledge on signals used in digital signal processing.
- To introduce signals, systems, time and frequency domain concepts and the associated mathematical tools those are fundamental to all DSP techniques.
- To provide a thorough understanding and working knowledge of design, implementation, analysis and comparison of digital filters for processing of discrete time signals.
- To study various sampling techniques and different types of filters and will also understand basic principles of Estimation Theory.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Discrete time signals & systems:** Discrete time signals, Discrete time systems, Linearity, causality, stability, static/dynamic, Time Invariance/Time variance, classification of discrete time system.	Impart the knowledge about continuous and discrete time signal Convert DT signals between different notation representations and determine the class of signal whether a signal is linear, time-invariant or Causal.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2	**Discrete time signals & systems:** Linear convolution, Circular convolution Cross Correlation, Autocorrelation. Linear constant coefficient difference equations	Apply to find impulse response of DT system, convolution/system response.	Lecture and problem discussion about linear convolution and correlation	Answer basic questions, quizzes, Homework, exams.
3	**Discrete time signals & systems:** sampling theorem & sampling process. Reconstruction of sampling data, convolution.	Understand origins of Nyquist sampling rate and sinc reconstruction formula for bandlimited signals.	Lecture and discussion on signal conversion	Answer basic questions, quizzes, Homework, exams.
4	**Discrete time signals & systems:** Frequency domain representation of discrete time signals and systems, Fourier transform of discrete time signals, properties of discrete time, Fourier transform.	Understand frequency domain and time domain representation of signal and Fourier transform of the digital signal.	Lecture and discussion	Exercise with various mathematical problems.
5	**The Z-transform:** Definition, properties of the region of convergence for the Z-transform, Z-	Determine the Z-transform of DT signal and specify ROC, using Z-transform properties to	Lecture and problem solving on z-transform	**Class Test 1**(topics of the week's 1-4)

	transform properties.	solve such problems efficiently.		
6	**The Z-transform:** Inverse Z-transform using contour integration, complex convolution theorem, Parseval's, unilateral Z-transform, stability interpretation using Jury's array.	Invert Z-transform by power-series expansion, table-lookup, and/or PFE.	Lecture and discussion with problems about different invert z-transform methods.	Answer basic questions, quizzes, Homework, exams.
7	**Transform analysis of LTI system & structures for discrete-time system:** Frequency response of LTI system, relationship between magnitude & phase, all pass systems, minimum phase system. Linear system with generalized linear phase.	Identify LTI system properties from system function / pole-zero plot (transient/steady-state response, causality, stability).	Lecture and discussion about Linear Time Invariant system.	Answer basic questions, quizzes, Homework (word size expansion, memory location expansion), exams.
8	**Transform analysis of LTI system & structures for discrete-time system:** Block diagram representation & signal flow graph representation of Linear constant. Coefficient difference equations, Basic structures for IIR systems, transposed forms, basic network structures for FIR systems, lattice structures.	Understand different types of IIR filter structures and their implementations (such as direct form I, direct form II, cascade of second order systems, parallel form implementations, etc.).	Lecture and discussion and graphical representation of different LTI system.	Answer basic questions, quizzes, Homework, exams.
9	**Filter design Techniques:** Design of discrete time IIR filters from continuous time filters, frequency transformations of low pass IIR filters.	Design IIR filters by bilinear transformation of analog filters,	Lecture and discussion with problems. IIR filter	**Class Test 2**(topics of the weeks5-8)
10	**Filter design Techniques:** Design of FIR filters by windowing, FIR filter design by Kaiser window method. Frequency sampling method.	Design FIR filters using window method or Hamming method.	Lecture and discussion with problems. FIR filter with windowing technique.	Answer basic questions, quizzes, Homework, exams.
11	**Discrete Fourier Transform:** Discrete Fourier series, properties of discrete Fourier series, Discrete Fourier transform, properties of DFT, circular convolution	Find Discrete Fourier transform of digital signals.	Lecture and discussion with problems.	Quizzes, Homework, exams.

	using discrete Fourier transform.			
12	**Discrete Fourier Transforms:** Decimation in time FFT algorithm, decimation in frequency FFT, FFT of long sequences using overlap add and overlap save method.	Find the digital signals for difference sequence of input signals.	Lecture and discussion, with problems.	Class Test 3 (Topics of the week-12)
13	**Digital signal processor architectures:** Evolution of DSP architecture, different architectures, important architectural elements of a DSP, instruction set and special instructions, Introduction to interfacing DSPs.	design a real-time signal processing algorithm using the latest fixed-point processor.	Lecture and discussion on DSP architectures.	Exercise the answering methods in final exam.

Course Code: **CSTE 3104**, Course Title: **Digital Signal Processing Lab**, 3 Hours/Week, 1.5 Credit, Total Marks: 100 (Class Attendance=10, Lab Performance=30, Final Viva-voce=20, Year-Term=40)

Recommended Books:

1. Digital Signal Processing by J.G. Proakis, Prentice-Hall.
2. Understanding Digital Signal Processing by R. G. Lyon, Orling Kindersley.
3. Digital Signal Processing by Defatta, Wiley.

COURSE CODE: **CSTE 3104**, COURSE TITLE: **DIGITAL SIGNAL PROCESSING LAB**

Rationale: The course deals with the concept of digital signal, systems and its applications, and also about the different operations on digital signals and digital filter design.

Course Objectives:

- To develop the knowledge on signals used in digital signal processing.
- To introduce signals, systems, time and frequency domain concepts and the associated mathematical tools those are fundamental to all DSP techniques.
- To provide a thorough understanding and working knowledge of design, implementation, analysis and comparison of digital filters for processing of discrete time signals.
- To study various sampling techniques and different types of filters and will also understand basic principles of Estimation Theory.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, MATLAB, DSP Kit.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	Write a program in MATLAB to generate the following waveforms (DT and CT signal)- i) Unit Impulse sequence/signal ii) Unit step sequence/signal iii) Unit Ramp sequence/signal iv) Sinusoidal sequence/signal v) Exponential sequence/signal vi) Random sequence/signal Write a program in MATLAB to study the basic operations on the Discrete – time signals. (Operation on dependent variable (amplitude manipulation) and Operation on independent variable (time manipulation)).	Generate the basic DT and CT signal and perform basic operations on DT signals.	Lecture and discussion on digital signals	-Home task -Quiz
3	Write a program in MATLAB to check for linearity, Causality and stability of various systems. Write a MATLAB Script to perform discrete convolution (Linear and Circular) for the given two sequences and also prove by manual calculation.	Check digital system properties and their application.	Lecture and problem discussion about linear convolution and digital systems	-Home task -Quiz
4-6	Write a MATLAB program to (a) find Z and inverse Z transform and pole zero plot of Z-transfer function. (b) Solve the difference equation and find the system response using Z transform. Write a MATLAB Script to perform sampling rate conversion for any given arbitrary sequence (D.T) or signal (C.T) by interpolation, decimation, up-sampling, down-sampling and resampling (i.e. fractional value).	Find pole-zero and Z-transform and different sampling operation on digital signals.	Lecture and problem solving on z-transform and sampling.	Quiz 1 (Topic of the 1-3 weeks)
7-8	Write a MATLAB program to perform the	Implement	Lecture and	Homework

	Discrete Fourier Transform (DFT) & inverse Discrete Fourier Transform for the given sequences. Write a MATLAB Script to compute Discrete Fourier Transform and Inverse Discrete Fourier Transform of the given sequence using FFT algorithms (DIT-FFT & DIF-FFT).	Fourier transform and inverse Fourier transform of digital signal	problem solving.	
9-10	Write a MATLAB Script to design a low pass FIR filter using Window Method for the given specifications Write a MATLAB Script to design Butterworth low pass filters using Bilinear Transformation Impulse Invariant Transformation	Design FIR and IIR filer using MATLAB.	Lecture and problem solving on Filter designing.	Quiz 2 (Topic of the 4-8 weeks)
11	Write a MATLAB program to find the response of type I, type II, type III, type IV FIR filter for a given sequence.	Check response of different FIR filter for input sequence.	Practice.	Homework.
12	Implement at least one of the following operations using DSP Processor i) Linear and Circular convolution. ii) Low pass filter an audio signal input to DSK with FIR filter. iii) Low pass filter an audio signal input to DSK with IIR filter. iv) To generate sine wave using lookup table with table values generated within the program.	Understand the application of DSP processor for different DSP operations.	Discussion and application of GSP processor.	Quiz 3 (Topic of the 4-11 weeks)
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 3105**, COURSE TITLE: **DATABASE MANAGEMENT SYSTEM**

Course Code: **CSTE 3105**, Course Title: **Database Management System**,3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 3, Term 1

Rationale: This course focuses on the fundamentals of relational database management system and also provide the background to design, implement, and use database management systems.

Course Objectives:

- List and explain the fundamental concepts of a relational database system.
- Analyze database requirements and determine the entities involved in the system and their relationship to one another.
- Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams.
- Manipulate a database using SQL.
- Formulate, using relational algebra, solutions to a broad range of query problems.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Understanding the DBMS Concepts such as: Integrity, security, authentication, transaction, concurrency, Recovery, distributed database, data mining and warehousing.
- Real world database design.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
14.	Drawback of general file processing system, data processing through COBOL, Basic concepts of the database system, Architecture of a Database System, Data structures and Corresponding Operators. The Hierarchical Approach to DBMS: Architecture to IMS, IMS data structure, External Level to IMS, IMS, Data manipulation, defining PCB, DL/1, Operations, Construction SSA and SSA command codes, The Network Approach to DBMS: Architecture to DBTG Systems, DBTG data structures, Hierarchical and Network Set constructs, Singular Sets, Membership Classes and set selections.	**Basic of Database Management System** Understand what a database is, about different types of databases, and why they are valuable assets for decision making. Explain the basic terminology of database. Learn data models, basic data-modeling building blocks. Different types of data model's business rules are and how they affect database design. Identify different types of database users. Explain the roles of database administrator. Use IMS database. Differentiate the IMS DBMS approach and capabilities from traditional master files. Describe hierarchical data structures, database records and the goals for accessing them through DL/I	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
15.	Entities and Entity Sets, Relationships and	**Entity- Relationship Model** Learn relational model's basic	Lecture and discussion with some practical	Exercise with various problems.

	Relationship Sets, attributes, mapping constraints, keys, entity relationship diagrams, Reducing E-R diagrams to Tables.	components such as: entities, attributes, and relationships among entities. Know how entities and their attributes are organized into tables. Learn about the various types of keys used in relational databases.	scenario.	
16.	Generalization, Aggregation, Design of an E-R Database Scheme.	Understand how to interpret the modeling symbols for the most popular ER modeling tools. Explain some advance topic specialization, generalization and aggregation.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
17.	Structure of Relational Databases, the relational Algebra, The Tuple Relational Calculus, the domain Relational Calculus, Modifying the database, Views.	**Relational Model** Explain the basic operation of relational algebra. Write queries in relational algebra and tuple relational calculus.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
18.	SQL, Query-by Example, QUEL, Summary.	**Relational Commercial Languages** Understand the basic operations of SQL. Perform join operations in SQL. Impose different types of constraints. Understand some string operations. Write subquery. Crate function, procedure. Understand how to use SQL for data administration (indexes, views, and roles).	Lecture and discussion with problems.	**Class Test 1**(topics of the week's 1-4)
19.	**Integrity Constraints:** Domain Constraints, Referential Integrity, Functional Dependencies, Assertions, and Triggers. Relational Database Design: Pitfalls in Relational Database Design,	Theoretical underpinnings of the relational database, including concepts like functional dependence, entity integrity, and relational integrity. Understand dependencies and pitfall in relational database.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
20.	Normalization using Functional Dependencies. Normalization using	Understand what normalization is and what role it plays in the database design process. Understand how normal forms	Lecture and discussion with some practical scenario.	Answer basic questions, quizzes, Homework, exams.

	Multi-valued Dependencies, Normalization using Join Dependencies, Domain – Key Normal Form, Alternative Approaches to Database design.	can be transformed from lower normal forms to higher normal forms.		
21.	Basic Concepts, Indexing, B+ Tree Index Files, B- Index Files, Static Hash Functions, Comparison of Indexing and Hashing Index Definition in SQL, Multiple-Key Access.	**Indexing and Hashing** Understand the basic concept of indexing and hashing. Explain the types of indices. Explain the types of hashing. Understand the concept of B and B+ tree indices.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
22.	Query Interpretation, Equivalence of Expressions, Estimation of Query Processing Cost, Estimation of Cost of Access using Indices, Join Strategies, Join Strategies for Parallel Processors, Structure of a Query Optimizer.	**Query Processing:** Understand the query optimization. Explain query processing cost.	Lecture and discussion with problems.	**Class Test 2**(topics of the weeks5-8)
23.	Failure Classification, the storage Hierarchy, Transaction Model, Log Based Recovery, Buffer Management, Checkpoints, Shadow Paging, failure With Loss of non-volatile Storage, Stable Storage Implementation.	**Crash Recovery:** Understand the failure classification. Implement log based recovery. Understand different types of recovery strategies.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
24.	Schedules, Testing of Serialization, Lock – based Protocols, Time Stamp Based Protocols, Validation Techniques, Multiple Granularity, Multi-version Schemes, Insert and Delete Operations.	**Concurrency Control:** Understand the basic concept of transaction and properties of transaction. Understand concurrent execution of transaction.	Lecture and discussion with problems.	Quizzes, Homework, exams.
25.	Centralized Systems, Client/Server Systems, Parallel systems, Distributed data storage, Network transparency, Distributed query	**Database System Architectures and Distributed Databases:** Explain centralized system, client-server system, parallel system, and distributed query processing.	Lecture on design and applications of the circuits.	**Class Test 3**(topics of the weeks9-12)

	processing, Distributed transaction model, Commit Protocols, Concurrency controls, Deadlock handling, Multidatabase Systems.	Understand deadlock. Explain deadlock detection, prevention and recovery.		
26.	Decision-Support Systems, Data Warehousing, Data Mining, Classification, Association Rules, Other Types of Associations, Clustering and Other Forms of Data Mining.	**Data Warehousing and Mining** Understand the basic concept of data mining and warehousing. Explain the classification and association rules.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Data base system Concepts, A. Silberschatz, H.F.Korth, 4th Edition, Mcgraw-Hill
2. Principles of Database Systems, Jeffrey D. Ullman, 2nd Edition, Galgotia Publishing.
3. An Introduction To Database Systems, C.J.Date, 7th Edition, Pearson Education.
4. Database Systems –Design, Implementation & Management 4th Edition, By Rob. Coronel, Thomson CourseTechnology

COURSE CODE: **CSTE 3106**, COURSE TITLE: **DATABASE MANAGEMENT SYSTEM LAB**

Course Code: **CSTE 3106**, Course Title: **Database Management System Lab**, 3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 3, Term 1

Rationale: This course focuses on the transformation of business requirements into an operational database.

Course Objectives:

- Analyze database requirements and determine the entities involved in the system and their relationship to one another.
- Manipulate a database using SQL.
- Formulate, using relational algebra, solutions to a broad range of query problems.
- Implement Integrity, security, authentication, transaction, concurrency, Recovery.
- Real world database implementation.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**		**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1-2	**Relational Commercial Languages:** Introduction to SQL, Relational Database Management System. Writing Basic SQL statements, Capabilities of SQL SELECT Statements, Restricting	Create SQL INSERT, UPDATE and DELETE statements to make changes to data Create SQL SELECT statements that retrieve any required data Process data with row and aggregate functions	Discussion and practice	Answer basic questions, quizzes, Homework, exams.

	and sorting data. Single-Row-Functions, Displaying Data from multiple tables, aggregating data using group functions.			
3-4	Sub queries, Multiple Column Sub queries, Producing Readable output with SQL *Plus. Manipulating Data, Creating and Managing Tables including constraints.	Manipulate data to modify and summaries results for reporting	Discussion and practice.	Answer basic questions, quizzes, Homework, exams. Quiz 1 (Topic of the 1-2 weeks)
5-6	Other Database Objects, Controlling User Access. SQL Workshop.	Set privilege of using data.	Lecture and discussion with problems.	Exercise with problems.
7-8	**Oracle PL/SQL** Oracle: Object Relational Database Management System, SQL statements, about PL/SQL and its environments. Declaring Variables, writing Executable Statements.	Create programmed solutions using the PL/SQL procedural language.	Discussion and practice	Answer basic questions, quizzes, Homework, exams.
9-10	Interacting with the Oracle Server, Writing Control Structures. Working with Composite Data types. Writing Explicit Cursors, Advanced Explicit Cursors Concepts.	Understand Conditional selection statements, loop statements and sequential control statements. Create cursors.	Lecture, discussion with problems and practice.	Answer basic questions, quizzes, Homework, exams. Quiz 2 (Topic of the 3-8 weeks)
11-12	Create view, procedures and functions. Handling Exceptions.	Apply views to break down problems and enhance security Write procedures and functions. Handle exception.	Discussion and practice	Answer basic questions, quizzes, Homework, exams. Quiz 3 (Topic of the 9-10 weeks)
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 3107**, COURSE TITLE: **OPERATING SYSTEM & SYSTEM PROGRAMMING**

Course Code: **CSTE 3107**, Course Title: **Operating System & System Programming,** 3 Hours/Week,

3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 3, Term 1

Rationale: This course has been designed to develop the students' ability to realize the Operating system and its functionalities.

