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OBE(Outcome Based Education) Based Curriculum
for
B.Sc. Engineering in
Computer Science & Telecommunication Engineering.

Noakhali Science and Technology University
Noakhali-3814, Bangladesh.

Curriculum for B.Sc. Engineering in Computer Science & Telecommunication Engineering

1. History of Program:

The Department of Computer Science and Telecommunication Engineering (CSTE) is one of the founding departments of Noakhali Science and Technology University. It commenced its activities in June 2006. The department currently offers a 4-year Bachelor of Science (Engineering) in CSTE undergraduate degree program and a 1.5-year Master of Science (Engineering-Project based) in CSTE and Master of Engineering (Research work based) in CSTE postgraduate degree programs. The department is enriched with a good number of highly qualified faculty members and well-equipped state-of-the-art Computer, Electronics, and Telecommunication Labs.

2. Vision:

To develop skilled and competent professionals through outcome-based education and innovative research who will contribute to society to meet the local and global challenges in the field of information, computation, and communication.

3. Mission:

M1	To grow, share, and apply knowledge in Computer Science, Communication, and interdisciplinary areas for the benefit of industry and society.
M2	To educate students to be successful, ethical, and effective problem-solvers, pioneers, and life-long learners who can contribute favorably to economic development locally and globally.
M3	To conduct innovative research for the advancement of computer science and communication engineering to meet the challenges of the 21st century and beyond.

4. Program Educational Objectives (PEO):Prepare students to

PEO1	be employed in IT and Telecom industries and IT-based government services and/or pursuing higher education, and be engaged in learning, understanding, and applying new ideas.
PEO2	be able to solve real-world complex engineering problems in the computing domain and effectively communicate solutions to technical and non-technical audiences.
PEO3	be skilled enough to handle professional responsibilities in respective areas of interest.
PEO4	be apprentice entrepreneurs and act as responsible social representatives.

5. PEO to Mission Statement Mapping:

MISSION STATEMENTS	PEO1	PEO2	PEO3	PEO4
M1	3	2	2	2
M2	2	3	3	3
M3	3	3	1	1

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low can be used)

6. Program Learning Outcome (PLO):

1	**PLO1**	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve complex engineering problems.
2	**PLO2**	**Problem analysis:** Identify, review research literature, formulate, and analyze complex engineering problems to achieve substantiated conclusions using the fundamental principles of mathematics, natural sciences, and engineering sciences.
3	**PLO3**	**Design/development of solutions:** Design solutions for complex engineering problems as well as system components or processes that meet the specified needs with appropriate consideration for public health, safety, and cultural, socioeconomic, and environmental factors.
4	**PLO4**	**Conduct investigations of complex problems:** Use research-based knowledge and methods, including experiment design, data analysis and interpretation, and information synthesis to provide valid conclusions.
5	**PLO5**	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling of complex engineering activities with an awareness of their limitations.
6	**PLO6**	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent obligations relevant to the professional practice of engineering.
7	**PLO7**	**Environment and sustainability:** Understand and evaluate the impact of professional engineering solutions in ecological and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
8	**PLO8**	**Ethics:** Apply ethical principles and make a commitment to the professional ethics, responsibilities, and standards of the engineering practice.
9	**PLO9**	**Individual and team work:** Function effectively both individually and as a team member or leader in diverse teams and multidisciplinary settings.
10	**PLO10**	**Communication:** Communicate effectively in complex engineering environments with the engineering community and with society at large, such as being able to grasp and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**PLO11**	**Project management and finance:** Demonstrate knowledge and comprehension of engineering and management principles and apply them to one's own work as a team member or leader to manage projects in multidisciplinary environments.
12	**PLO12**	**Life-long learning:** Realize the essentiality of, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