Course Objectives:

- Identify and describe functions and facilities of operating systems and fundamental operating system abstractions.
- Select and justify recommending an operating system for a specified application and system configuration.
- Evaluate the design and performance of algorithms used in major components of operating systems, such as scheduler, memory manager, concurrency control manager and mass-storage manager, I/O manager.
- Investigate operating system administrative functions based on a commonly available operating system.
- Design and develop system program to implement operating system functions using system service calls.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, Slides, PDF books, e-Tutorials, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
27.	Introduction to operating system, operating system structures, services, user interface, and system calls.	Identify many types of computing environments, OS services, structures and major components. Differentiate between user level and system level functions of OS. Explain the various ways of Structuring an operating system. Explore several open- source operating systems.	Lecture and discussion with some basic questions on the role of operating system in computer system. Demonstrate various OS structures with real life examples.	Answer basic questions using practical examples on operating systems from the user viewpoint.
28.	Process scheduling, operations on processes, IPC, Threading, Scheduling criteria, scheduling algorithms.	Describe various features of processes, including scheduling, creation and termination, and communication. Explain different process scheduling algorithms and their pros and cons. Differentiate between the notion of a process and thread and describe various types of multithreading models. Evaluate the performance of various scheduling algorithms.	Lecture and discussion. Provide sample problems and engage students while making solutions. Provide exercise problems as assignment. Arrange quizzes. Conduct lab class session on processes.	1) Solve given exercise problems and submit assignment. 2) Participate in the quiz 3) Implementing process scheduling algorithms by writing computer programs

3	Process coordination, synchronization, critical section problem, semaphores.	Introduce the critical- section problem, whose solutions can be used to ensure the consistency of shared data Present both software and hardware solutions of the critical-section problem Examine several classical process-Synchronization problems Explore several tools that are used to solve process synchronization problems	Lecture and discussion with examples on the topic. Provide exercise problems as assignment. Conduct lab class session on processes.	Solve given exercise problems and submit assignment.
5	Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, avoidance and detection**.**	Identify deadlock situation by checking conditions Select a deadlock handling method from a number of different methods for a specific scenario. Identify safe state and apply deadlock avoidance algorithm for sample data set.	Lecture and discussion with examples on the topic Provide exercise problems	Answer basic questions on the topic Solve exercise Do lab tasks and submit lab report on the topic
6	Memory management strategy, swapping, paging, segmentation.	Identify various ways of organizing memory hardware Explain memory-management techniques, including paging and segmentation	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz
7	Virtual memory management, demand paging and page replacement.	Describe benefits of a virtual memory system Explain the concepts of demand paging, page- replacement algorithms, and allocation of page frames Examine the relationship between shared memory and memory-mapped files. Explore how kernel memory is managed.	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz
8	File systems, access methods, file system mounting.	Explain the function of file systems Describe the interfaces to file systems Discuss file-system design tradeoffs, including access methods, file sharing, file locking, and directory structures Explore file-system protection	Lecture and discussion with examples on the topic Conduct lab session on the topic	Answer basic questions on the topic Discuss among them on the topic Submit lab report on the topic
9	Disk structure, Disk scheduling, RAID structure.	Describe the physical structure of secondary storage devices and its effects on the uses of the devices Explain the performance characteristics of mass- storage devices Evaluate disk scheduling algorithms	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz

		Discuss operating- system services provided for mass storage, including RAID		
11	I/O System, I/O hardware, application I/O Interface, Transforming I/O requests to Hardware Operations.	Explore the structure of an operating system's I/O subsystem Discuss the principles of I/O hardware and its complexity Explain the performance aspects of I/O hardware and software	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz
12	System Security, System and Network Threats, Cryptography as a security tool, user authentication.	Explore the structure of an operating system's I/O subsystem Discuss the principles of I/O hardware and its complexity Explain the performance aspects of I/O hardware and software	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz
13	System Security, System and Network Threats, Cryptography as a security tool, user authentication.	Discuss the goals and principles of protection and security threats and attacks in a modern computer system Explain how protection domains combined with an access matrix are used to specify the resources a process may access Examine capability and language-based protection systems Explain the fundamentals of encryption, authentication, and hashing and the uses of cryptography in computing Describe the various countermeasures to security attacks	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz

Recommended Books:

11. Operating System Concepts, 9th edition by Silberschatz, Galvin, Gagne.
12. Modern Operating Systems (3rd Edition): Andrew S. Tanenbaum

COURSE CODE: **CSTE 3108**, COURSE TITLE: **OPERATING SYSTEM & SYSTEM PROGRAMMING LAB**

Course Code: **CSTE 3108**, Course Title: **Operating System & System Programming Lab,** 3 Hours/Week, 3 Credits, Total Marks 100 (Class Attendance =10, Internal Evaluation/Observation = 70, Final Viva-voce = 20), Year 3, Term 1
Rationale: This course has been designed to develop the students' ability to realize the Operating system and its functionalities by doing lab task properly.
Course Objectives: ➢ Identify and describe functions and facilities of operating systems and fundamental operating system abstractions ➢ Select and justify recommending an operating system for a specified application and system

configuration

- Evaluate the design and performance of algorithms used in major components of operating systems, such as scheduler, memory manager, concurrency control manager and mass-storage manager, I/O manager
- Investigate operating system administrative functions based on a commonly available operating system
- Design and develop system program to implement operating system functions using system service calls.

Resources Used: Computer with Linux/Unix environment, Multimedia, Whiteboard, Marker, Handouts, Slides, PDF books.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1-2	Introduction to Linux- Linux Installation, Introduction to Shell, Creating user account- 1.5hrs.	Install Linux OS Work with some Shell Commands Manage user account	Lecture in the lab class with demonstration	a. Install Linux b. Use Shell commands c. Solve Exercise
3-4	Course Project discussion and group formation – list of projects, team formation, project plan and deliverables with presentation – 1.5hrs	To form a team and select a project	Project discussion with demonstration of sample project	a. Form a project team b. Select a project and prepare a plan
5-6	Introduction to Linux tools- Linux files, Directories, Root, File Permissions, Working with files and directories, Disk related commands- 1.5hrs.	Work with Linux files and directories	a. Lecture in the lab class with demonstration b. Providing simple lab tasks based on the demonstration	a. Use Linux tools with commands b. Work with file and directory operations c. Do lab task d. Solve Exercise
7-8	Essential Linux commands and Working with editors- 2.5hrs. Present the concept of the project in a team – 30mins	Customize Linux environment using commands. Identify types of editors and modes of operation. Edit single and multiple files with command line options. Plan work for the project and present the concept	Lecture in the lab class with demonstration of customizing and editing session. Providing simple lab tasks based on the demonstration. Arrange team presentation.	Do lab task. Solve Exercise Present the concept of the project (Presentation 1)
9	Processes in Linux, Process Scheduler, Deadlock avoidance– 3hrs	Work with process related commands. Write computer programs for various scheduling algorithms. Write programs for deadlock avoidance algorithm.	Lecture in the class with demonstration of process related commands and algorithms	Implement Process Scheduling Algorithms

10	Introduction to Shell Scripts- Shell programming, Shell Variables, Shell Keywords, Write simple Shell program- 1.5hrs.	Create simple Shell script Debug and process scripts	Demonstration of Shell Scripting b. Providing simple lab tasks based on the demonstration	Do lab task Solve Exercise
11	Decision making and Loop control structure- 1.5hrs.	Write Shell programs related with decision making and loop control structure.	Demonstration of Shell Scripting Providing simple lab tasks based on the demonstration	Do lab task Solve Exercise
12	Shell Administration- Adding and removing users, Daily administrative works, File management. Disk management, Monitoring system and Ensuring system security	To be able to work as an administrator	a. Demonstration of administrative commands b. Providing simple lab tasks based on the demonstration	a. Do lab task Solve Exercise
13	Final Team Project	a. To develop a project through knowledge acquired	Arrange and guide team presentation on the project	Present the team project

COURSE CODE: **CSTE 3109**, COURSE TITLE:**MICROPROCESSOR, MICROCONTROLLER AND INTERFACING**

Course Code: **CSTE 3109**, Course Title:**Microprocessor, Microcontroller and Interfacing**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 3, Term 1
Rationale: This course has been designed for the students to introduce microprocessor architecture, instruction sets, assembly language programming and discussed the design of systems based on microprocessors and microcontrollers.
Course Objectives: ➢ Students to become familiar with the architecture and the instruction sets and addressing modes of an Intel 8086 microprocessor. ➢ Assembly language programming will be studied as well as the design of various types of digital and analog interfaces. ➢ Ability to interface various devices to the microprocessor. ➢ Skill to understand microcontroller architecture, addressing mode and instruction sets ➢ Familiar with various programmable interfacing devices. ➢ Develop various interfacing techniques using assembly language programming.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	Evolution of microprocessor, architecture of a microprocessor, Data bus, address bus, control bus, I/O units, and memory, architecture of Intel 8086 Microprocessor, its execution unit, and bus-interface unit, its registers and flags.	**Microprocessor Fundamentals and Architecture.** To learn the basic concepts on microprocessor architecture, data buses, I/O units and memory. To understand the Intel 8086 Microprocessor, its execution unit, and bus-interface unit, its registers and flags.	Overall discussion with the students must be needed about the course contents including the objectives, course outcomes, examinations, physical environment and methodology. An interactive demonstration must be needed to teach the microprocessor architecture and its related functional parts in classroom.	Answer basic questions, group discussion, assignments.
2	Programming model of 8086 processor, segment-offset address and physical address calculations, even and odd addressing, the introduction of different addressing modes, Operating systems and BIOS, Memory organization of PC.	**Programming Model.** To understand the segment-offset address To calculate any physical address of memory location. To comprehend the all types of addressing modes, its PA calculations and memory organization.	Delivering lecture and overall discussion with the students must be needed on several topics of programming model of 8086 processor interactively in classroom. Several examples of addressing modes will be solved in classroom.	Problems must be solved correctly in classroom. Home works and assignments must be submitted regularly.
3	Introduction to IBM PC Assembly Language, Assembly Language syntax, Program Data, Variables, named constants, program structure, memory models, Input/output instruction, Running program, Program Segment Prefix.	**Assembly Language.** To understand assembly language instructions, syntax, variable declaration and step by step procedures to run a program.	Delivering lecture and overall explanation with the students must be needed about several topics of assembly language programminginteractively in classroom. Demonstrate various solving techniques to run a program in the classroom.	Exercise with various programming problems.

4	The processor status and the Flag register, overflow condition, debugging a program, flow control instructions, conditional jumps, signed versus unsigned jumps, high-level language structures, branching and looping structures.	**Status Register and Flow Control.** To debug a program and show the status of all flag registers. To understand the algorithms to find out modular exponentiation. To understand conditional jumps, signed versus unsigned jumps, high-level language structures, branching and looping structures.	Demonstrate various techniques to solve the design of a program. Demonstrate flowcharts to run a program correctly.	Exercise with various programming problems.
5	Logic, Shift and Rotate Instruction, some common applications of Shift and Rotate operations and related examples.	**Logic Operation.** To solve different examples on logical operations. To run shift and rotate instructions based programs.	Demonstrate several problem-solving techniques to the students to solve several problems on logical, shift and rotate instructions in the classroom.	**Class Test 1**(topics of the week's 1-4)
6	The Stack and Introduction to Procedures, Basic stack operations, Procedures Declaration, Communication between procedures, calling a procedures.	**Data Structure.** To understand stack operations, procedures declaration, communication between procedures and calling a procedures.	Lecture and discussion on stack operations, procedures declaration, communication between procedures and calling a procedures. Discuss on sample programs using stack operations.	Exercise with various programming problems, group discussion.
7	Multiplication and Division Instructions, signed versus unsigned multiplications, divide overflow, Signed Extension of Dividend.	**Arithmetic Operation.** To solve different problems using arithmetic terminologies.	Lecture and explanation on arithmetic terminologies to run related programs.	Exercise with various programming problems, home works.
8	Arrays and related addressing modes, DUP operator, register indirect modes, Based and Indexed addressing modes. The string instructions, director flag, moving a string, storing a string, loading a string, scanning a string, comparing strings, substring operation.	**Arrays andString Manipulation.** To solve different arrays and String related programs.	Lecture and discussion on arrays and String related programs and solve programs in the class room.	Answer basic questions, home works.
9	Introduction to microcontroller, microcontroller architecture, addressing mode and instruction sets, introduction to 8051	**Microcontroller.** To know about 8051 microcontroller architecture, addressing mode, instruction sets and different related terminologies.	Lecture and explanation on different microcontroller terminologies.	**Class Test 2**(topics of the week's 5-8)

	family architecture, pin diagram, operation, ports, addressing modes, internal & external memory, SFR, flags, organization, counters and timers, serial communication.			
10	Basic description on Programmable Peripheral Interface (8255), block diagram, ports and operating modes, programming 8255, control word, I/O port addressing, BSR mode,Interface to Read from I/P DIPs and Display at O/P LEDs in mode 0, all interface circuit and programs, basics of Keyboard and Display Interface, 8086 Keyboard Interface.	**PPI 8255, Keyboard and Display Interfaces.** To design PPI 8255 and Keyboard and Display Interfaces. To solve different applications using these interfacing devices with interface programs. .	Lecture and discussion on PPI 8255, Keyboard and Display Interfaces.	Q & A session, group discussion, assignments.
11	DMA controller (8237), data transfer DMA mode, block diagram, step in DMA operation, DMA registers and modes, Programmable Interrupt Controller (8259), block diagram, priority modes, control word initialization, masking and prioritization, programming OCWs, LRC7040 Printer Interface to a Microcomputer using the 8295-printer controller chip.	**8237, 8259, 8295.** To design DMA, Interrupt and Printer controller interface devices. To solve different applications using these interfacing devices with interface programs.	Lecture and explanation on DMA, Interrupt and Printer controller interface devices.	Answer basic questions, presentations, Homeworks.
12	Programmable Interval Timer (8254), block diagram, control register, status register, modes of counters with examples and interface programs, Advanced Virtual RISC (AVR) Microcontroller, ARM Microcontroller.	**8254, AVR, ARM Microcontroller.** To understand the pros and cons of 8254, AVR, ARM Microcontrollers.	Lecture and discussion on the pros and cons of 8254, AVR, ARM Microcontrollers.	**Class Test 3**(topics of the week's 9-12)
13	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Assembly Language Programming and Organization of the IBMPC by Ytha Yu and Charles Marut, McGraw-Hill
2. Microprocessor and Microcomputer based System Design by Rafiquzzaman, CRC Press
3. Microcomputer Systems: 8086/8088 Family by Y. Liu and G. A. Gibson, Prentice-Hall.
4. Microprocessor and Interfacing by Douglas V. Hall, Tata McGraw Hill.

COURSE CODE: **CSTE 3110**, COURSE TITLE:**MICROPROCESSOR, MICROCONTROLLER AND INTERFACING LAB**

Course Code: **CSTE 3110**, Course Title: **Microprocessor, Microcontroller and Interfacing Lab**, 2 Hours/Week, 1 Credit, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20).

Rationale: This Lab course has been designed for the students to introduce and operate the microprocessor MDE-8086 kit, develop instruction sets and assembly language programming, design microprocessor and microcontroller-based interfacing devices.

Course Objectives

- Students to become operate microprocessor MDE-8086 kit.
- Ability for storing and executing of a typical machine code program using the MDE-8086 kit and to observe the operation in a single step.
- Develop various Interface, Interrupt and Serial monitor based experiments by using 8255A I/O controller and MDE-8086 kit.
- Skill to develop various Assembly language programs by using MASM translator in PC.
- Skill to design of various interfacing systems based on microprocessors and microcontrollers.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Sample interfacing devices and programs.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	Introduction on Microprocessor MDE-8086 kit.	**MDE-8086 kit.** To independently handle and operate microprocessor MDE-8086 kit successfully.	An interactive demonstration must be needed to teach different key functions, addressing, instructions and related functional parts of MDE-8086 kit in classroom.	Answer basic questions, group discussion.

2-3.	**Experiments on 8255A Interface:** a) 7-segment display interface to display the hexadecimal character. b) LED interface	**8255A Interface.** To conduct and perform machine code program for displaying the hexadecimal character using the MDE-8086 kit perfectly. To design LED interface using MDE-8086 kit.	Delivering lecture and overall discussion on 7-segment display interface and LED interface using 8255A module into MDE-8086 kit interactively in classroom. Several machine code programs will be solved in classroom.	Home works and assignments.
4-5.	**Experiments on Interface:** a) Interfacing a speaker with microprocessor and to operate on by the program b) Dot matrix LED displays. c) Stepper Motor Interface to control speed.	**Interface.** To design instruction code programs to interface speaker, dot matrix LED display and speed control of stepper motor by MDE-8086 kit.program.	Demonstrate various solving techniques to interface speaker, display dot matrix LED and control the speed of stepper motor by MDE-8086 kit in the classroom.	Exercise with various instruction code programs.
6.	**Experiments on Interrupt:** a) Interrupt due to division by zero b) Interrupt due to overflow c) Interrupt due to user defined software.	**Interrupt.** To manage and design various Interrupt based experiments by using 8255A I/O controller and MDE-8086 kit.	Demonstrate various techniques to solve various Interrupt based experiments.	**Lab Test 1**(topics of the weeks1-5)
7.	**Experiments with serial monitor:** a) Execution of different serial monitor commands b) Loading and executing assembly language program.	**Serial monitor.** To design various serial monitor based experiments by using 8255A I/O controller and MDE-8086 kit.	Delivering lecture and overall discussion to solve various Serial monitor based experiments with various instructions and assembly programming in the classroom.	Assignments.
8.	**List of Assembly Language based programs:** a) Write an assembly language program to read a character from the keyboard. b) A program to display a single character. c) A program to display a line of the message.	**Assembly Language Programs.** To develop various assembly codes to input, display a single character or multiple characters and also display a single line of the message.	Lecture and discussion on related sample programs.	Exercise with various programming problems, group discussion.
9.	**List of Assembly Language based programs:** a) A program to display a message using Macro. b) A program to display more than one message in a different line.	**Assembly Language Programs.** To develop various assembly codes to display multiple line messages. To write codes for case conversion letter.	Lecture and explanation on program terminologies to run related programs.	Assignments, group discussion.

	c)A program to read a character from the keyboard and display it next line. d) Enter a lowercase letter and display it in uppercase. e) Enter an uppercase letter and display it in lowercase.			
10.	**List of Assembly Language based programs:** a) Display program checks flags. Find ADD,SUB,NEG, AND INC of a number using debug. b) A program to display "NSTU" 20 times. c) A program to display 256 ASCII character/Enter IBM set character. d) Write a count-controlled loop to display a row of 80 stars.	**Assembly Language Programs.** To solve different arithmetic operations and loop related programs.	Demonstrate various techniques to solve various arithmetic operations and loop related programs in the class room.	Answer basic questions, homeworks.
11.	**List of Assembly Language based programs:** a) A program to read a character if it's 'is 'x' display it, otherwise,terminate the program. b) A program to find odd or even numbers using Procedure. c) A program to find odd or even numbers using Macro.	**Assembly Language Programs.** To solve different programs using Procedure and Macro.	Lecture and discussion on procedure and macro related programs in the class room.	**Lab Test 2** (topics of the weeks 8-10)
12.	**List of Assembly Language based programs:** a) A program to display the string in Reverse order. b) A program to display the length of a string. c) A program to the sum of first 4 numbers. d) A program to sort 10 numbers in Ascending order. e) A program to sort 10 numbers in Descending order.	**Assembly Language Programs.** To solve different string, arrays and sort related programs.	Demonstrate various techniques to solve various string, arrays and sort related programs in the class room.	Q & A session, group discussion, final exam preparation.
13.	**Final Exam (Job, Viva)**			

Year-3 Term-2

Sl.#	Course Code	Course Title	Credit	Credit Hours	Page No.
1	CSTE 3201	Computer Networking	3	3	
2	CSTE 3202	Computer Networking Lab	1	2	
3	CSTE 3203	Microwave and Satellite Communication	3	3	
4	CSTE 3204	Microwave and Satellite Communication Lab	1	2	
5	CSTE 3205	Web Engineering	3	3	
6	CSTE 3206	Web Engineering Lab	1	2	
7	CSTE 3207	Optical Fiber Communication	3	3	
8	CSTE 3208	Optical Fiber Communication Lab	1	2	
9	CSTE 3209	Software Engineering and Information System Design	3	3	
10	CSTE 3210	Software Engineering and Information System Design Lab	1.5	3	
11	CSTE 3211	Wireless and Mobile Communication	3	3	
12	CSTE 3212	Wireless and Mobile Communication Lab	1	2	
13	CSTE 3226	Viva Voce	1	0	
		Total	**25.5**	**31**	

COURSE CODE: **CSTE 3201**, COURSE TITLE: **COMPUTER NETWORKING**

Course Code: **CSTE 3201**, Course Title: **Computer Networking**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 3, Term 2

Rationale: This course has been designed to develop the students' ability to realize Networking principles, media, devices, functions of devices, analyses and applications of communication protocols.

Course Objectives:

- Make the students familiarize with the internal structure of Networking layers, Protocols, Application of Protocols, Topologies, device selection depending on medium.
- Analyze and apply debugging and testing techniques to locate and resolve errors and to determine the effectiveness of a network.
- Effective use of protocol applications, troubleshooting and network management.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Introduction:** The Use of Computer Network – Network Hardware, LANs, WANs, Wireless network, Internetworks, Network software Protocol Hierarchies, Design issues for Layers, Interfaces and services, CO & CL services, service primitives, relationship of services to protocol,	Realize Network types, devices, TCP/IP and OSI model.	Lecture and discussion with detailed information about network devices, types of networks.	Answer basic questions, quizzes, Homework, exams.
2	OSI reference model, TCP/IP reference model, Example networks – Novell NetWare, Internet, X.25.		Lecture and discussion with characteristics OSI model and protocols in several network types- LAN, MAN, WAN	Questions about comparison, quizzes, Homework, exams.
3	**The PhysicalLayer:**The theoretical basis of data communication-Fourier Analysis, Bandwidth-limited signals. The maximum data rate of a channel. Transmission Media - twisted pair, Baseband Coaxial Cable, Broadband coaxial cable, fiber optics. The line of Sight transmission, Communication satellites. Analog Transmission, tree Telephone system, Modems, RS – 232 & RS – 449.	Describe properties and applications of communication media.	Lecture and discussion with problems.	Design, development, explanation, quizzes, Homework, exams.
4	**The medium Access Sublayer:** Local and Metropolitan Area's Networks Static Channel allocation in LAN's and MAN's Dynamic channel allocation in LAN's and MAN's Network Protocols-persistent and Non-Persistent CSMA, CSMA with collision detection, BRAP-broadcast recognition with alternating priorities. MLMA-the multilevel multi-access Multi-access protocol, binary countdown. Limited Contention Protocol – The adaptive tree walk protocol. IEEE standard 802 for local area network – IEEE standard 802.3 and Ethernet, IEEE standard 802.5 token buses, IEEE standard 802.5 token, ring, comparison of local area networks, FDDI, Wireless LAN – 802.11.	Apply media access control and standards of them.	Lecture and discussion with problems in multiple access control.	Exercise with various problems in media access.

5	**The Data Link Layer:** data link layer issues-services provided to the network Layer, Framing Error Control, Flow control, Link Management, error detection and Correction-Error-Correcting Codes, error-detecting codes.	Error control, flow control and management of data communication.	Lecture and discussion on various types of link management	**Class Test 1**(topics of the week's 1-4)
6	Elementary data link protocols – An Unrestricted simplex, Protocol, A simple Stop and wait for protocol, A simplex protocol for a noisy channel, sliding window protocols – A one-bit sliding window protocol, A protocol using Go back N, A protocol using selective repeat Protocol performance – performance of the stop and wait for protocol. The performance of the sliding window protocol. An example of the data link layer – the data layer in public networks – the data link layer on the Internet.		Lecture and discussion with problems in error control, flow control	Performance analysis of flow control protocols, quizzes, Homework, exams.
7	**The Network layer:** Network Layer design issues – services provided to the transport layer, an Internal organization of the network layer,	IP distribution and network management.	Lecture on design and applications of IP addresses. IP distribution, address block, sub-netting, super-netting, subnet mask, Broadcast and network addresses.	Assignment on IP distribution of an ISP
8	Routing, Congestion, Internetworking, Routing Algorithms,		Lecture on performance of router	Presentations, quizzes, Homework, exams
9	Congestion – Control algorithms, Pre-allocation of buffers. Packet discarding, Congestion Control, flow control, Choke packets, deadlocks. Examples of the network layer – the network layer in public networks, the network layer on Internet (IP).	Congestion control, flow control.	Lecture and discussion about congestion control	**Class Test 2**(topics of the weeks5-8)
10	**The Transport Layer:** Transport layer design issues-services provided to the session layer, quality of services, the OSI transport service primitives, transport protocol, elements of transport protocols,	Process to process data delivery in port.	Lecture on services of transport layer	Explanation, quizzes, Homework, exams.
11	addressing, establishing a connection, releasing connection flow control & buffering, multiplexing, crash recovery, examples of the transport layer, Transmission Control Protocol TCP).		Lecture on Transmission Control Protocol TCP, User Datagram Protocol	Explanation, quizzes, Homework, exams.
12	**The presentation Layer:** Presentation layer design issues-Data representation, Text Compression, Network security and privacy. The OSI presentation, Service	Network security and privacy.	Lecture on security issues and applications of them.	**Class Test 3**(topics of the weeks9-12)

	primitives, Substitution Ciphers, Transposition Ciphers, Public key Encryption, Secrecy and Digital Signature with Public Key encryption.			
13	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Data Communications and Networking by Behrouz A. Forouzan, McGraw-Hill.
2. Computer Networks by Andrew S. Tanenbaum, Prentice Hall.
3. TCP/IP Protocol Suite by Behrouz A. Forouzan, McGraw-Hill.

COURSE CODE: **CSTE 3202**, COURSE TITLE: **COMPUTER NETWORKS LAB**

Course Code: **CSTE 3202**, Course Title: **Computer Networks Lab**, 2 Hours/Week, 1 Credit, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 3, Term 2

Rationale: This course has been designed to develop the students' ability to realize Networking principles, media, devices, functions of devices, analyses and applications of communication protocols. Server (email server, web server) setup and maintenance.

Course Objectives:

- Make the students familiarize with the internal structure of Networking layers, Protocols, Application of Protocols, Topologies, device selection depending on medium.
- Analyze and apply debugging and testing techniques to locate and resolve errors and to determine the effectiveness of a network.
- Effective use of protocol applications, troubleshooting and network management.
- DNS, FTP, NFS, email server, web server setup and maintenance.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Hand books-manual,Previous questions, LAN, Internet.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	The Use of Computer Network – Network Hardware, OSI model.	Realize Network types, devices, TCP/IP and OSI model.	Discussion with Hands on manual	Answer basic questions, quizzes.
2	Installation of a virtual machine		Demonstration with RHEL6.iso and bootable pen drive with rhel6	Do.
3	Network setup with appropriate IP of real host and guest machine. ping,		Ensure and testing communication	Do.

	traceroute, arp, learning remote login using telnet session, ssh. Study of Network IP. TTL, ICMP		between computers.	
4	FTP, vsftpd configuration, NFS	File sharing and browsing	Demonstration with FTP	Do.
5	IP forwarding, dig, nslookup			**Class Test 1**(topics of the week's 1-4)
6	Web server in Redhat OS, httpd configuration	Web server setup	Hands on instruction	Answer basic questions, quizzes.
7	Email server setup in Redhat OS.	Email server	Hands on instruction	Do.
8	User add, user delete, recreate user name	Email ID creation	Hands on instruction	Do.
9	Manual using for instruction		Demonstration	**Class Test 2**(topics of the weeks5-8)
10	DNS	Domain Name System setup	Hands on instruction	Answer basic questions, quizzes.
11	DHCP server	DHCP Server setup	Hands on instruction	Do.
12	yum server installation	Easy installation practice by yum server	Demonstration	**Class Test 3**(topics of the week's9-11)
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 3203**, COURSE TITLE: **MICROWAVE AND SATELLITE COMMUNICATION**

Course Code: **CSTE 3203**, Course Title: **Microwave and Satellite Communication**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 3, Term 2	
Rationale: This course has been designed to cover the most relevant aspects of microwave & satellite communications, with emphasis on the most recent applications and developments.	
Course Objectives: ➢ To understand Radio communication in general and also the special aspects that relate to microwave and satellite communications. ➢ To discuss the use of microwave radio systems in communications highlighting the design, deployment and operational challenges of microwave radio communications ➢ To provide an in-depth understanding of different concepts used in a satellite communication system. ➢ To give a thorough understanding of satellite systems including topics of orbits and constellations, satellite space segment, and propagation and satellite links; baseband communications techniques for satellites including modulation, coding, multiple access and on-board processing as well as the applications of various satellite communications systems.	
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.	
	Lesson Plan (as per week):

Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	**Microwave Communication:** CCIR recommendation on frequency assignment; comparison with radio communication in another frequency band.	Understand the fundamental concepts of microwave communication.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2.	**Microwave Link:** Microwave link and its advantage, Frequency assignment, modulation methods, Transmitting and receiving equipment, Baseband repeater, IF repeater, Microwave carrier supply, Auxiliary channels	Understand the details concept of microwave signal transmission.	Lecture and discussion with details concept of microwave transmission	Answer basic questions, quizzes, Homework, exams.
3.	**Microwave Antenna:** Hertzian and half wave dipoles. Monopole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.	Design microwave antenna for microwave signal transmission.	Lecture and discussion on brief outline and choosing of microwave antenna for long haul and short haul.	Answer basic questions, quizzes, Homework, exams.
4.	**Microwave transmission lines:** Introduction to transmission lines, waveguides, strip-lines, microstrip lines, fin-lines, inverted-striplines. Reflection coefficient, Transmission coefficient, VSWR, Impedance transformation in RF lossless lines. Impedance measurement.	Design impedance matching network for any transmission line or system.	Lecture and discussion on how the microwave signal reach it exactly by find out the components of transmission line.	Exercise with various mathematical problems.
5.	**Microwave Components:** Microwave hybrid circuits, scattering parameters, Waveguide Tees, Directional couplers, Circulators and Isolators, Phase shifter and attenuator.	Identify the use of microwave components and devices in microwave applications	Lecture and discussion on various type of microwave components.	**Class Test 1**(topics of the week's 1-4)
6.	**Microwave Devices:** Microwave transistors; varacter diode, IMPATT diode, Gunn Diode, Schottky Barrier diode; a backward diode; point contact diode.		Lecture and discussion on how the microwave devices work properly and why need these devices.	Answer basic questions, quizzes, Homework, exams.
7.	**Microwave Devices:** Klystron; Reflex Klystron, TWT, Backward Wave Oscillator (BWO), Microwave filters, planer microwave elements (directional copular, circulators) and Magnetron.		Lecture and discussion on how the microwave devices work properly and why need these devices.	Answer basic questions, quizzes, Homework exams.
8.	**Applications of Microwave:** Radar	Discriminate different	Lecture and	Answer basic

	systems - Pulsed radar, MTI, Tracking radars, Altimeter- Principles of operation, applications.	Radars, find applications and use of its supporting systems.	discussion with various types of radar and its applications.	questions, quizzes, Homework, exams.
9.	**Satellite Communication: Introduction:** Origin of Satellite communication. The current state of Satellite Communication. **An orbital aspect of satellite communication:** Orbital mechanism, the equation of orbit, locating satellite in orbit, orbital elements, orbital perturbation.	Explain the basics of satellite communication.	Lecture and discussion with fundamental concepts of satellite communication.	**Class Test 2**(topics of the week's 5-8)
10.	**Space craft subsystem: -**Altitude and orbit control system, Telemetry tracking and command power system, communication subsystem. **Satellite link design:** System noise temperature and G/T ratio, downlink design, domestic satellite system, uplink design, the design of satellite link for specified (C/N).	Explain and analyzes link budget of satellite signal for proper communication and different types of subsystem.	Lecture and discussion on the design of satellite link budget and different types of subsystem which is very important for controlling.	Answer basic questions, quizzes, Homework, exams.
11.	**Fundamentals of Software Defined Radio:** Baseband Technology, Emergence of Software Defined Radio, Evolution of Software Defined Radio, Baseband requirements.	Understand the fundamental concepts of software defined radio.	Lecture and discussion on the importance of software defined radio	Quizzes, Homework, exams.
12.	**Multiple access techniques: -** FDMA, FDM/FM/FDMA, effects of intermodulation, commanded FDM/FM/FDMA. TDMA, TDMA frame structure and design, TDMA synchronization and timing, code division multiple access, SS transmission and reception applicability of CDMA to a commercial system, multiple access onboard processing, SCPS system, digital speech interpolation system, DAMA.	Understand working principle of multiple access technique and analyze its performance for satellite communication.	Lecture and discussion on satellite Multiple Access (MA) techniques which is interconnect ground stations through multiple satellite transponders with the goal of optimizing several system attributes.	**Class Test 3**(topics of the week's 9-12)
13.	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Advanced Electronic Communication Systems by Wayne Tomasi, Prentice Hall.
2. Foundations for Microwave Engineering by R. E. Collin, McGraw Hill.
3. Satellite Communications by Dennis Roddy, McGraw Hill.
4. Microwave devices and Circuits by S. Y. Lao, Prentice Hall.

COURSE CODE: **CSTE 3204**, COURSE TITLE: **MICROWAVE AND SATELLITE COMMUNICATION LAB**

Course Code: **CSTE 3204**, Course Title: **Microwave and Satellite Communication Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 3, Term 2

Rationale: This course is designed to acquire skills in measuring, designing by conducting and simulating experiments related to microwave communication, microwave devices/components, microwave antenna and satellite communication.

Course Objectives:

- Provide hands-on experience to the students so that they are able to puttheoretical concepts to practice.
- Acquire teamwork skills for working effectively in groups.
- Develop technical writing skills important for effective communication.
- Familiarize with basic microwave measurements.
- Characterize microwave and microwave components/devices bymeasuring important parameters.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy(activities directed to achieve outcomes)	Assessment Strategy(How they are developed)
1.	To familiar with different equipment related to microwave and satellite communication.	gain significant experience with microwave and satellite communication equipment.	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Answer basic questions about different types of instruments.
2, 3, 4, 5 6,	• Study of the characteristics of Klystron Tube and to determine its electronic tuning range. • To determine the frequency & wavelength in a rectangular wave-guide working on TE_{10} mode. • To determine the Standing Wave-Ratio and Reflection Coefficient. • To measure an unknown Impedance with Smith chart. • To study the substitution method for attenuation measurement & determine the attenuation due to a component under test. • Study the voice communication by using microwave test bench. • Study of PC to PC communication using microwave test bench. • Study of PC to PC communication using	used microwave laboratory equipment to measure fundamental microwave parameterssuch as SWR, reflection coefficient, unknown impedance, attenuation and power. used modern microwave design and measurement techniques,	Through lecture, laboratory, and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are due at the beginning of the lab period. Respected Teacher will be evaluated in lab period.

	microwave transceiver communication kit. • Study of Magic Tee, Circulator/Isolator, Attenuator (Fixed and Variable type), and Resonant Cavity.			
7 8, 9, 10	• Establishing a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal. • To implement matlab code for uplink and downlink budget calculation. • To implement matlab code to determine look angle (azimuth and elevation) of satellite. • Transmitting and receiving three separate signals (Audio, Video, Tone) simultaneously through satellite link. • Study the delay between Uplink Transmitter and Downlink Receiver during data transmission. • Study the global positioning system and GPS receiver. • Calculate the carrier to noise ratio/signal to noise ratio of established satellite link. • Transmitting and receiving PC data through satellite link.	motivate students toward space by providing "real world" satellite design, fabrication,test, launch, and operational experience;	Through lecture, laboratory, and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are due at the beginning of the lab period. Respected Teacher will be evaluated in lab period.
11, 12	Followings are implemented by the simulation software. • Design of a 100 MHz Chebyshev Lowpass Filter (series inductor and parallel capacitor version). • Impedance Matching using a 1 / 4 –Microstrip-Line (on an FR4-board). • Impedance Matching using a 1 / 4 – Line (= Grounded Coplanar Waveguide). • Analyzing a 1 GHz – Microstrip-LPF. • Complete Design of a 1575 MHz – Microstrip edge coupledBandpass Filter.	used modern microwave design and measurement techniques, software and instrumentation to design, simulate, fabricate and verify the operation of a passivemicrostrip microwave circuit.	Through lecture, and problem design in simulation environment.	Hands on experience in simulation environment.
13	**Final Lab Exam (Job, Quiz and Viva)**			

COURSE CODE: **CSTE 3205**, COURSE TITLE: **WEB ENGINEERING**

Course Code: **CSTE 3205**, Course Title: **Web Engineering**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 3, Term 2

Rationale: Lectures and seminars are supported by practical exercises that impart skills as well as knowledge. This outline enables students to put into practice the techniques they have been taught throughout the course.