7. Mapping of PLOs to PEOs:

No.	PLO statement	PEO1	PEO2	PEO3	PEO4
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve complex engineering problems.	3	3	3	2
2	**Problem analysis:** Identify, review research literature, formulate, and analyze complex engineering problems to achieve substantiated conclusions using the fundamental principles of mathematics, natural sciences, and engineering sciences.	3	3	3	1
3	**Design/development of solutions:** Design solutions for complex engineering problems as well as system components or processes that meet the specified needs with appropriate consideration for public health, safety, and cultural, socioeconomic, and environmental factors.	3	3	1	3
4	**Conduct investigations of complex problems:** Use research-based knowledge and methods, including experiment design, data analysis and interpretation, and information synthesis to provide valid conclusions.	3	3	2	1
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling of complex engineering activities with an awareness of their limitations.	3	3	1	1
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent obligations relevant to the professional practice of engineering.	1	1	3	3
7	**Environment and sustainability:** Understand and evaluate the impact of professional engineering solutions in ecological and environmental contexts, and demonstrate the knowledge of and need for sustainable development.	2	1	1	2
8	**Ethics:** Apply ethical principles and make a commitment to the professional ethics, responsibilities, and standards of the engineering practice.	2	2	3	3
9	**Individual and team work:** Function effectively both individually and as a team member or leader in diverse teams and multidisciplinary settings.	3	3	3	3

10	**Communication:** Communicate effectively in complex engineering environments with the engineering community and with society at large, such as being able to grasp and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	3	3	2	3
11	**Project management and finance:** Demonstrate knowledge and comprehension of engineering and management principles and apply them to one's own work as a team member or leader to manage projects in multidisciplinary environments.	3	2	2	3
12	**Life-long learning:** Realize the essentiality of, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	3	3	3	3

8. Rules and Regulations:

The B.Sc. (Engineering) in Computer Science and Telecommunication Engineering degree is designed to be completed in four academic years. The degree is referred to as Undergraduate Program. Each academic year is divided into two terms (I and II), a total of eight terms to carry out the program. Each term has a duration of 21 weeks. The courses are offered continuously and consistently to distribute the workload evenly throughout the terms. In each term, students are evaluated on the courses provided. A term is segmented into three parts: Class-weeks (Theory and Lab classes), Preparatory leave, and Term final examination (Theoretical and Lab tests). The total time distribution for completing a term is as follows:

Classes	13 weeks (There are 5 working days per week)
Preparatory leave before final examination	2 weeks
Final examination	4 weeks
Term Break	2 weeks
Total	21 weeks

Admission:

Admission to the undergraduate program and Examination of courses for the program is guided and controlled by the Admission Ordinance and the Examination Ordinance of the University.

Eligibility:

Eligibility of students to take the admission test is determined and regulated in accordance with the University's policies.

Admission Test:

Procedures for admission tests are determined by the rules of the University. Information relating to the detailed syllabus, type and format of questions, date, time, and venue of the admission test can be found in the prospectus, daily newspapers, and on the university website http://www.nstu.edu.bd.

Selection Procedure:

The selection procedure is governed and maintained as per the University regulations.

Rules for Admission:

Procedures for admission are directed as per the rules of the University.

Tuition & Other Fees:

Tuition fees and the mode of payment for four years undergrad program are determined per the university's rules.

Course Offering and Instruction:

The courses to be offered in a particular term are announced and published in the Registration Package along with the tentative term schedule before the end of the preceding term. The courses to be offered in any term are decided and planned by the Academic Committee of the department. Each course is conducted by one or multiple course teachers who are responsible for maintaining the expected standard of the course and for the assessment of students' performance.

Course Coordinator:

One course coordinator is appointed for each batch per term by the chairman of the department. The course coordinator advises each student about the academic program of that particular term. However, it is also the student's responsibility to keep regular contact with their course coordinator, who will review and eventually approve the student's specific study plan and monitor the student's subsequent progress. The course coordinator will ensure the examinee's eligibility for the improvement exam after the necessary justification of the transcript.

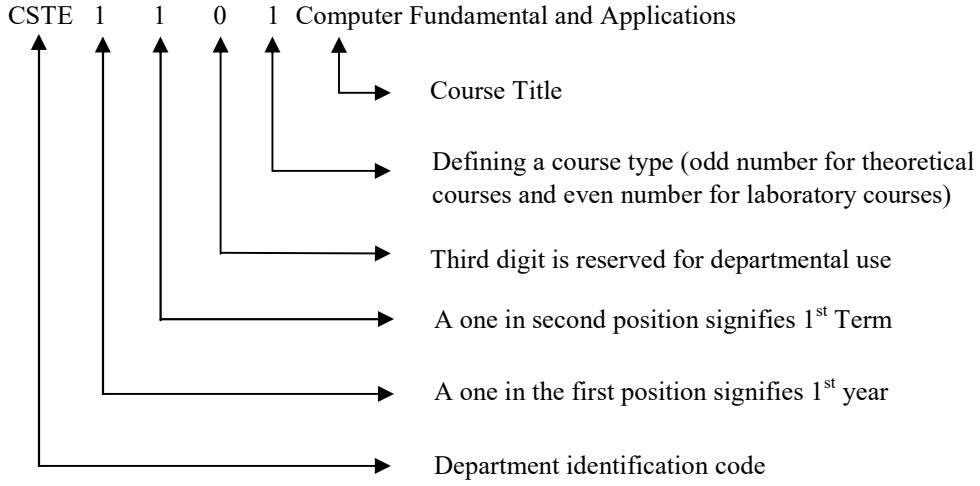
Course Pattern and Credit Structure:

The undergraduate program is decorated with a set of theoretical courses along with a related set of laboratory courses to support them and is also covered by viva-voce and thesis/project.

Course Designation and Numbering System:

A course will be represented by a course code, the course title, credit hours, and conduct hours per week (Theory or Lab). Each course is designated by a maximum of four-letter code identifying the department offering the course, followed by a four-digit number having the following interpretation: The first and second digits correspond to the year and the term in which the students typically enroll in the course. The third digit is reserved for the internal use of the department. The last digit is an odd number for theoretical courses and an even number for laboratory courses.

The following example illustrates a course representation system:



Assignment of Credits:

The assignment of credits to a theoretical course follows a different rule from that of a practical or laboratory course.

(a) Theory course: One lecture of one hour a week will be equivalent to one credit hour. 13 lectures of one hour each in 13 weeks will be equivalent to one credit.

(b) Lab Course: One lab class of one and half hours a week will be equivalent to one credit hour.

Marks allocated for each course, either theory or lab, is 100. The evaluation of a course will be carried out by taking a continuous assessment and a final examination.

Distribution of Marks:

Thirty percent (30%) of marks are allotted to Continuous Assessment, i.e. quizzes and homework assignments, class attendance and class participation. The remaining marks will be allotted to the term final examination, which will be conducted by the department. There will be two examiners for each theory course in the term final examination, which will be of 3/4 hour's duration for credit 2/3 respectively.

The distribution of marks for given theory courses will be as follows:

No	Description	Marks
1	Class participation	05
2	Homework assignment(s), Term and quizzes, class tests	25
3	Final examination	70
Total		100

The distribution of marks for a given lab course will be as follows:

No	Description	Marks
1	Class participation/contact with teacher	10
2	Internal criticism/evaluation/observation	70
3	Final Jury/Viva-voce	20
Total		100

Similarly, the distribution of marks for a given thesis/project course will be as follows:

No	Description	Marks
1	Evaluation	60
2	Viva-Voce	20
3	Presentation	20
Total		100

Basis for awarding marks for class attendance and participation will be as follows:

Attendance & participation	**Marks**
90% and above	5.0
80% to less than 90%	4.5
70% to less than 80%	4.0
65% to less than 70%	3.0
60% to less than 65%	2.0
Less than 60%	0.0

Attendance:

i. To be eligible for appearing at the final examination, each student must be present in at least 70% of classes of each theoretical and laboratory course.

ii. If any student obtains 60-69% attendance, they may be allowed to appear at the examination on payment of Tk. 1,000.00 (One thousand) as a fine.

iii. Students with below 60% attendance will not be permitted to take the final examination.

iv. Course teachers will record the attendance for each course and inform the students about the condition of the attendance in the middle of the Term to alert them about their attendance. The course teacher will finalize the attendance on/before the last day of completion of the Term and submit it to the department's Chairman and inform the students. The Chairman will submit all the attendance records from the teachers to the academic section of the Registrar Office.

Earned Credits:

The courses in which a student obtains a D or above grade will only be counted as credits earned. A student must retake the course if they receive an F grade in that course during any Term.

Grading Scale:

The Universal Grading System introduced by the University Grant Commission (UGC) of Bangladesh is followed which are given below:

Numerical Grade	Letter Grade	Grade Point
80% or above	A+ (A plus)	4.00
75% to less than 80%	A (A regular)	3.75
70% to less than 75%	A- (A minus)	3.50
65% to less than 70%	B+ (B plus)	3.25
60% to less than 65%	B (B regular)	3.00
55% to less than 60%	B- (B minus)	2.75
50% to less than 45%	C+ (C plus)	2.50

45% to less than 50%	C (C regular)	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00
Incomplete	I	
Withdrawn	W	
Continuation (For project and thesis/design course)	X	

Calculation of GPA:

Grade point Average (GPA) is the weighted average of grade points obtained in all the courses passed/completed by a student. For example, if a student has passed/completed five courses in a term having credits of C1, C2, C3, C4, and C5, and their points in these courses are G1, G2, G3, G4, and G5, respectively, then,

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

A numerical example:

Suppose a student has completed five courses in a Term and obtained the following grades (two examples):

Course	Credit	Grade	Grade Point
CSTE-2103	3	A+	4.00
CSTE-2105	3	C+	3.00
CSTE-2107	3	A	3.75
MATH-2105	2	B	3.25
ENG-2101	1	B+	3.50

Then their GPA for the Term will be computed as follows:

$$GPA = \frac{3(4.0)+3(3.0)+3(3.75)+2(3.25)+1(3.5)}{(3+3+3+2+1)} = 3.52$$

Course	Credit	Grade	Grade Point
CSTE-2103	3	A+	4.0
CSTE-2105	3	F	0
CSTE-2107	3	A	3.75
MATH-2105	2	B	3.25
ENG-2101	1	B+	3.50

Then their GPA for the Term will be computed as follows:

$$GPA = \frac{3(4.0)+3(0)+3(3.75)+2(3.25)+1(3.50)}{(3+0+3+2+1)} = 3.69$$

Examinations:

The final examination for each term is conducted as per the university's term structure, directed by the Examination Ordinance and controlled by the Controller of Examination Office.

Theory Courses: In any theory course, the distribution of total marks (100%) will be as follows: (a) 30% Continuous assessment and (b) 70% Written examination.

(a) Continuous Assessment (CA)

(i) The total marks (30%) of CA will be constituted of: Class participation or Attendance: 5% and Class tests, Quizzes, Assignments, Term-papers etc.: 25%.

(ii) The class tests, Quizzes, Assignments, Term-papers, etc., carrying 25%, will be arranged according to the following table:

No. of credit for the course	Total no. of Assessments required	No. of best assessments to be considered for grading
1	2	1
2	3	2
3	3	2

(iii) Duration of a class test will be 20-45 minutes, preferably taken during class hours.

(iv) Each of the Continuous Assessments will finally carry equal marks or weightage. The answer script for the assessment may be shown to the student. The concerned teacher would submit the evaluated answer scripts and attendance log to the Chairman of the Department.

(v) If a student retakes a course for which he received an F grade (in any previous Term), he will not be allowed to resubmit the Continuous Assessment (i.e., class test/quiz/assignment/Term paper). The class participation marks will also be taken from the previous record.

Promotion to next Term:

i. If any student fails to complete two or more courses in a term, he shall be obliged to re-admit in the immediate next session.
ii. If any final year student wants to appear at the improvement exam on one or more final year courses, he shall be obliged to re-admit in the immediate next session.

Improvement Exam:

i. Improvement exam is allowed only with the immediate next session. If the sessional gap is not suitable for the improvement examinee, they will be permitted to appear at the exam with the examinees in the subsequent session.
ii. Improvement exam is allowed only on one course if the mark is below 40 or an F grade.
iii. Improvement exam is allowed only on two courses if the mark is between 40 and 49 or a D to C grade.
iv. Course registration of the courses for improvement exam is not necessary. But these courses must be cited in the exam application form with the requisite fees.

Publication of Results:

In order to qualify for the B.Sc. Engineering degree, a student must acquire a minimum of 160 credits (Out of 166 credits) but student must complete all the major courses and a minimum CGPA of 2.25 within a maximum of six academic years. The result will be published based on merit.

Merit Position:

The TGPA obtained by a student in the term final examinations will be considered for determining the merit position for the purpose of awarding scholarships, stipends etc. The CGPA obtained by a student will be considered for determining the final merit position (must complete or pass all term courses) which is mentioned in the final transcript. The final merit list will not include students who want to appear at the improvement exam on final year courses or any other courses.

Application for graduation and award of degree:

A student who has fulfilled all the academic requirements for the B.Sc. Engineering degree will have to apply for graduation to the Controller of Examinations through their department's Chairman. A provisional degree will be awarded on completion of credit (minimum 155 credits) and CGPA (minimum 2.25) requirements. The Regent Board will grant this provisional degree based on the recommendation of the Academic Council. Original certificates are normally provided through convocation or thereafter.