Course Objectives:

- Encourage students to take web technology as their profession.
- They will be able to know about the technologies of web.
- They can be able to develop webpage.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
29.	**Web Engineering:** • Attributes of Web based system and Application. • Web App Engineering Layers • Web Engineering Process	• Know the attributes of Web Applications • Layers of Web App Engineering • Processes of Web Engineering	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework.
30.	**Web Apps Analysis:** • Requirement Analysis, • Analysis Model, • Web Apps Estimation, • Content Model.	• Analyze and select requirements for web apps. • Analyze and estimate target app model.	Lecture and discussion with characteristics parameters of logic families individually. Data sheet will be introduced.	Answer basic questions, quizzes, Homework.
3-5	**Web Apps design:** • Design issues of Web Apps • Interface Design, Typography, • Layout design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, • Object Oriented Hypermedia Design, Design Metrics for web Apps.	• Students will able to know the issues of web apps. • They can design different kinds of layout as the requirement of web apps.	Lecture and discussion with problems.	Class Test-1 (topics of the week's 1-5)
6-8	**Web Apps Implementation:** **Client-side scripting:** Java Script, AJAX, JQuery; **Server-Side Scripting:** ASP.NET, PHP;	Students can develop Client side and server-side apps by different scripting languages		Exercise with various mathematical problems.

	Framework: PHP MVC frameworks (Code Igniter, Symfony, Zend, CakePHP) ASP.NET MVC Framework, Web service.			
10-11	**Web Apps Security:** • Encryption techniques (digital signatures, certificates, PKI), • Security threats, securing client/server interactions, Vulnerabilities at the client (desktop security, phishing, etc.) and • The server (cross-site scripting, SQL injections, etc.), Building Secure Web Apps.	• Know how to build secure web apps with different techniques. • Know how to apply different security techniques in web apps.		**Class Test- 2** (topics of the weeks 5-9)
12	**Testing Web Apps:** • Content Testing, User • Interface Testing, • Navigation Testing, • Configuration Testing, • Security Testing, Performance Testing.	• Know how to test web app with different testing approaches		Answer basic questions, quizzes, Homework, exams.
13	**Maintenance of Web Applications:** • Web Server and Database server load balancing, • web apps performance assessment • Application usage monitoring and report generation	Know how to monitor and maintain web app		**Class Test-3** (topics of the weeks 10-13)

Recommended Books:

1. Roger Pressman and David Lowe, Web Engineering, Tata McGraw Hill Edition, 2008
2. Dino Esposito Programming Microsoft ASP.NET 2.0, Microsoft Press, 2005
3. J. Castagnetto, H. Rawat, S. Schumann, C. Scollo and D. Veliath, Professional PHP Programming ,Wrox Publications, 1999.
4. Leon Atkinson, Core PHP Programming, Prentice Hall Professional, 2004

COURSE CODE: **CSTE 3206**, COURSE TITLE: **WEB ENGINEERING LAB**

Course Code: **CSTE 3206**, Course Title: **Web Engineering Lab**, 3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 3, Term 2
Rationale: This course provides an introduction of web-development techniques that use HTML, CSS and JavaScript as a web development essential including database connectivity (JDBC), Basics of PHP, Basics of Java for Web Development and Basics of Asp.Net as an advanced technique of web

programming.

Course Objectives:

- To understand the concept of Web Application Development and its Architecture.
- To understand the Essentials of Web Application Development.
- To understand and practice web page designing techniques.
- To understand and practice embedded dynamic scripting on client-side Internet Programming.
- To understand the differences between client side & server-side technologies to develop Web Application.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Eclipse IDE.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
31.	**UI DESIGN** • Introduction to HTML and HTML5 • TML Tags, • Formatting and Fonts,Commenting • Code, Anchors, Backgrounds, Images, • Hy perlinks, Lists, Tables, Frames, HTML Forms.	• Students will able to do frontend layout. • Able to write html code.	Discussion and practice	-Home task -Quiz
2-3	**Cascading Style Sheet** • Basic syntax and structure , • Inline Styles, Embedding Style Sheets • Linking External, Sty le • Backgrounds, Manipulating Text, Margins • and Padding Positioning using CSS	• Students will introduce with design. • They will understand about attribute, class, id etc. • They will make perfect design.	First lecture and then Practice	Answer basic questions, quizzes, Homework, exams.
4-5	**Introduction to JavaScript** • Develop Client side and server side apps by different scripting languages	• Student will introduce with JavaScript. • Can make JavaScript functions. • Understand Jquery library.	Lecture and discussion with problems.	Quiz 1 (Topic of the 1-3 weeks)
6-7	**JDBC (Java Database Connectivity)** • SQL, My SQL, PostgreSQL • Connection Overview, Transactions, • Driver Manager Overview	• Introduce with SQl/MySQL • JDBC connection. • Database connectivity. • Data view from database.	Practice with a real life problem. CRUD Project.	Homework

	• Statement Overview • Result Set Overview • Prepared Statement Overview			
8-10	**Java Server Pages Technology** • Creating Dynamic Content • Using Objects within JSP Pages • JSP Programming • Java Applets • Java Servlets	• Introduction to JSP • How to create dynamic content. • Create Java Applets • Java Servlets.	Practice with a real life problem. Apply JSP on CRUD Project.	Quiz 2 (Topic of the 4-7 weeks)
11-12	**.Net Architecture and C#** • Introduction to Dot Net. • Dot Net framework and its architecture • CLR ,What is Assembly , • Components of Assembly , • DLL hell and Assembly Versioning. Overview to C#. • Introduction to ASP.net Asp.net Programming	• Introduction to MVC framework. • A large collection of library.	Practice with a real life problem or project. Make CRUD Project using MVC framework.	Answer basic questions, Homework Quiz 3 (Topic of the 8-13 weeks)
	Final Lab Exam (Job and Viva)			

COURSE CODE: CSTE 3207, **COURSE TITLE:OPTICAL FIBER COMMUNICATION**

Course Code: CSTE 3207, **Course Title:Optical Fiber Communication,** 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 3, Term 2				
Rationale: This course has been designed to provide the students an in-depth understanding of component and system concepts in optical communications and its application which is fundamental to the students' ability to become a successful telecommunication engineer.				
Course Objectives: ➢ To give students with a knowledge with the history of optical fiber communication and their application in optical communication networks. ➢ To provide students with an understanding of the functionality of each of the components, that comprises a fiber-optic communication system: optical source, transmitter, fiber, amplifier, an optical detector, and receiver etc. ➢ To provide students with an understanding of the design of a basic communication link.				
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.				
Lesson Plan (as per week):				
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)

1.	**History:** History of optical fiber communications, Overview of the SEA-ME-WE-4 project. **Introduction:** General communication system and optical fiber communication system, The need for fiber-optic communication systems, Satellite systems versus optical fiber networks.	To know the history of optical fiber communication with its need comparing with other networks.	Discussion on detailed information about the course, including the objectives, course outcomes, examinations. Discussion on the history of optical fiber communication with its need comparing with other networks.	Answering basic questions, quizzes, Homework etc.
2.	The advantage of optical fiber communication, Property of light, Skew ray and meridional ray, Phase and group velocity, Energy level concepts of radiating material, pumping and radiation, Electrical bandwidth and optical bandwidth.	To get some fundamental knowledge on light propagation through the optical fiber and its bandwidth calculation.	Lecture and discussion on the fundamentals of light property and some other related topics. Exercise on some basic topics.	Answering basic questions, quizzes, Homework etc.
3.	**Optical fiber waveguide:** Basics, Refractive index, Step index fiber, Graded-index fiber, Multimode step-index fiber, Multimode graded index fiber, Total internal reflection.	To learn the basics of an optical fiber waveguide. To learn the characteristics of different fiber types.	Discussion on the basics of optical fiber waveguide and the characteristics of different fiber types. Exercise on refractive index and some other basic topics.	Answering basic questions, quizzes, Homework etc.
4.	**Optical fiber waveguide:** Critical propagation angle, Incident angle, Acceptance angle, Numerical aperture, Attenuation, Absorption, Dispersion, Bit rate and Bandwidth.	To learn the details of an optical fiber waveguide.	Lecture and discussion in detail on optical fiber waveguide, attenuation, absorption, dispersion etc. Exercise on NA, attenuation, dispersion etc.	Answering basic questions, quizzes, Homework etc.
5.	**Preparation of optical fibers:** Liquid phase (melting) technique, Vapor phase deposition technique.	To explain the fiber preparation technique in detail.	Demonstration on optical fiber preparation techniques.	CT-1 (topics of the week's 1-4)
6.	**Optical sources and transmitter:** Light emitting diode, Principle of action and characteristics, Properties of spontaneous and stimulated radiation, Homostructure and heterostructure LED, SLED, ELED.	To learn the basics of optical sources. To understand the working procedure of different types of LED.	Lecture and discussion on the basics of a light source and working principles of different types of LED. Exercise on related topics.	Answering basic questions, quizzes, Homework etc.
7.	**Optical sources and transmitter:** a Laser diode (LD), Principle of action and characteristics, Fabry-Perot laser diode, Lifetime, rise/fall time and bandwidth, a Functional block diagram of an optical transmitter.	To understand the working procedure of different types of LD. To explain the functional block diagram of an optical transmitter.	Lecture and discussion on working principles of different types of LD. Exercise on related topics.	Answering basic questions, quizzes, Homework etc.

8.	**Optical detectors and receiver:** p-n photodiode, p-i-n photodiode, Avalanche photodiode (APD) with working procedure, Responsibility of a photodiode, Phototransistors, Functional block diagram of an optical receiver.	To learn the basics of optical sources. To understand the working procedure of different types of optical detector. To explain the functional block diagram of an optical receiver.	Lecture and discussion on the basics of an optical detector and working principles of different types of optical detector. Exercise on related topics.	Answering basic questions, quizzes, Homework etc.
9.	**Optical fiber connection:** Joints and couplers, Fiber splices, Fiber connectors.	To learn in detail about fiber joint techniques and coupler types.	Lecture and discussion on fiber joint and couplers. Exercise on joint and coupling loss calculations.	CT-2 (topics of the week's 5-8)
10.	**Optical amplifiers:** Types of an optical amplifier, Semiconductor optical amplifier (SOA), Types of SOA, Erbium-doped fiber amplifier (EDFA). **Optical link connections in electronic networks:** FDDI, Ethernet, fiber channel, ESCON, and intersystem coupling.	To learn the basics of optical amplifiers. To understand the working procedure of different types of optical amplifier. To familiar with some networks using fiber link.	Lecture and discussion on the basics of an optical amplifier and working principles of different types of the optical amplifier and some electronic networks using an optical link. Exercise on related topics.	Answering basic questions, quizzes, Homework etc.
11.	**Optical link connections in electronic networks:**Opticonnect, SONET and SDH, ATM, WDM, building photonic networks, components for WDM, add-drop multiplexers, optical space division switches, optical switching nodes, wavelength converters, standards for WDM, lightwave networks.	Familiar with some other electronic networks using fiber link connections Familiar with some optical devices like multiplexers, switches, wavelength converters etc.	Lecture and discussion on some other electronic networks using an optical link and some optical devices like multiplexers, switches, wavelength converters etc used in practical applications.	Answering basic questions, quizzes, Homework etc.
12.	Optical fiber applications. Optical link budget.	Introduce different optical fiber applications Analyze optical link budget.	Discussion on optical fiber applications. Exercise on optical link budget calculations.	CT-3 (topics of the week's 9-12)
13.	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Students will be asked to answer the questions orally on previous lectures and review the contents of the course. Discussion on the better answering methods for the final examinations.	Exercise the answering methods in final exam.

Recommended Books:

1. Fiber-Optic Communications Technology by Djafar K. Mynbaev, Addison-Wesley
2. Optical Fiber Communications by John M. Senior, Prentice-Hall.
3. Fiber-Optic Communication Systems by G P. Agrawal, G P. Agrawal, Wiley.

COURSE CODE: **CSTE 3208**, COURSE TITLE: **OPTICAL FIBER COMMUNICATION LAB**

Course Code: **CSTE 3208**, Course Title: **Optical Fiber Communication Lab**, 2 Hours/Week, 1Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 3, Term 2

Rationale: This course has been designed to provide the students with practical understanding of theories and concepts in optical communications which is fundamental to the students' ability to become a successful telecommunication engineer.

Course Objectives:

- To enable students to relate what they have learnt in classroom to practical, hands-on experiments that will be performed in a fiber optic communication laboratory.
- To take away the "fear factor" by providing experience of operating various equipments.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Lab equipment and Manuals.

Lesson Plan (as per week):

Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1-2.	➢ Study the basic structure and types of the optical fiber. ➢ Examine the operational characteristics and parameters of optical sources and detectors. ➢ Examine the characteristics of optical connectors.	➢ To understand, measure and examine the parameters of optical sources, detectors and connectors.	Lecture and discussion with practical implementation.	Answer basic questions, quizzes, homework.
3.	➢ Carry out measurements on the optical communication system.	➢ To calculate and analyze the measurements on the optical communication system.	Discussion and practice.	Answer basic questions, quizzes.
4-5.	➢ Construct a digital transmission system applying Manchester and Bi-phase data codes. ➢ Construct a data transmission system with personal Computer.	➢ To construct a digital transmission system applying Manchester and Bi-phase data coding techniques. ➢ To construct a link for the transmission of data with personal Computer.	Discussion with practical implementation and testing.	Answer basic questions, quizzes.
6-7.	➢ Construct a communication system consisting of : ⇨ 8-channel Multiplexer/ Demultiplexer ⇨ Manchester or Bi-Phase coder/decoder. ⇨ Transceiver of optical fiber.	➢ To construct a communication system consisting of some defined features.	Lecture and discussion with practical implementation.	Answer basic questions, quizzes, homework.
8.	➢ Carry out a communication system consisting of FM modulator and demodulator, transmitter and receiver on optical fiber.	➢ To construct an optical communication system with FM modulator and demodulator.	Discussion and practice.	Answer basic questions, quizzes.

9-10.	➢ Carry out an optical multiplexing of audio signal with the video signal through a frequency translation. ➢ Carry out how the multiplexed audio signal can be separated from the video signal.	➢ To design an optical communication system with audio-video multiplexing/ demultiplexing techniques.	Discussion and practice.	Answer basic questions, quizzes.
11.	➢ Perform Intensity modulation (linear modulation) of an optical source.	➢ To perform Intensity modulation of an optical source.	Discussion and practice.	Answer basic questions.
12	➢ Construct an audio+video communication system consisting of audio and video source, audio/video multiplexer and de-multiplexer; analog transmitter and receiver on optical fiber and loudspeaker. ➢ Perform other experiments relevant to this course.	➢ To construct and analyze an audio/video optical communication system.	Discussion with practical implementation and testing. Demonstration with e-Tutorials.	Answer basic questions, quizzes, homework, exams.
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 3209**, COURSE TITLE: **SOFTWARE ENGINEERING AND INFORMATION SYSTEM DESIGN**

Course Code: **CSTE 3209**, Course Title: **Software Engineering and Information System Design**,3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 3, Term 2

Rationale: This course introduces the concepts and methods required for the construction of large software intensive systems. It aims to develop a broad understanding of the discipline of software engineering.

Course Objectives:

- Apply software engineering practice over the entire system lifecycle. This includes requirements engineering, analysis, prototyping, design, implementation, testing, maintenance activities and management of risks involved in software and embedded systems.
- Effective communication skills and technical skills to assure production of quality software, on time and within budget.
- Agile software developers with a comprehensive set of skills appropriate to the needs of the dynamic global computing-based society.
- Capable of team and organizational leadership in computing project settings, and have a broad understanding of ethical application of computing-based solutions to societal and organizational problems.
- Understanding of the role and impact of software engineering in contemporary business, global, economic, environmental and societal context.
- Ability to use knowledge, techniques, skills and modern tools necessary for software engineering practice.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)

32.	Overview of Software Industry, Introduction to Software Engineering, Software Development Process and Various Life Cycle Models.	**Basic of Software Engineering** Explain the software engineering practice. Understand the basic terminology and characteristics of good software. Explain the system development and software development life cycle.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes.
33.	Communication Techniques, Analysis Principles, Software Prototyping, Requirement Specification.	**Requirement Engineering and Modeling.** Explain the tasks of requirement engineering. Initiate requirement engineering process. Recognize multiple viewpoint.	Lecture and discussion with requirement analysis tasks. Discuss Inception, Elicitation, Elaboration, Negotiation, Specification, validation, and requirement management and software prototype.	Answer basic questions, quizzes, Homework, exams.
34.	Working in Teams, Characteristics of Successful Team, understanding Group Dynamics, Team Roles and Temperament, democratic Team and Chief Programmer Team Approach.	Work in team environment. Explain the characteristics, roles and responsibilities of teams.	Lecture and discussion with problems related to teamwork.	Homework, exams.
35.	Steps of system analysis, Feasibility study, Economic and technical analysis, System specification, the elements of analysis model.	**Feasibility Study** Understand technical feasibility, operational feasibility, economic feasibility, and operational feasibility. Build analysis model. Explain the elements of the analysis model.	Lecture and discussion on different types of feasibility study and feasibility study process. Discussion with problems and its solution.	Exercise with various scenario.
36.	Data modeling, Functional modeling and information flow, Behavioral modeling, Mechanics of structured analysis, Data Dictionary.	Understand data flow diagram. Explain functional model. Understand graphical description. Explain activity diagram.	Lecture and discussion on elements of different types of models. Discussion with problems.	**Class Test 1** (topics of the weeks 1-4)
37.	Design principles, Design Concepts, effective modular design, design	**Software Design** Explain design principles, concepts. Design effective software module.	Lecture and discussion with problems and its solution.	Answer basic questions, quizzes, Exercise with

	heuristics, Data Design, Architectural Design process,	Understand taxonomy of architectural styles.		various scenario, exams.
38.	Transformation mapping, Transaction mapping, interface design, human computer interface design, procedural design.	Use DFDs to map real life scenarios to a software architecture. Explain transaction flow. Understand how to design interface.	Lecture and discussion with problems and its solution.	Exercise with various problem scenario.
39.	Testing fundamentals, test case design, white-box testing, black-box testing, testing GUIs, Unit testing, Integration testing, validation testing, system testing, debugging.	**Software Testing** Understand the characteristics of different types of testing. Develop test cases. Understand strategic approach to software testing. Explain recovery, security, stress, performance testing. Explain alpha and beta testing.	Lecture on design different test cases and perform different types of software testing based on scenarios.	Answer basic questions, exams.
40.	Major maintenance activities, estimating maintenance cost and productivity.	**Maintenance.** Understand different types of software maintenance. Understand key factors that distinguish development and maintenance Estimate repair and maintenance cost.	Lecture on corrective, adaptive, perfective maintenance and maintenance cost estimation.	**Class Test 2**(topics of the weeks5-8)
41.	Project estimation, estimation techniques, project scheduling, critical path analysis.	**Software Cost Management.** Apply critical path method of software project management. Estimate cost in software project.	Lecture and discussion with problems.	Answer basic questions, exams.
42.	O-O concepts, O-O analysis, Domain analysis, O-O analysis process, Object relational model. O-O design: system design process, object design process, O-O programming.	**Object Oriented Software Engineering.** Understand the generic steps of object-oriented analysis. Understand how a software design may be represented as a set of interacting objects that manage their own state and operation. Understand the different models that may be used to document an object-oriented design Represent the models in the Unified Modeling Language (UML).	Lecture and discussion with problems.	Quizzes, Homework, exams.
43.	**O-O Testing:** Testing strategies,	Explain object oriented testing by designing test cases.	Lecture and discussion with problems.	**Class Test 3** (topics of the

	test case design. **Introduction to CASE Tools:** What is CASE, the taxonomy of CASE tools, iCASE environment, CASE repository, Example CASE tools.	Development and maintenance of software projects with help of various automated software tools. Automate SDLC activities	Component and scope of CASE tools.	weeks9-12)
44.	Trade Marks, Copy Rights, Trade Secrets, Patents.	**Intellectual Properties** Understand some software engineering ethics. Explain and differentiate trademarks, copy rights, trade secrets and patents.	Lecture and discussion with examples.	Exercise the answering methods in final exam.