Qualifying GPA for promotion:

A student securing a GPA below 2.00 in a particular Term Examination will not be promoted to the higher Term. Such a student will retake the courses for the whole year by re-admission with the students of the next session. In that case, marks obtained in the previous Continuous Assessment, Fieldwork examination, etc., will be retained if they cannot repeat them. It is worth noting that a student must finish all the courses for graduation within six successive years (12 Terms), starting from the date of the first admission. Otherwise, they will be dropped out of the program.

Conditions to be fulfilled to take part in Term Final Examination:

a) A student will be allowed to take part in the Term Final Examination if they fulfill the following conditions:
    i. If they register for the course in due time.
    ii. If the student pays all dues (Registration/tuition fees/other charges) applicable to the university authority/department authority/hall authority.
    iii. If the student is not instructed by the disciplinary action committee to refrain from taking part in the examination.
b) A student who has already been registered for a particular course will have their student roll number treated as the roll number for the examination hall for all courses, and no separate roll number will be assigned later. Inside the examination hall, each examinee must carry their admit card.

সাধারণ শৃংখলা ও আচরণবিধিঃ

(ক) কোন ছাত্র কর্তৃক বিশ্ববিদ্যালয়ের আইন, সংবিধি, অধ্যাদেশ, বিধান বা প্রবিধান অমান্য করা বা প্রকাশ্যে নিন্দাবাদ করা; বিশ্ববিদ্যালয়ের কোন কর্মকর্তা বা কর্মচারীর প্রতি অসৌজন্যমূলক আচরণ বা অন্য কোন অপরাধকে বিশ্ববিদ্যালয়ের যে কোন কর্তৃপক্ষ, তদ্‌সদস্য বা বিশ্ববিদ্যালয়ের শিক্ষকবৃন্দ অসদাচরণ বা আইনশৃংখলা পরিপন্থী কাজ বলে বিবেচনা করতে পারবেন। এরূপ ছাত্রের বিরুদ্ধে অপরাধের গুরুত্ব অনুসারে ব্যবস্থা গ্রহণ করা যাবে।

(খ) কোন ছাত্র বিশ্ববিদ্যালয়ের রেজিস্ট্রার বা কোন শিক্ষকের নিকট হতে চারিত্রিক সনদপত্র গ্রহণ করতে চাইলে তাকে অবশ্যই প্রক্টর কর্তৃক ইস্যুকৃত প্রশংসাপত্র/চারিত্রিক সনদ পত্রের কপি রেজিস্ট্রার বা ঐ শিক্ষকের নিকট জমা দিতে হবে এবং প্রদত্ত প্রশংসাপত্র/চারিত্রিক সনদ পত্রে যদি উক্ত ছাত্রের বিরুদ্ধে আইন- শৃংখলা পরিপন্থী/অসদাচরণ সম্পর্কিত কিছু লিখিত থাকে তবে তা হুবহুলিখে রেজিস্ট্রার বা শিক্ষক প্রশংসাপত্র/চারিত্রিক সনদ পত্র প্রদান করবেন।

(গ) আবাসিক কোন ছাত্রের আচরণ সন্তোষজনক না হলে অথবা কোন ছাত্র আইনশৃংখলা পরিপন্থী কাজের সাথে জড়িত থাকলে সংশ্লিষ্ট প্রভোস্ট ঐ ছাত্রকে কোননির্দিষ্ট (এক বছরের অধিক) সময়ের জন্য হল থেকে বের করে দিতে পারবেন।

(ঘ) ভিন্ন হলের ছাত্রদের কর্তৃক সংঘঠিত কোন অসদাচরণ বা আইন শৃংখলা পরিপন্থী ঘটনার জন্য যে হলে তা সংঘটিত হয়েছে ঐ হলের প্রভোস্ট তার/তাদের বিরুদ্ধে সংশ্লিষ্ট আবাসিক হলের প্রভোস্টকে অবহিত করলে তিনি বিধি অনুযায়ী শাস্তির ব্যবস্থা করবেন।

(ঙ) কোন ছাত্র/ছাত্রগোষ্ঠী প্রক্টরের লিখিত অনুমোদন ছাড়া কমিটি গঠন করতে পারবে না বা এর জন্য সভাসমিতিও আহ্বান করতে পারবেনা। উভয় কাজই শাস্তিযোগ্য অপরাধ বলে বিবেচিত হবে। ক্যাম্পাসে বাদ্যযন্ত্র বা সাংস্কৃতিক- অনুষ্ঠান আয়োজনের জন্যও পূর্বানুমোদন প্রয়োজন হবে। এরূপ কোন প্রকার নিয়মের লংঘন শাস্তিযোগ্য অপরাধ বলে বিবেচিত হবে।