Recommended Books:

1. Software Engineering, A Practitioner's approach by Roger S. Pressman, 4th Edition, McGraw Hill
2. Software Engineering by I. Sommerville, 6th Edition, Pearson Education
3. Software Engineering Concepts by Richard Fairley, 1st Edition, McGraw Hill
4. Software Quality Assurance from Theory to Implementation by D. Galin, 1st Edition, Addison Wesley
5. Software Engineering for Internet Applications by Eve Andersson, et. al.
6. UML Process by SharamHekmat

COURSE CODE: **CSTE 3210**, COURSE TITLE: **SOFTWARE ENGINEERING AND INFORMATION SYSTEM DESIGN LAB**

Course Code: **CSTE 3210**, Course Title: **Software Engineering and Information System Design Lab**,3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 3, Term 2	
Rationale: This course focuses on experiments to verify practically the theories and concepts develop in CSTE 3209.	
Course Objectives: ➢ Apply software engineering practice over the entire system lifecycle. This includes requirements engineering, analysis, prototyping, design, implementation, testing, maintenance activities and management of risks involved in software and embedded systems. ➢ Develop software in application level by the knowledge of previous knowledge such as database system, software engineering, data structure etc. ➢ Follow the procedure of software such as collection of user requirements by visiting different organization/institution or company. ➢ Understanding of the role and impact of software engineering in contemporary business, global, economic, environmental and societal context. ➢ Ability to use knowledge, techniques, skills and modern tools necessary for software engineering practice.	
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Previous questions.	
	Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-3	House hold accounting- for budgeting of a particular family.	Applysoftware development life cycle. Initiate requirement engineering process.	Discussion, practice and case study	Answer basic questions, Homework.
4-5	Library management system to run a library.	Understand technical feasibility, operational feasibility, economic feasibility, and operational feasibility. Recognize multiple viewpoint. Work in team environment. Design effective software module. Develop test cases. Estimate project cost. Explain recovery, security, stress, performance testing Understand different types of software maintenance.	Discussion, practice and case study	quizzes, Homework, Quiz 1 (Topic of the 1-3 weeks)
6-7	Payroll system.		Discussion, practice and case study	Answer basic questions, Homework.
8-9	Lubricating oil management system.		Discussion, practice and case study	Answer basic questions, Homework. Quiz 2 (Topic of the 4-7 weeks)
10-11	Super shop management system.			Answer basic questions, Homework.
12	To perform other experiments relevant to this course.	Understand key factors that distinguish development and maintenance .	Discussion, practice and case study	Answer basic questions, quizzes, Homework, exams. Quiz 3 (Topic of the 8-11 weeks)
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 3211**, COURSE TITLE: **WIRELESS AND MOBILE COMMUNICATION**

Course Code: **CSTE 3211**, Course Title: **Wireless and Mobile Communication,** 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 1, Term 2
Rationale: This course has been designed for the students to understand wireless and mobile cellular communication systems, advanced multiple access techniques, frequency reuse, cell splitting, different modulation techniques, different generations mobile, wireless LAN and other networks.
Course Objectives: ➢ To enable the student to synthesis and analyze wireless and mobile cellular communication systems. ➢ To provide the student with an understanding of advanced multiple access techniques. ➢ To provide the student with an understanding of diversity reception techniques. ➢ To give the student about understanding digital cellular systems (cdma 2000, W-CDMA, LTE),

WLAN, RTS/CTS mechanism, GSM, GPRS, Bluetooth networks.

- By the end of the course, the student will have the ability to work in advanced research wireless and mobile cellular programs.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	Evolution of mobile radio communications, wireless communication system definitions, FDD and TDD, cordless and cellular mobile systems, different generations of wireless networks, modulation techniques for wireless communication.	**Introduction to wireless communication.** To learn the basic concepts on wireless communication system, different generations of wireless networks. To understand different duplexing and modulation techniques.	Overall discussion with the students must be needed about the course contents including the objectives, course outcomes, examinations, physical environment and methodology.	Answer basic questions, group discussion, assignments.
2	FDMA, TDMA and CDMA multiple access techniques for wireless communications,	**FDMA, TDMA and CDMA.** To understand the multiple access techniques for wireless communications, To setup encoding and decoding techniques by using CDMA.	Delivering lecture and overall discussion with the students must be needed on several techniques of multiple access. Show the comparison among FDMA, TDMA and CDMA in classroom.	Draw the circuit diagrams to design the multiple accesses in classroom. Assignments on the applications of multiple accesses must be submitted regularly.
3	GSM and GPRS: services, system architecture, radio interface, protocols, handover, security.services,	**GSM and GPRS.** To understand the architecture and other services of GSM and GPRS.	Delivering lecture and overall discussion on GSM and GPRS systems. Demonstrate block diagrams and video tutorials GSM and GPRS systems in the classroom.	Answer basic questions and demonstrate presentation.
4	2.5G systems, EDGE, TETRA, TDMA frame structure of TETRA, 3G systems, UMTS, Spreading and scrambling technique, UTRAN, 4G and beyond	**Special Wireless Network Systems.** To draw the block diagrams of special wireless networks. To be able to understand the Spreading and scrambling technique.	Demonstrate various techniques to solve the design of all wireless networks.	Q & A session, demonstrate presentation and assignments.
5	IS-95 System architecture,	**CDMA Terminologies.**	Delivering lecture	**Class Test**

	Air interface, Physical and Logical channel, Handover and Security, and Introduction to CDMA 2000, W-CDMA	To draw the block diagrams of different categories CDMA system. To understand the handover, security and channel formation in CDMA technique.	and overall discussion on different categories CDMA system.	**1**(topics of the weeks 1-4)
6	Mobile telephone systems, Trunking efficiency, Basic cellular system, Performance criteria, Mobile radio environment, Operation of cellular systems, Planning a cellular systems, Analog and digital cellular systems.	**Cellular Mobile Concepts.** To understand the concept of trunking, grade of service, mobile phone functions, setting a call, types of mobile system, control channel and mobile equipment.	Lecture and explanation on cellular Mobile Concepts in the class room.	Answer basic questions, group discussions, assignments.
7	frequency reuse, cell splitting, registration, terminal authentication, handoff;	**Cellular Services.** To improve coverage and capacity in cellular systems.	Lecture and discussion on different cellular services to expand cellular coverage and capacity.	Group discussion, presentation.
8	Path loss modeling and signal coverage, Path loss model for outdoor communications- Free space propagation model, Two-Ray model, Okumura model, Hata model, Path loss model for indoor communications.	**Radio Propagation and Path Loss Model.** To solve different radio propagation and path loss problems for indoor and outdoor communications. To compare the characteristics among different path loss models.	Demonstrate on various path loss models for outdoor and indoor communications.	Q & A session and demonstrate presentation.
9	Small scale fading- Flat fading, Frequency selective fading, Fast fading, slow fading, Large scale fading, Rayleigh and Rician distributions. Statistical model for multipath fading channels. Narrowband fading model, Wideband fading model, Diversity, transmit diversity, receive diversity-selection combining (SC), maximal ratio combining, Coherence time and Coherence bandwidth, Path loss, shadowing and multipath, Effects of multipath channel, Doppler shift.	**Fading.** To know about different fading problems occurred due to multipath propagation in cellular system and solve the problems by applying diversity schemes.	Lecture and explanation on different fading problems and to solve the problems by applying diversity schemes.	**Class Test 2**(topics of the weeks 5-8)
10	Frequency planning, noise and interference in wireless communication systems, antenna & radio-wave propagation in the mobile environment-fading.	**Wireless Communication Technology.** To comprehend pros and cons of basic wireless communication system. To solve different noise,	Delivering lecture and overall discussion on several topics of basic wireless communication	Answer basic questions, group discussion, presentation.

		interference and radio propagation problems in mobile system. .	system in classroom.	
11	IEEE 802.11 standard, WLAN Family, WLAN modulation system, WLAN protocol architecture, Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA Collision avoidance (CSMA/CA).	**Wireless LAN.** To understand different WLAN basics, family and modulation system. To design WLAN protocol architecture and solve hidden terminal problems in WLAN by using CSMA/CD mechanism.	Lecture and discussion on WLAN basics, family and modulation system, protocol architecture and CSMA/CD mechanism.	Q & A session, demonstrate presentation and assignments.
12	IEEE 802.11 Distributed Coordinate System (DCF) and Point Coordination Function (PCF), WLAN family (HAN, WPAN, Wireless ATM. HIPERLAN: Requirements & Architecture. BLUETOOTH architecture & protocol stack. Brief introductions to 3G and 4G Cellular Mobile Communications Systems. Adhoc network (MANET, VANET)	**WLAN and ADHOC families.** To learn about different WLAN and ADHOC network systems. To design and maintain these networks properly.	Lecture and explanation on the pros and cons ofdifferent WLAN and ADHOC network systems.	**Class Test 3**(topics of the weeks 9-12)
13	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

1. Mobile Communications by Jochen Schiller, PEARSON Education Ltd.
2. Mobile Cellular Telecommunications by William C.Y. Lee, McGraw Hill.
3. Wireless Communications: Principles and Practice by Theodore S. Rappaport, Wiley.
4. Wireless Digital Communication by KamiloFeher, Prentice Hall.
5. Wireless Communications by Andrea Goldsmith, Cambridge University Press.

COURSE CODE: **CSTE 3212**, COURSE TITLE: **WIRELESS AND MOBILE COMMUNICATION LAB**

Course Code: **CSTE 3212**, Course Title: **Wireless and Mobile Communication Lab**, 2 Hours/Week, 1 Credit, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 3, Term 2
Rationale: This course deals with Wireless connectivity establishment, designing and monitoring. It also helps to investigate different signal bands and channels.
Course Objectives: ➢ Experimental verifications of theoretical concepts developed in CSTE 3211. ➢ To understand Wireless LAN designing and develop Wireless LAN connectivity between two pcs. ➢ To investigate different signals and channels. ➢ To create frequency flat Rayleigh fading channel and Rican fading channel object for processing a DBPSK signal.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1-2	• How to create a home group. • Configure two pc for wireless LAN using DWL-2100AP. • Transfer a file between two pc using wireless LAN.	• Learn about wireless LAN connectivity and transfer data through it.	Discussion and practice	-Home task -Quiz
3-4	• Radio Signal Monitoring and White Space Allocation • Investigate a wide band (1710 – 3500 MHz) • Investigate the ISM band (2400-2500MHz)	• Learn about monitoring and investigation of different band signal.	First lecture and then Practice	Answer basic questions, quizzes, Homework, exams. Quiz 1 (Topic of the 1-4 weeks)
5-6	• Signal strength of the 3G mobile phone frequency band • Monitoring 3G mobile phone signal (optional) • Simulate a QPSK modulation scheme and compare it with BPSK scheme.	• Learn about the simulation.	Lecture and discussion with problems.	Homework
7-8	• Create a frequency flat Rayleigh fading channel object. Uses it to process a DBPSK signal. • Create a Rican fading channel object. Uses it to process a DBPSK signal. • Generate binary random sequence with length 10000.	• Create frequency flat Rayleigh fading channel and Rican fading channel object.	Lecture and discussion with problems.	Quiz 2 (Topic of the 5-8 weeks)
9-10	• Pulse Shaping and Matched Filtering. • OFDM Modulation & Frequency Domain Equalization. • Channel Estimation & Equalization.	• Learn about filtering, modulation, and channel estimation and equalization.	Practice with a real-life problem.	Answer basic questions, quizzes, Homework, exams.
11-12	• Wireless LAN designing by LAN Planner. • Investigation on WLAN	• Learn about wireless LAN design and investigation	Lecture and discussion with problems.	Answer basic questions, Homework Quiz 3 (Topic of

	Multipath Channel.			the 9-10 weeks)
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 3226**, COURSE TITLE:**VIVA VOCE**

COURSE CODE: **CSTE 3226**, COURSE TITLE: **VIVA VOCE**, 0 Hours/Week, 1 Credits, Total Marks 100, Year 3, Term 2	
Rationale: This course has been designed to develop the students' ability to realize practical situation of job environment.	
Course Objectives: ➢ Prepare the students to face interview both at the academic and the industrial sector	
COURSE CONTENTS	**OUTCOME** (Student should be able to)
VIVA VOCE (Viva based on major/minor courses of Year-3)	Evaluate overall technical knowledge and industry readiness. Able to go under a virtual environment of technical interview. Able to analyze various application of Computer Science & Telecommunication Engineering in real-life problem solving.

Year-4 Term-1

Sl.#	Course Code	Course Title	Credit	Credit Hours	Page No.
1	CSTE 4101	Computer Graphics and Animation	3	3	
2	CSTE 4102	Computer Graphics and Animation Lab	1	2	
3	CSTE 4103	Artificial Intelligence and Neural Networks	3	3	
4	CSTE 4104	Artificial Intelligence and Neural Networks Lab	1	2	
5	CSTE 4105	Compiler Construction	3	3	
6	CSTE 4106	Compiler Construction Lab	1	2	
7	CSTE 4108	Software Development Project	1	2	
8	CSTE 4109	Cryptography and Information Security	3	3	
9	CSTE 4110	Cryptography and Information Security Lab	1	2	
10	CSTE 4111	Industrial Training	1	0	
11	CSTE 4125	Project and Thesis	2	2	
		Total	**20**	**23**	

COURSE CODE: **CSTE 4101**, COURSE TITLE: **COMPUTER GRAPHICS AND ANIMATION**

Course Code: **CSTE 4101**, Course Title: **Computer Graphics and Animation**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 4, Term 1

Rationale: This course has been designed to develop the students' ability to implement the tools and techniques of different computer graphics.

Course Objectives:

- Explain the tools and techniques of different computer graphics hardware and software.
- Describe briefly different algorithms used in computer graphics.
- Discuss clipping, splines and interactive techniques.
- Explain lighting models, shading and animation techniques.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course contents**	**Outcome** (at the end of the session, student should be able to)	**Teacher Learning strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	**Computer Graphics Programming:** OpenGL. Scan Conversion: scan converting a point, line, circle, ellipse, arc, and sectorized polygons.	Work with OpenGL. Explain Scan Conversion and converting method of a point, line, circle, ellipse, arc, and sector-based polygon.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, physical environment and methodology with the students. Demonstrate problem solving techniques	Answer basic questions, quizzes, Homework, exams.

2.	**Camera Analogy and Color Model:** Viewing, Windowing,Clipping, RGB color model,CMYK color model, Lookup table and direct coding	Explain viewing, windowing, and clipping. Learn different color models like RGB, CMYK, lookup table, and direct coding.	Lecture and discussion about camera analogy and color model.	Answer basic questions, quizzes, Homework, exams.
3.	**ProjectiveTransformation:** Types of projection, Parallel Projection, Perspective Projection	Learn and explain different types of projection.	Demonstrate examples of projective transformation using internet.	Answer basic questions, quizzes, Homework, exams.
4.	**Vector and Matrix:** Normal Vector,View Vector, 2D and 3D Rotation and Translation Matrix	Explain normal and view vector. Differentiate between 2D and 3D rotation and translation matrix.	Lecture and discussion about vector and matrix.	Answer basic questions, quizzes, Homework, exams.
5.	**Raster Graphics & Hidden Surface Removal:** Line Drawing,Anti-aliasing,Polygon Filing Algorithms, Z-buffer algorithm,Painter's algorithm	Explain about line drawing, anti-aliasing, polygon filing algorithms, Z-buffer algorithm, and painter's algorithm.	Use different software tools to implement algorithms relate to raster graphics and hidden surface removal.	**Class Test 1** (topics of the week's 1-4)
6.	**Lighting and Surface Property:** Diffused Light, Ambient Light, Specular Light, Lighting Models for reflection, refraction and transparency	Compare different light such as diffused light, ambient light, and specular light. Explain lighting models for reflection, refraction and transparency.	Lecture and discussion about lighting and surface property.	Answer basic questions, quizzes, Homework, exams.
7.	**Shading and Texture Mapping:** Flat Shading, Lambert Shading, Phong Shading, Texture Fundamentals, Texture Blending	Differentiate among Flat, lambert, and phong shading. Explain Texture fundamentals and blending.	Lecture and demonstrate shading and texture mapping.	Answer basic questions, quizzes, Homework, exams.
8.	**Curves and Surfaces:** Types of Curves, Cubic-Spline, Beta-Spline, NURBS	Explain different types of curves, cubic-spline, beta-spline, and NURBS.	Lecture and discuss about curves and surfaces.	Answer basic questions, quizzes, Homework, exams
9.	**Image Formats:** PPM,BMP,Image Based Rendering	Explain PPM, BMP, and Image Based Rendering.	Lecture and discussion about Image formats.	**Class Test 2** (topics of the week's 5-8).
10.	**Morphing** View-morphing**,** Volume Metamorphosis	Explain view-morphing, and volume metamorphosis.	Lecture and discussion about morphing.	Answer basic questions, quizzes, Homework, exams.

11.	**Animation:** Real time animation, Hardware for real-time animation, Character Animation, Computer Games, Movies	Explain real time animation, hardware for real-time animation, character animation, Computer games, and movies.	Lecture and demonstrate videos of real time animations, games and movies using animation.	Answer basic questions, quizzes, Homework, exams.
12.	**Animation:** Computer based Animation, Animation Language, Methods of controlling Animation, Display of Animation, Transmission of Animation	Explain computer-based animation, animation language, and methods of controlling animation. Demonstrate animation and transmission of animation.	Lecture and discussion about animation. Use Unix and 3D max studio for practical uses.	**Class Test 3** (topics of the week's 9-12)
13.	Miscellaneous and Final exam preparation	Learn about latest trends and the better answering methods in final exam.	Lecture and discussion on miscellaneous subjects	Exercise the answering methods in final exam.

Recommended books:

4. Computer Graphics: A Programming approach by St even Harrington, McGraw Hill.
5. Computer Graphics by Donald Hearnand M. Pauline Baker, Prentice Hall.
6. OpenGL(r) 1.2 Programming Guide, Third Edition: The Official Guide to Learning OpenGL, Version 1.2: by Mason Woo, Jackie Neider, Tom David, Dave Shriner, OpenGL Architecture Review Board, Tom Davis, Dave Shreiner.
7. Computer Graphics: Schaum's Outlines, McGraw Hill.
8. Animations for Beginners by MorrOleroz.

COURSE CODE: **CSTE 4102**, COURSE TITLE: **COMPUTER GRAPHICS AND ANIMATION LAB**

Course Code: **CSTE 4102**, Course Title: **Computer Graphics and Animation Lab**,2 Hours/Week, 1 Credit, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 4, Term 1

Rationale: This course deals with drawing line, circle, and ellipse, scan conversion, transformation, line and polygon clipping, and 3D graphics using OpenGL API.

Course Objectives:

- Experimental verifications of theoretical concepts developed in CSTE 4101.
- To understand different algorithms related to drawing line, circle, and ellipse properly.
- To use scan conversion technique to convert various designs and characters.
- To develop 3D models using OpenGL API
- To develop complete project using these concepts.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, OpenGL.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)

1-2	• Draw a Line using Polynomial Line Algorithm, DDA Line Algorithm, Bresenham's Line Algorithm • Draw a Circle using Midpoint Circle Algorithm, Polynomial circle algorithm, Trigonometric circle algorithm, Bresenham's circle algorithm	• Write programs for drawing line, and circle using different algorithms	Discussion and practice	-Home task -Quiz
3-4	• Draw an Ellipse using the Polynomial algorithm, Trigonometric algorithm. • Draw an Arc and a sector.	• Write programs for drawing ellipse, arc and sector using various algorithms	First lecture and then Practice	Quiz 1 (Topic of the 1-4 weeks)
5-6	• Scan conversion of various characters: using Bitmap method and Outline method • Scan converting a character bangle ka using Bitmap method and Outline method • The scan converts Shahid Minar, SritiShoudo, a clock and a flower.	• Write programs on scan conversion of various characters and designs.	Lecture and discussion with problems.	Answer basic questions, quizzes, Homework, exams.
7-8	• Rotate a Line, Triangle, and Rectangle about a point. • Magnifying a circle, a triangle and a rectangle about a point. • Create a flower with rotating an object	• Write programs on transformation.	Lecture and discussion with problems.	Quiz 2 (Topic of the 5-8 weeks)
9-10	• Scan converts a three-dimensional "F" and cube then rotates the object about the x-axis and magnifies it. • Rotate a 3D cube and NSTU Shahid Minar using OpenGL. • Projection of 3D cube.	• Write 3D graphical programs using OpenGL API.	Practice with a real life problem.	Answer basic questions, quizzes, Homework, exams.
11	• Line & polygon clipping problems. • To perform also other experiments relevant to this course.	• Write programs on line and polygon clipping	Lecture and discussion with problems.	Answer basic questions, Homework Quiz 3 (Topic of the 9-12 weeks)
12	**Project**	• Submit a project using the concepts of structured programming language.	Evaluate each project.	Presentation, Project showcasing.
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 4103**, COURSE TITLE: **ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS**

Course Code: **CSTE 4103**, Course Title: **Artificial Intelligence and Neural Networks**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 4, Term 1

Rationale: Artificial Intelligence (AI) is a flourishing research field that is one of the driving forces of today's economy and as such is having increasing impact on our way of living. Artificial intelligence studies how computers can be made to behave intelligently. In this course we'll cover theoretical and practical approaches to AI, with topics to include search, game playing, knowledge representation, logic, uncertainty and decision-making systems. This course also introduces students with the Machine learning algorithms. Machine learning is a specific subset of AI in which machine can learn by its own without being explicitly programmed.

Course Objectives:

- Formulate search problems and implement search algorithms using admissible heuristics.
- Formulate constraint satisfaction problems and find solutions using constraint graphs.
- Describe games as adversarial search problems and implement optimal and efficient solutions.
- Obtain theoretical and practical knowledge about principles for logic-based representation and reasoning.
- To understand natural language processing and to learn how to apply basic algorithms in this field.
- Formulate nondeterministic search as Markov decision processes and solve the Bellman equations in reinforcement learning contexts.
- Formulate Bayes' nets for stochastic problems and use them to solve inference problems.
- Solve temporal applications using hidden Markov models and filtering algorithms.
- Understand the applications of Fuzzy set theory and design Fuzzy controllers.
- Define the machine learning problems and implement simple algorithms including Naive Bayes, Neural Networks and Support Vector Machine.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcomes** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1.	**Introduction to AI**: History of AI, Views of AI, Turing Test, Intelligent Agents	• Know about the history of AI research; • Understand the views, objectives and principles of AI; • Explain the architecture, properties and types of AI agents/systems; • Differentiate between AI and Non-AI systems.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations.Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2.	**Search:** State Space Search, Uninformed search algorithms	• Formulate problems, such as puzzles as State Space Search problems; • Learn the ways of obtaining brute-force solution of such problems by using un-informed search techniques; • Choose the appropriate algorithm for different types	Lecture and discussion, showing programming solutions of simple problems to reinforce the theoretical understandings.	Answer basic questions, quizzes, Homework, exams.

		of problems		
3.	**Informed search techniques:** A* and Greedy Best First Search, Designing Heuristics, Hill Climbing Search, Simulated Annealing, Constraint Satisfaction Problems, Planning problems	• Learn to solve optimization problems using different informed search techniques; • Design admissible heuristics for finding optimal solutions faster; • Understand Constraint Satisfaction Problems and Local Search Problems; • Realize the techniques and algorithms to solve Constraint Satisfaction Problems and Local Search Problems.	Lecture and discussion, showing programming solutions of simple problems to reinforce the theoretical understandings.	Answer basic questions, quizzes, Homework, exams.
4.	**Game playing:** Two player zero sum games, Minimaxing Algorithm, Alpha-beta pruning	• Use minimaxing algorithm to design AI for two player zero–sum games (i.e. Chess); • Understand the utility of alpha-beta pruning technique for increasing the effectiveness of such AI.	Lecture and discussion, Visual simulation, showing programming solutions of related problems to reinforce the theoretical understandings.	Answer basic questions, quizzes, Homework, exams.
5.	**Knowledge Representation:** KR Frameworks, Semantic Nets, Introduction to Logical reasoning	• Represent knowledge of a domain formally using different KR frameworks; • Design, implement and apply a knowledge-based system, andunderstand the limitations and complexity of reasoning algorithms.	Lecture and discussion, demonstrating related problems	Answer basic questions, quizzes, Homework, exams.
6.	**Logic:** Propositional and Predicate Logic, First Order Predicate Logic, Prolog	• Understand and be able to explain and illustrate the meaning of given logical formulas, to translate such formulas into English and vice-versa; • Be able to use the resolution proof system in propositional logic and in predicate logic; • Learn to use Prolog language to solve FOPL problems	Lecture and discussion, showing programming solutions of related problems to reinforce the theoretical understandings.	Answer basic questions, quizzes, Homework (word size expansion, memory location expansion), exams.
7.	**Natural Language Processing:** Introduction, history of NLP, Natural language understanding: semantic representation, inference and knowledge representations. **HMM and Speech Recognition:** Speech	• Apply basic algorithms for NLP; • Get acquainted withunderlying computational properties of natural languages; • Conceive basics of speech recognition and speech synthesis techniques;		

	Recognition Architecture, Overview of HMM, A* decoding			
8.	**Uncertainty:** Reasoning under uncertainty, Bayes' Rule, Bayesian Net, Dempster-Shafer Theory	• Understand the probabilistic principles of reasoning under uncertainty; • Have insight into algorithms for probabilistic reasoning in Bayesian networks; • Have insight into the pros and cons of learning models versus using expert knowledge; • Using Bayesian Network and Dempster-Shafer Theory to solve problems involving uncertainty	Lecture and discussion, Visual simulation, showing solutions of related problems to reinforce the theoretical understandings.	Answer basic questions, quizzes, Homework, exams.
9.	**Fuzzy Logic:** Crisp vs Fuzzy Set Theory, Fuzzy controller, Fuzzification, Inference rules and Defuzzification techniques	• Understand the concepts of fuzzy sets; • Knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic;	Lecture and discussion, Visual simulation, showing solutions of related problems to reinforce the theoretical understandings.	Answer basic questions, quizzes, Homework, exams.
10.	**Markov decision process:** Stochastic Processes and Finite Horizon MDPs, Infinite Horizon Discounted MDPs,value iteration, policy iteration, linear programming methods, and applications **Hidden Markov Models**	• Learn about sequential decision making in a stochastic environment; • Model engineering problems as Markov Decision Process (MDP) and study the tools and techniques to solve these MDPs.	Lecture and discussion, Visual simulation, showing programming solutions of related problems to reinforce the theoretical understandings.	Answer basic questions, quizzes, Homework, exams.
11.	**Introduction to Neural Networks:** History and concepts of Artificial Neural Networks (ANN), Models of ANN, Learning algorithms	• Understand the concepts and architecture of neural networks and connectionist models; • Identify and describe the mathematical elements, characteristics and behaviors of different types of neural networks; • Design, train, use and analyze neural networks for practical purposes.	Lecture and discussion, Visual simulation, showing programming solutions of related problems to reinforce the theoretical understandings.	Quizzes, Homework, exams.
12.	**Backpropagation Network:**	• Understand the architecture of Backpropagation Network;	Lecture and discussion, Visual simulation,	Answer basic questions, quizzes,

	Architecture of Backpropagation Network, Learning in Backpropagation Network, Gradient Descent Learning	• Realize the concept of Gradient Descent Error correction technique; • Design, train, use and analyze Backpropagation networks for practical purposes.	showing programming solutions of related problems to reinforce the theoretical understandings.	Homework, exams.
13.	**Recurrent Neural networks:** Structure of RNN, LSTM, Learning in RNN **Support Vector Machine (SVM)**	• Understand the architecture of Recurrent Neural Network; • Realize the methods of learning in RNNs; design, train, use and analyze RNN for practical purposes; • Understand the basic concept and application of SVM for classification problems.	Lecture and discussion, Visual simulation, showing programming solutions of related problems to reinforce the theoretical understandings.	Exercise the answering methods in final exam.

Recommended Books:

1. Artificial Intelligence: A Modern Approach by Stuart J. Russel and Peter Norvig, Pearson.
2. Introduction to Artificial Intelligence and Expert System by D. W. Patterson,Prentice-Hall.
3. Prolog Programming for Artificial Intelligence by Bratko, Addison-Wesley.

COURSE CODE: **CSTE 4104**, COURSE TITLE: **ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS LAB**

Course Code: **CSTE 4104**, Course Title: **Artificial Intelligence and Neural Networks Lab**, 3 Hours/Week, 1.5 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 3, Term 2				
Rationale: This course accompanies the theoretical course CSTE 4103, where various AI concepts are discussed. In this course, the student will try to programmatically solve various AI problems on some selected topics. They will be introduced to new programming languages and frameworks for AI along the way. In each topic, solutions for a few sample problems will be demonstrated to better grasp the techniques and algorithms. Then their understanding will be tested using assignments and home tasks.				
Course Objectives: • Reinforce the concept of various AI concepts learnt in theory lectures. • Get acquainted to various AI tools like programming languages and frameworks. • Get firsthand experience on how to implement learnt algorithms in suitable programming languages. • Solve search, planning, reasoning, assertion, prediction, classification and regression problems using appropriate AI tools; • Learn to design, train and use machine learning systems.				
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Codeblocks IDE, MATLAB, Tensorflow, CNTK, Keras, Theano Neural Network frameworks, Python.				
	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)

1-2	**State Space Search: Uninformed search:** Implementing BFS, DFS, DLS, IDS, and Bidirectional search for solving - • Water-jug problem • 8-puzzle problem, • Missionaries and Cannibals problem	• Reinforce the concept of various uninformed search techniques learnt in theory lectures by analyzing and coding solutions of various related problems;	Discussion, Demonstration of sample programing codes to guide students	Home task, assignments, Lab exam
3	**Informed search:** Rewrite 8 puzzle problem solution using heuristics and implementing - • Greedy best first search • A* heuristic search Use heuristic search for path finding problems	• Reinforce the concept of various informed search techniques learnt in theory lectures; • Design admissible heuristics for informed search problems;	Discussion, Demonstration of sample programing codes to guide students	Home task, assignments, Lab exam
4	**Constraint satisfaction and Local search problems:** Solve local search problems (i.e. n-queens problem) using: • Hill-climbing, • Simulated annealing, • Local beam search, • Genetic algorithm	• Reinforce the concept of various local search techniques learnt in theory lectures; • Write AI for solving constraint satisfaction and local search problems;	Discussion, Demonstration of sample programing codes to guide students	Home task, assignments, Lab exam
5	**Minimaxing algorithm:** Write a two player zero sum games AI program (i.e. Tic-Tac-Toe/ Chess) using - • Minimaxing algorithm • Minimaxing with alpha-beta pruning	• Reinforce the concept of minimaxing and alpha-beta pruning techniques learnt in theory lectures; • Write AI for two player zero sum games;	Discussion, Demonstration of sample programing codes to guide students	Home task, assignments, Lab exam
6-8	**Prolog:** Solve reasoning, deduction and assertion problems using Prolog (SWI-Prolog IDE): • Express family tree and relationships, • Solve Mark Twain's puzzle, • List manipulation, • Solve Einstein's puzzle	• Express domain knowledge in FOPL in prolog; • Write prolog programs for reasoning, assertion and deduction problems;	Discussion, Demonstration of sample programing codes to guide students	Home task, assignments, Lab exam
9	**Bayesian network:** Implement Bayesian Network to design a reasoning/ prediction system (i.e. Disease-Symptom Checker) using	• Reinforce the concept of Bayesian Network learnt in theory lectures; • Design simple prediction systems using Bayesian Network;	Discussion, Video tutorial, Demonstration of sample programing codes to guide students	Home task, assignments, Lab exam

	MATLAB/C++			
10-13	**Neural Network:** Learn about Neural Network frameworks: Tensorflow, CNTK, Keras, Theano; Setting up and using Tensorflow and Keras on Python environment for learning basic systems: • AND/OR gate using SLP, • XOR gate using MLP and Backpropagation learning, • Designing and training a CNN for English alphabet OCR;	• Reinforce the concept of Neural Networks learnt in theory lectures; • Get firsthand experience with available NN frameworks; • Setup environment to train basic systems;	Discussion, Video tutorial, Demonstration of sample programing codes to guide students	Home task, assignments, Lab exam

Course Code: **CSTE 4105**, Course Title: **Compiler Construction**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 4, Term 1

Rationale: The purpose of this course is to provide an understanding about the phase of compiler and to develop skill for constructing compiler.

Course Objectives:

- To introduce the major concept areas of language translation and compiler design.
- To explore the principles, algorithms, and data structures involved in the design and construction of compilers.
- To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, machine code generation, and use of symbol table.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To provide practical programming skills necessary for constructing a compiler.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Introduction:** Compilers & Translators, Structure of Compiler, phases of Compiler, Compiler writing tools, Programming languages:	describe the design of a compiler including its phases and components.	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2	**Introduction:** Lexical & Syntactic structure of a Language, Data elements, Data structures, Operators, Assignments, Program Units, Data environments. Parameter transmission, storage Management, Lexical Analyzer.	Understand different translation technique and symbol extraction technique.	Lecture and problem discussion about lexical analyzer.	Answer basic questions, quizzes, Homework, exams.
3	**Syntax Analysis:** The role of Parser, Top-down parsing, predictive Parsers.	Learn basic parsing tools and its applications. Learn top-down parsing.	Lecture and discussion on parsing technique.	Answer basic questions, quizzes, Homework, exams.
4	**Syntax Analysis:** Bottom-up parsing. L.R. Parsers (SLR, CLR & LALR), Implementation of LR Parsers.	Learn different bottom-up parsing and implementations.	Lecture and discussion on bottom-up parsing technique: (SLR)	Exercise with various mathematical problems.
5	**Syntax Analysis:** Bottom-up parsing. L.R. Parsers (SLR, CLR & LALR), Implementation of LR Parsers.	Learn different bottom-up parsing and implementations.	Lecture and problem solving on bottom-up parsing technique:(CLR and LALR)	**Class Test 1**(topics of the week's 1-4)
6	**Syntax Directed**	Understand code	Lecture and	Answer basic

	Translation: Intermediate Code, Postfix notation, Parse tree, Three address code, quadruples, triples, Translation of assignment statements.	representation and its notations.	discussion with problems about different translation notations.	questions, quizzes, Homework, Viva-exams.
7	**Syntax Directed Translation:** Translation of Assignment statements. Boolean expressions, statements that alter the flow of control. Array references in arithmetic expressions, Procedure Calls, Declarations, and Case Statements.	Learn to translate productions into semantic rules and to evaluate the order of operations.	Lecture and discussion about semantic rules	Answer basic questions, quizzes, Homework (word size expansion, memory location expansion), exams.
8	**Symbol Tables:** Contents, Data structures for symbol tables, representing scope information.	Learn symbol table components, operations and its scope.	Lecture and discussion on scope management.	Answer basic questions, quizzes,
9	**Symbol Tables:** Error detection and Recovery: Error handling. Lexical-phase, Syntactic phase and semantic phase.	Learn different error detection and recovery technique.	Lecture and discussion on error detection.	**Class Test 2**(topics of the weeks5-8)
10	**Code Generation:** Issues in Code Generation, Target Machine, Runtime storage management.	Understand run-time environment and its tasks in compiler.	Lecture and discussion on code generation.	Answer basic questions, quizzes,
11	**Code Generation:** Basic block and flow graphs, Simple code generator, register allocation and assignment.	design & conduct experiments for Intermediate Code Generation in compiler.	Lecture and discussion and code generation from flow graph.	Quizzes, Homework, exams.
12	**Code Generation:** DAG, Peephole Optimization, Generation Code from DAG's. Three address codes, quadruples, triples.	Understand internal code representation and code generation.	Lecture and discussion on DAG.	**Class Test 3**(topics of the weeks9-12)
13	**Code optimization:** Principle source of optimization, optimization of basic books, blocks, loops in Flow graphs, Data-Flow analysis, code improving transformations, alias, Data flow algorithms	learn the new code optimization techniques to improve the performance of a program in terms of speed & space.	Lecture and discussion on code optimization.	Exercise the answering methods in final exam.

COURSE CODE: **CSTE 4106**, COURSE TITLE: **Compiler Construction Lab**, 2 Hours/Week, Credits: 1, Total Marks 100 (ClassAttendance=10, Internal Evaluation= 70, Final Viva-voce =20), Year 4, Term 1

Recommended Books:

1. Principles of Compiler Design by Alfred V. Aho and Jeffrey D. Ullman, Addison-Wesley.
2. Compiler design in C by A.J. Holub, Prentice-Hall .
3. Theory and Practices of Compiler Writing by Trembly and Sorensen, McGraw-Hill
4. Compiler Construction by Niklaus wirth, Addision-Wesley.

COURSE CODE: **CSTE 4106**, COURSE TITLE: **COMPILER CONSTRUCTION LAB**

Rationale: This course is aimed to deal with the practical implementation process of different phases of modern compiler. It will also help to understand the detail concept of each compiler design processes.

Course Objectives:

- To understand the basic concept of lexical analyzer and its operation.
- To understand the application of regular expression and grammar in language recognition.
- To understand the use of Lex, flex and other lexical analyzer generation tools.
- To understand the implementation of parser and code generator in compiler.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, C/C++ compiler, LEX & YACC Tools.

Lesson Plan (as per week):

Week	Course Contents	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1-2	Write a c program to find number of characters, number of alphabets, number of digits, number of white spaces and number of new lines from a file. Write a c program to find comments in a given file or text. Write a program that shows whether a variable is valid or not	To understand the basic operations of lexical analyzer.	Discussion and practice.	-Home task -Quiz
3-5	Write a c program to find keywords in a program. Write a c program to find different types of variables. Write a c program to find numbers in .c file. Write a C program to simulate lexical analyzer for validating operators. Write a c program to find operator precedence parsing for an expression like ((x+y*z) +p/q) +z	Implement the fundamental operation of compiler first phase.	Lecture and Discussion with problems.	Answer basic questions, quizzes, Homework, exams.
6	Write a c program to validate string by a given regular expression like a*b^{+}, (a|b)*abb, (ab)*aba. Write a C program to check whether a string belong to a grammar or not	Understand string validation concept in compiler design and its applications.	Lecture and discussion about regular expression and grammars.	Quiz 1 (Topic of the 1-5 weeks)
7	Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.	Apply Lex & YECC tool to implement lexical analyzer.	Lecture and discussion on Lex & YACC tools	Homework
8-9	Write a c program to eliminate left recursion in a production. Write a c program to identify first and follow of a grammar.	Implement grammar recursion elimination and first-follow identification.	Lecture and discussion with problems	Quiz 2 (Topic of the 6-7 weeks)
10	Write a c program to construct	Implement parsing	Lecture and	Homework

	parsing table for a predictive parser.	table and its application to parse	discussion on parsing	
COURSE CODE: **CSTE 4108**, COURSE TITLE: **Software Development Project**, 2 Hours/Week, 1 Credits, Total Marks = 100 (ClassAttendance=10, Internal Evaluation/Observation = 70, Final Viva-voce = 20), Year 4, Term 1				
Rationale: This course is intended with the practical implementation process of different phases				
	Program semantic rules to calculate the expression that takes an expression with digits, + and * and computes the value.	rules to recognize expression.	discussion about semantic rules	
12	Write a C program to generate machine code from abstract syntax tree generated by the parser.	Generate machine code from syntax tree.	Lecture and discussion code generation.	Answer basic questions, Homework Quiz 3 (Topic of the 8-12 weeks)
13	**Final Lab Exam (Job and Viva)**			

of modern compiler. It will also help to understand the detail concept of each compiler design processes.

Course Objectives:

- To understand the basic concept of lexical analyzer and its operation.
- To understand the application of regular expression and grammar in language recognition.
- To understand the use of Lex, flex and other lexical analyzer generation tools.
- To understand the implementation of parser and code generator in compiler.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, C/C++ compiler, LEX & YACC Tools.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	Write a c program to find number of characters, number of alphabets, number of digits, number of white spaces and number of new lines from a file. Write a c program to find comments in a given file or text. Write a program that shows whether a variable is valid or not	To understand the basic operations of lexical analyzer.	Discussion and practice.	-Home task -Quiz
3-5	Write a c program to find keywords in a program. Write a c program to find different types of variables. Write a c program to find numbers in .c file. Write a C program to simulate lexical analyzer for validating operators. Write a c program to find operator precedence parsing for an expression like ((x+y*z) +p/q) +z	Implement the fundamental operation of compiler first phase.	Lecture and Discussion with problems.	Answer basic questions, quizzes, Homework, exams.
6	Write a c program to validate string by a given regular expression like a*b^{+}, (a|b)*abb, (ab)*aba. Write a C program to check whether a string belong to a grammar or not	Understand string validation concept in compiler design and its applications.	Lecture and discussion about regular expression and grammars.	Quiz 1 (Topic of the 1-5 weeks)
7	Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.	Apply Lex & YECC tool to implement lexical analyzer.	Lecture and discussion on Lex & YACC tools	Homework
8-9	Write a c program to eliminate left recursion in a production. Write a c program to identify first and follow of a grammar.	Implement grammar recursion elimination and first-follow identification.	Lecture and discussion with problems	Quiz 2 (Topic of the 6-7 weeks)
10	Write a c program to construct parsing table for a predictive	Implement parsing table and its	Lecture and discussion on	Homework

	parser. Write a c program to LL(1) parsing for a given input expression.	application to parse input string.	parsing	
11	Write a C program to implement Program semantic rules to calculate the expression that takes an expression with digits, + and * and computes the value.	Implement semantic rules to recognize expression.	Lecture and discussion about semantic rules	Homework
12	Write a C program to generate machine code from abstract syntax tree generated by the parser.	Generate machine code from syntax tree.	Lecture and discussion code generation.	Answer basic questions, Homework Quiz 3 (Topic of the 8-12 weeks)
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 4109**, COURSE TITLE: **CRYPTOGRAPHY AND INFORMATION SECURITY**

Course Code: **CSTE 4109**, Course Title: **Cryptography and Information Security**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70), Year 4, Term 1

Rationale: This course has been designed to provide the students an in-depth understanding of different types of symmetric and public-key encryption-decryption technique for security in public network which is fundamental to the students' ability to become a successful network engineer.

Course Objectives:

- To provide students basics of Cryptography and Network Security.
- To give students a knowledge of standard algorithms used to provide confidentiality, integrity, and authenticity.
- To understand the various key distribution and management schemes.
- To understand various protocols for network security to protect against the threats in the networks.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Question bank, Previous questions.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able to)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1.	**Overview of Cryptography:** Concept of Cryptography, Cryptanalysis, Brute-force Attack. OSI Security Architecture: Security Attacks, Security Services, Security Mechanisms; Network Security Model.	➢ To introduce the basics of Cryptography with its importance in networking. ➢ To learn in detail about OSI security architecture.	Discussion on detailed information about the course, including the objectives, course outcomes, examinations. Lecture and discussion on the basics of Cryptography and OSI security architecture.	Answering basic questions, quizzes, Homework etc.
2.	**Symmetric Cryptosystem:** Symmetric Cipher Model, Substitution Technique: Caesar Cipher, Monoalphabetic Cipher, Polyalphabetic Cipher,	➢ To learn the basics of a symmetric cryptosystem. ➢ To analyze the encryption-decryption	Lecture and discussion on basics of symmetric cryptosystem with a variety of substitution and transposition symmetric	Answering basic questions, quizzes, Homework etc.

	Playfair Cipher, Hill Cipher; Transposition Technique: Rail Fence Technique, Columnar Transposition; Rotor Machines, Steganography.	algorithm of a variety of substitution and Transposition symmetric cipher technique.	ciphers encryption-decryption technique. Exercise on substitution and transposition symmetric ciphers encryption-decryption technique.	
3.	**Block Ciphers & DES:** Block Cipher Principals, The Feistel Cipher, Data Encryption Standard (DES). DES Encryption, DES Decryption, The Strength of DES, Differential and Linear Cryptanalysis of DES, Diffusion, and Confusion.	➢ To analyze the popular DES block cipher encryption-decryption technique.	Detailed discussion on DES encryption-decryption technique with examples.	Answering basic questions, quizzes, Homework etc.
4.	**AES:** Basic Structure, Primitive Operation, Inverse Cipher, Key Expansion, Rounds, Inverse Rounds, Simplified AES; Double DES, Triple DES.	➢ To analyze the popular AES block cipher encryption-decryption technique and some DES extensions.	Detailed discussion on DES encryption-decryption technique with examples and introduce with DES extension techniques.	Answering basic questions, quizzes, Homework etc.
5.	**Block Cipher Modes of Operation:** Electronic Codebook Mode (ECB), Cipher Block Chaining Mode (CBC), Cipher Feedback Mode (CFB), Output Feedback Mode (OFB), Counter Mode (CTR).	➢ To get a good understanding of different types of block cipher modes of operation.	Lecture and discussion on different types of block cipher modes of operation.	CT-1 (topics of the week's 1-4)
6.	Stream Cipher and RC4; Placement of Encryption Function: Link versus End-to-End Encryption, Traffic Confidentiality, Key Distribution Scenario, Automatic Key Distribution, Decentralized Key Distribution.	➢ To understand the stream cipher technique. ➢ To decide where encryption function should deploy in networks. ➢ To learn the procedures of symmetric key management and distribution.	Lecture and discussion on stream cipher technique, to identify potential locations where encryption function should deploy in networks and symmetric key management procedures.	Answering basic questions, quizzes, Homework etc.
7.	**Public Key Cryptosystems:** Requirements for Public Key Cryptography, Principles of Public Key Cryptosystems, **RSA** Algorithms, Security of RSA.	➢ To learn the basics of the public key cryptosystem. ➢ To analyze the RSA public key algorithm.	Discussion on the basics of public key cryptosystem and detailed discussion on RSA algorithm with examples.	Answering basic questions, quizzes, Homework etc.
8.	**Key Management:** Distribution of Public Keys, **Diffie-HellmanKey Exchange;** Authentication Requirements, Authentication Functions, Message Authentication Codes.	➢ To learn the procedures of public key management and distribution including Diffie-Hellman key exchange technique. ➢ To get a well	Lecture and discussion on public key management procedure with a detailed analysis of Diffie-Hellman key exchange technique and discussion on message authentication	Answering basic questions, quizzes, Homework etc.

		understanding of message authentication.	technique.	
9.	**Hash Functions; Digital Signature Standards:** RSA Approach, DSS Approach.	➢ To learn in detail about digital signature.	Lecture on different approaches to digital signature.	CT-2 (topics of the week's 5-8)
10.	**Network Security:** Electronic Mail Security: Pretty Good Privacy, S/MIME. **IP Security:** Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.	➢ To get a well understanding of network security, E-mail security, and IP security.	Lecture and discussion on network security, E-mail security and IP security.	Answering basic questions, quizzes, Homework etc.
11.	**Web Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Electronic Translation.	➢ To familiar with Web security.	Lecture and discussion on web security.	Answering basic questions, quizzes, Homework etc.
12.	**Firewalls:** Firewall Design Principles, Packet-Filtering Router, Application-Level Gateway, Circuit-Level Gateway, Firewall Configurations, Trusted Systems.	➢ To learn about security issues in Firewall, Router, and Gateway.	Discussion on the security issues in Firewall, Router, and Gateway.	CT-3 (topics of the week's 9-12)
13.	Review topics and Final exam preparation.	➢ To learn about the latest trends and the better answering methods in the final exam.	Students will be asked to answer the questions orally on previous lectures and review the contents of the course. Discussion on the better answering methods for the final examinations.	Exercise the answering methods in final exam.

Recommended Books:

1. Cryptography and Network Security Principles and Practice by W. Stallings,Prentice Hall.
2. Cryptography and Network Security by BehrouzForouzan, McGraw-Hill.
3. Fundamentals of Computer Security Technology by Edward Amoroso, Prentice Hall.

COURSE CODE: **CSTE 4110**, COURSE TITLE: **CRYPTOGRAPHY AND INFORMATION SECURITY LAB**

Course Code: **CSTE 4110**, Course Title: **Cryptography and Information Security Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20), Year 4 Term 2
Rationale: This course has been designed to provide the students with practical knowledge of different

security techniques which is fundamental to the students' ability to become a successful network engineer.

Course Objectives:

- Be exposed to the different cipher techniques.
- Learn to implement different Substitution and Transposition techniques.
- Understand the Digital Signature Standard.
- Learn to use network security tools like GnuPG, KF sensor, Net Strumbler.
- Be familiar with the intrusion detection system.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Lab equipment and Manuals.

Lesson Plan (as per week):

Week	Course Contents	Outcome (at the end of the lesson, student should be able)	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2.	➢ Find out the corresponding Caesar cipher, Monoalphabetic Cipher and Polyalphabetic Cipher of a plaintext. And then find the original text from the cipher text.	➢ To implement the Caesar cipher, Monoalphabetic Cipher and Polyalphabetic Cipher Substitution techniques.	Discussion and practical implementation of Caesar cipher, Monoalphabetic Cipher and Polyalphabetic Cipher.	Answer basic questions, quizzes.
3-4.	➢ Find out the corresponding Playfair Cipher and Hill Cipher of a plaintext. And then find the original text from the cipher text.	➢ To implement the Playfair cipher and Hill Cipher Substitution techniques.	Discussion and practical implementation of Playfair cipher and Hill Cipher.	Answer basic questions, quizzes, homework.
5-6.	➢ Find out the corresponding Transposition Cipher of a given message. Then perform the reverse operation to get original plaintext. ➢ Find out the corresponding double Transposition Cipher of a given plaintext. Then perform the reverse operation to get original plaintext.	➢ To implement the Transposition and Double Transposition techniques.	Lecture and discussion with practical implementation of Transposition Cipher.	Answer basic questions, exams.
7.	➢ Implement the encryption and decryption of 8- bit data using 'Simplified DES Algorithm' (created by Prof. Edward Schaefer) in 'C'.	➢ To implement the encryption and decryption techniques of DES algorithm.	Discussion with practical implementation of DES encryption and decryption techniques.	Answer basic questions, quizzes, homework.
8.	➢ Implement 'Linear Congruential Algorithm' to generate 5 pseudo-random numbers in 'C'. ➢ Implement the Euclid Algorithm to generate the GCD of an array of 10 integers in 'C'.	➢ To implement the algorithms for generating pseudo-random numbers and GCD of an array of integers.	Discussion and practice	Answer basic questions, quizzes.
9.	➢ Encrypt the plaintext message using RSA algorithm. Then perform the reverse operation to get	➢ To implement the RSA algorithm for encryption and decryption.	Discussion with practical implementation of RSA encryption and	Answer basic questions, quizzes, exams.

	original plaintext.		decryption techniques.	
10.	➢ Implement the Signature Scheme - Digital Signature Standard.	➢ To design the signature scheme by applying Digital Signature Standard.	Discussion and practice.	Answer basic questions, quizzes.
11.	➢ Demonstrate how to provide securedata storage, secure data transmission and for creating digital signatures (GnuPG)	➢ To use different open source tools for network security and analysis.	Demonstration with e-Tutorials.	Answer basic questions, quizzes.
12	➢ Demonstrate intrusion detection system (ids) using any tool (snort or any other) ➢ Perform other experiments relevant to this course.	➢ To demonstrate the intrusion detection system.	Demonstration on intrusion detection with e-Tutorials.	Answer basic questions, quizzes, homework, exams.
13	**Final Lab Exam (Job and Viva)**			

COURSE CODE: **CSTE 4111**, COURSE TITLE: **INDUSTRIAL TRAINING**

Course Code: **CSTE 4111**, Course Title: **Industrial Training**, 2 Hours/Week, 2 Credits, Total Marks 100, Year 4, Term 1	
Rationale: This course has been designed to develop the students' ability to realize project and research methodologies. [This is a 5-credit course which has two parts: one in Year 4, term 1 credit 2, and the other in year 4, term 2, credit 3]	
Course Objectives: ➢ To study a field of interest under a supervisor and to find out a specific problem can be solved for thesis or a project work to be carried through 4th year. ➢ To get clear idea of the related work/project accomplished by the different authors. ➢ To learn project/research methodologies that propel the students to do good project/research work.	
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Internet, Printer, photocopier, Device manual (if necessary), Journals, other necessary resources from Internet.	
COURSE CONTENTS	**OUTCOME**
Study the problems related to Computer Science and Telecommunication Engineering. [Every project/Thesis work will be continued to the 2nd term of the 4th year.]	Student should be able to 1. Realize the existing research/project work. 2. Find out a problem from a research paper or a project work. 3. Try to solve the problem

COURSE CODE: **CSTE 4125**, COURSE TITLE: **PROJECT AND THESIS**

Course Code: **CSTE 4125**, Course Title: **Project and Thesis**, 2 Hours/Week, 2 Credits, Total Marks 100, Year 4, Term 1
Rationale: This course has been designed to develop the students' ability to realize project and research methodologies. [This is a 5-credit course which has two parts: one in Year 4, term 1 credit 2, and the other in year 4, term 2, credit 3]

Course Objectives: ➢ To study a field of interest under a supervisor and to find out a specific problem can be solved for thesis or a project work to be carried through 4th year. ➢ To get clear idea of the related work/project accomplished by the different authors. ➢ To learn project/research methodologies that propel the students to do good project/research work.	
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Internet, Printer, photocopier, Device manual (if necessary), Journals, other necessary resources from Internet.	
COURSE CONTENTS	**OUTCOME**
Study the problems related to Computer Science and Telecommunication Engineering. [Every project/Thesis work will be continued to the 2nd term of the 4th year.]	Student should be able to 4. Realize the existing research/project work. 5. Find out a problem from a research paper or a project work. 6. Try to solve the problem

Year-4 Term-2

Sl.#	Course Code	Course Title	Credit	Credit Hours	Page No.
1	CSTE 4201	Digital Image Processing	3	3	
2	CSTE 4202	Digital Image Processing Lab	1	2	

3	CSTE 4203	Multimedia Communications	3	3	
4	CSTE 4225	Project and Thesis	3	3	
5	CSTE 4226	Viva Voce	1	0	
		Total	**11**	**11**	
	Grand Total		**165**	**210**	

COURSE CODE: **CSTE 4201**, COURSE TITLE: **DIGITAL IMAGE PROCESSING**

Course Code: **CSTE 4201**, Course Title: **Digital Image Processing**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 4, Term 2

Rationale: This course has been designed to introduce the fundamental concepts of image processing to the undergraduate level students. The idea is to make them familiar with the basic image processing tools, image filtering, and image compression.

Course Objectives:

- Make a foundation of the basic knowledge (both theoretical and practical) on Digital Image Processing.
- Provide a rigid concept of underlying mathematics of basic image processing tools.
- Gain the practical experience of digital image processing on the real-world problem using MATLAB.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	Digital Image Fundamentals, Simple Image Model, Sampling and Quantization, Basic Relationship between Pixels, Image Geometry;	Explain the basic concept of image and model of image processing. Get the idea about sampling, quantization, and details of pixels. Understand the basic geometry of image processing.	Give a details course plan, objectives, possible outcomes and assessment plan for the whole course. Deliver the topics wise lectures in details to provide deep concepts about image processing.	Conduct one MCQ test to justify the basics at the last lecture of the week.
2	Fourier Transform, Discrete Fourier Transform;	Explain the basic of fourier and discrete Fourier transform.	Provide the lecturers on the desire topics.	Home assignment to solve any problem using fourier transform.
3	Properties of 2D Fourier Transform, Fast Fourier Transform, Image Transform.	Understand the properties of 2-D fourier and fast fouriertransfrom. Get the fundamentals of image transform.	Provide the lecturers on the desire topics.	**Conduct a class test-1 (week 1-3).**
4	Background of Image Enhancement, enhancement by Point-Processing, Spatial Filtering;	Get the basic idea about the necessity of image enhancement and the procedure to perform the same.	Lecture and discussion with problems. Provide some practical examples of image enhancement.	Exercise with various image enhancement techniques.

5	Enhancement in Frequency Domain, Color Image Processing.	Understand the principals of color image processing	Lecture and discussion on the desire topics.	Exercise on color image processing.
6	Degradation Model, diagonalization of circulant and block-circulant Matrices.	Explain the basics and necessity of image restoration.	Lecture and discussion about restoration and diagonalization.	Give an assignment on image restoration.
7	Algebraic Approach to Restoration, Inverse Filtering, Geometric Transformation	Understand the use of various filters in image processing.	Lecture on desire topics.	**Conduct a class test-2 (week 4-7).**
8	**P**rinciple of Mathematical Morphology, Erosion and Dilation in the Euclidean Space,	Explain the basic of morphological image.	Lecture on morphology and it's use on image processing.	Sudden test to justify the class performances.
9	Closings and Openings,Grayscale Morphology, Links between Links and Sets, Grayscale Morphological Transformations,	Explain the basic of morphological image.	Lecture on desire topics.	Answer basic questions, quizzes, Homework, exams.
10	Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding,	Understand the basics of image segmentation.	Lecture on image segmentation.	Answer basic questions, quizzes, Homework, exams.
11	Region-Oriented Segmentation, Use of Motion in segmentation.	Explain the basic of morphological image	Lecture on image segmentation.	Quizzes, Homework, exams.
12	JPEG Compression Technique, MPEG Compression Technique, Motion Estimation, Motion Vector Generation.	Understand the basics of image compression.	Lecture on image compression.	**Conduct a class test-3 (week 8-12).**
13	Review topics and Final exam preparation.	Learn about latest trends and the better answering methods in the final exam.	Lecture and discussion on research related issue of digital image processing.	Exercise the answering methods in final exam.

COURSE CODE: **CSTE 4202**, COURSE TITLE: **DIGITAL IMAGE PROCESSING LAB**

Course Code: **CSTE 4202**, Course Title: **Digital Image Processing Lab**, 2 Hours/Week, 1 Credits, Total Marks 100 (Class Attendance=10, Internal Evaluation/Observation = 70, Final Viva-voce =20),Year 4, Term 2
Rationale: This lab course aims to introduce the principles of digital image processing andto develop students' knowledge from basic signal processing techniques toadvanced image processing and analysis systems with the practical environment.

Course Objectives:

- Learn basic image processing theories and their real-world applications, including printing, medical diagnosis, telecommunications, internet and digital entertainment.
- Design and conduct digital imaging experiments and analyze and interpret image and videodata, as evidenced from computer projects.
- Identify, formulate and solve engineering problems using digital imaging techniques. An example is how to scan, compress, analyze and index old newspaper images so that one can retrieve a piece of old news easily through the internet.
- Learn how to use image processing related tools, including compilers, and hardware and software for image acquisition, storage and conversion.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcome** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy**(activities directed to achieve outcomes)	**Assessment Strategy**(How they are developed)
1	To familiar about the tools for digital image processing.	gain significant experience for image processing.	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Answer basic questions.
2, 3, 4	Add any two given images and write the result into a file in BMP format. Perform subtraction of two given BMP image. Save the output image in BMP file. Input images may be of different size. Draw histogram for any image, equalize the histogram and redraw the equalized image. You are given a blurred image. Make it smooth using smoothing filter (filter size may be varied).	Reflect a basic understanding of image processing.	Through lecture, laboratory, on-line learning, computer projects and out-of-class assignments.	Neatness, organization, completeness and individually written lab reports are due at the beginning of the lab period. Respected Teacher will be evaluated in lab period.
5, 6, 7	You are given an image make it a negative image. Save the output image in BMP file. You are given an image perform log transformation. Save the output image in BMP file. Perform Point and Line Detection,	Reflect a basic understanding of image processing.	Through lecture, laboratory, on-line learning, computer projects and out-of-class assignments.	
8, 9, 10, 11	You will be given a file of fixed-length binary string, you will have compressed the file using Huffman coding. You will be given a file of fixed-length binary string, you will have compressed the file using Truncated Huffman coding. You will be given a file of binary	Reflect a basic understanding of image processing.	Through lecture, laboratory, on-line learning, computer projects and out-of-class assignments.	

	stream, you will have compressed the file using ID run-length coding in accordance with the given length-code table			
12	Submit a mini project in a group			
13	**Final Lab Exam (Job, Quiz and Viva)**			

Course Code: **CSTE 4203**, Course Title: **Multimedia Communication**

Course Code: **CSTE 4203**, Course Title: **Multimedia Communication**, 3 Hours/Week, 3 Credits, Total Marks 100 (Attendance=5, Continuous Assessment=25, Final exam=70),Year 4, Term 2

Rationale: This course introduces technologies for multimedia processing, coding, and communications. We will address how to efficiently represent multimedia data and how to deliver them over a variety of networks. In the coding aspect, state-of-the-art compression technologies will be presented. Emphasis will be given to state-of-the-art multimedia coding standards.

Course Objectives:

- Understanding the multimedia communications systems, application and basic principles, analysis of the multimedia streaming.
- Learn about different types of multimedia file formats and their standards. Learning about different multimedia file structures give students the idea of how the designers of those standards tackled or overcame various issues or problem
- Learn about popular multimedia software applications and try them firsthand.

Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Video tutorial, Question bank, Previous questions.

	Lesson Plan (as per week):			
Week	**Course Contents**	**Outcomes** (at the end of the lesson, student should be able to)	**Teaching Learning Strategy** (activities directed to achieve outcomes)	**Assessment Strategy** (How they are developed)
1	**Syllabus overview, course organization and expectations** **----** **Introduction to Multimedia Communication:** Media and Data-stream, Medium, Transmission of multimedia contents. Properties of multimedia	• Get the basic outline and overview of the course contents; • Learn about different types of media; • Learn about different transmission techniques for multimedia contents;	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, Topic wise lecture delivery.	Answer basic questions, quizzes, Homework, exams.
2	**Coding:** Codecs, Encoding and Decoding techniques,RLE, DPCM, Entropy coding: Huffman coding, Arithmetic coding **Compression:** Lossy and lossless compression techniques,	• Realize the importance of coding and compression in multimedia systems; • Learn about different encoding algorithms used in multimedia file standards; • Learn about different compression techniques	Lecture and discussion, Visual simulation	Answer basic questions, quizzes, Homework, exams.

		used in multimedia file standards;		
3	**Introduction to Audio coding:** Properties of audio/sound, Digitizing sound, DAC, Sound quality standards, Need for compression, Streaming audio, MIDI, Audio editing applications: Audacity	• Learn how audio are digitized stored and reproduced/ outputted in computers; • Learn about uncompressed audio standards; • Realize why audio needs to be compressed for transmission; •	Lecture and discussion, Visual simulation	Answer basic questions, quizzes, Homework, exams.
4	**MP3 Standard:** History, Advantages of MP3, Psychoacoustics, Perceptual coding, MP3 file structure, Encoding in MP3, MDCT and Windowing, Q, Decoding in MP3, Streaming of MP3	• Learn about history of MPEG standard; • Learn about file structure of MP3, and factors for such design consideration; • Learn about perceptual coding and how human perceptual limitations are exploited in MP3 compression; • Learn about the encoding and decoding pipeline in MP3 standard; • Learn about different techniques used for compression in JPEG;	Lecture and discussion, Visual simulation	Answer basic questions, quizzes, Homework, exams.
5	**Introduction to Image:** Image formats, Raster and vector formats, Use cases of different formats, Color spaces: RGB, CMYK, HSV, YIQ, YUV, YCbCr and other color spaces, Legacy TV video standards, How digital camera works. How modern monitors work, Color gamut, How to choose a monitor for image/video editing; **Simple raster formats:** Bitmap, Raw image format **Vector image formats:** Scalable Vector Graphics (SVG), Encapsulated PostScript	• Learn about the difference between raster and vector image formats; • Learn about different image formats and their use cases; • Learn about different color spaces and techniques for conversion between them; • Learn about how common image capturing, manipulation and presentation devices work;	Lecture and discussion, Visual simulation	Answer basic questions, quizzes, Homework, exams.

	(EPS)			
6	**JPEG Standard:** History, Advantages of JPEG, Encoding in JPEG, Decoding in JPEG	• Learn about the pipeline of JPEG encoding and decoding; • Learn about different techniques used for compression in JPEG;	Lecture and discussion, Showcasing MATLAB code for JPEG encoding and decoding	Answer basic questions, quizzes, Homework (word size expansion, memory location expansion), exams.
7	**Other image formats**: Portable Network Graphics (PNG) format, **GIF format:** Encoding and decoding in GIF, LZW encoding, Animation in GIF **Image Editing applications:** Photoshop/GIMP, Illustrator etc.	• Learn about other image standards like PNG and GIF; • Realize how PNG standard was designed to be forward compatible; • Understand the compression in GIF and how animations can be encoded in GIF file format; • Learn about popular image manipulation/editing software/applications;	Lecture and discussion, Visual simulation	
8	**Introduction to Video:** Capture and digitization of video,Challenges in video streaming, Need for video compression, Common Video formats: MPEG-1, MPEG-2, MPEG-4, H.264 (MPEG-4 AVC), H.265 HVEC, MKV container format, AVI, WMV Video editing applications	• Learn about the capture, storing and presentation of digital video; • Learn why video needs to be heavily compressed; • Learn about the different video standards available; • Learn about the future of video standards;	Lecture and discussion, Visual simulation	Answer basic questions, quizzes, Homework, exams.
9	**MPEG Standard:** History of MPEG, MPEG standards, Encoding in MPEG-4: Spatial and temporal compression, Motion compensation, Inter-frame encoding, CBR, VBR encoding, Decoding in MPEG-4,	• Learn about different techniques used for compression in JPEG; • Learn about Encoding and decoding in MPEG standard; Learn about MPEG-4 file structure and inter-frame encoding;	Lecture and discussion, Showcasing MATLAB code for MPEG encoding and decoding	Answer basic questions, quizzes, Homework, exams.
10	**Animation:** Introduction to animation, 2D/3D animation techniques: Key framing, motion capture, Animation software/applications, VFX **Simulation:** Physics simulation for animation	• Learn about traditional and modern 2D/3D animation techniques; • Learn about cotemporary animation techniques; • Learn about simulation of physics in animations;	Lecture and discussion, Visual simulation, showing making of successful animation movies, showcasing popular animation software/applications	Answer basic questions, quizzes, Homework, exams.

11	**Networking for Multimedia Communication:** Streaming, broadcasting, multicasting, Quality of Service (QoS) guarantees, resource reservation, traffic specification, shaping and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions;	• Understand the mechanisms of multimedia streaming, broadcasting and multicasting; • Learn how to ensure high-Quality voice and video Streaming With QoS;	Lecture and discussion, Visual simulation	Quizzes, Homework, exams.
12	**Security in Multimedia Communication:** Storage of Multimedia contents, Right management (DRM), digital watermarking, partial encryption schemes for video streams. Other security concerns	• Understand the need for security in Multimedia storage and streaming; • Learn about right management in multimedia; • Learn about different techniques for right managements in digital multimedia contents and gaming consoles;	Lecture and discussion, Visual simulation	Answer basic questions, quizzes, Homework, exams.
13	**Multimedia Operating Systems:** Multimedia OS vs General purpose OS, Requirements of Multimedia OS, Scheduling in Multimedia OS, **Other Multimedia Applications:** Audio and Video conferencing, Video on demand, Satellite DTH, VOIP; Podcasts	• Learn about the requirements of Multimedia OS; • Learn about the scheduling techniques in Multimedia OS; • Learn about other multimedia applications;	Lecture and discussion, Visual simulation	Exercise the answering methods in final exam.

Recommended Books:

1. Multimedia Communications Applications, Networks, Protocols and Standards by Fred Halsall, Pearson.
2. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew, Pearson.
3. Multimedia Sound and Video by Jose Lozano, Louis Molina and John Willie, Prentice-Hall.
4. Multimedia: Making It Work by Tay Vaughan, McGraw-Hill.

COURSE CODE: **CSTE 4225**, COURSE TITLE: **PROJECT AND THESIS**

Course Code: **CSTE 4225**, Course Title: **Project and Thesis**, 3 Hours/Week, 3 Credits, Total Marks 100, Year 4, Term 2	
Rationale: This is the continuation of the course CSTE 4125. After completion of the course CSTE 4125, student can get the registration done for the course CSTE 4225.	
Course Objectives: ➢ To design one's own algorithm to solve the specific problem. ➢ To implement his/her proposal. ➢ To be oriented with the research/big project.	
Resources Used: Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Internet, Printer, photocopier, Device manual (if necessary), Journals, other necessary resources from Internet.	
COURSE CONTENTS	**OUTCOME**
Continuation of the project/Thesis topic undertaken in CSTE 4125.	At the end of the course student should be able to 1. Work in team. 2. Have detailed insights of a specific topic and the works done by others. 3. Design and implement of the proposal prepared in the previous term. 4. Compare the results produced in the previous term or with those of others work. 5. Write journal and conference paper

COURSE CODE: **CSTE 4226**, COURSE TITLE: **VIVA VOCE**

COURSE CODE: **CSTE 4226**, COURSE TITLE: **VIVA VOCE**, 0 Hours/Week, 1 Credits, Total Marks 100, Year 4, Term 2	
Rationale: This course has been designed to develop the students' ability to realize practical situation of job environment.	
Course Objectives: ➢ Prepare the students to face interview both at the academic and the industrial sector	
COURSE CONTENTS	**OUTCOME** (Student should be able to)
VIVA VOCE (Viva based on major/minor courses of whole academic year)	Evaluate overall technical knowledge and industry readiness. Able to go under a virtual environment of technical interview. Able to analyze various application of Computer Science & Telecommunication Engineering in real-life problem solving.