(চ) কোন ছাত্র/ছাত্রগোষ্ঠী ক্যাম্পাসে ধর্মঘট আহ্বান করতে পারবেনা বা ছাত্রকে স্বাভাবিক চলাচলে বাধা প্রদান করতে পারবেনা বা তাকে ক্লাশ করা হতে বিরত রাখতে পারবেনা এবং এ উদ্দেশ্যে কোন সভা/সমিতি র‍্যালী করতে পারবেনা। এ ধরনের কাজের সাথে জড়িত ছাত্র/ছাত্রগোষ্ঠী দোষী সাব্যস্ত হলে বিশ্ববিদ্যালয় হতে বহিস্কার পর্যন্ত করা যেতে পারে। যারা এতদুদ্দেশ্যে ক্লাশ করা হতে বিরত থাকবে ঐ সকল ছাত্রের স্কলারশিপ/স্টাইপেন্ড বাজেয়াপ্তসহ শাস্তিমূলক ব্যবস্থা গ্রহণ করা যাবে।

(ছ) বিশ্ববিদ্যালয় কর্তৃক স্কলারশিপ প্রাপ্ত কোন ছাত্র আইনশৃংখলা পরিপন্থী বা অসদাচরণের মত কোন কাজের সাথে জড়িত প্রমাণিত হলে তার স্কলারশিপ বাতিল হবে এবং অপরাধের গুরুত্ব অনুযায়ী অন্য শাস্তি ভোগ করতে হবে।

(জ) কোন ছাত্র/ছাত্রগোষ্ঠী বিশ্ববিদ্যালয় এলাকায় অন্য কোন ছাত্র/ছাত্রগোষ্ঠীর সহিত দুর্ব্যবহার, উচ্ছৃংখল আচরণ, শারিরীক বা মানসিক নির্যাতন করতে পারবেনা। এরূপ ঘটনা শাস্তিমূলক আচরণের মধ্যে পড়বে। বিশ্ববিদ্যালয়ের বাইরে কোনছাত্র/ছাত্রগোষ্ঠীর সহিত দুর্ব্যবহার বা অসদাচরণ করলে তা ও শাস্তিযোগ্য অপরাধ বলে বিবেচিত হবে।

(ঝ) কোন ছাত্র/ছাত্রগোষ্ঠী বিশ্ববিদ্যালয় এলাকায় যে কারও সাথে অসৌজন্যমূলক/উচ্ছৃংখল আচরণ করলে তা শাস্তিযোগ্য অপরাধ বলে বিবেচিত হবে এবং অপরাধের গুরুত্ব বিবেচনায় তাকে/তাদেরকে বিশ্ববিদ্যালয় হতে চিরতরে বহিস্কার পর্যন্ত শাস্তি প্রদান করা যাবে।

(ঞ) বিশ্ববিদ্যালয়ের কোন- ছাত্র মাদকাসক্তি, অসামাজিক কার্যকলাপ বা নৈতিক স্খলনের অপরাধে দোষী সাব্যস্ত হলে তার বিরুদ্ধে প্রচলিত রাষ্ট্রীয় ব্যবস্থা ছাড়াও বিশ্ববিদ্যালয় কর্তৃপক্ষ শাস্তিমূলক ব্যবস্থা গ্রহণ করতে পারবেন।

পরীক্ষায় শৃংখলা ও আচরণ বিধিঃ

পরীক্ষার্থীগণ নিম্নবর্ণিত নির্দেশসমূহ কঠোরভাবে মেনে চলতে বাধ্য থাকবেঃ

(ক) পরীক্ষার্থীগণ উত্তরপত্রের কভার পৃষ্ঠাসহ কোথাও নিজের নাম লিখতে পারবেনা। কোন পরীক্ষার্থী এরূপ লিখলে তার উত্তরপত্র মূল্যায়ন করা নাও হতে পারে।

(খ) প্রত্যেক পরীক্ষার্থী স্পষ্টাক্ষরে তার রোল নম্বর উত্তরপত্রের কভার পৃষ্ঠায় নির্দিষ্ট জায়গায় লিখবে। এর কোন ব্যত্যয় ঘটলে উত্তরপত্র মূল্যায়ন করা নাও হতে পারে।

(গ) কোন পরীক্ষার্থী অতিরিক্ত প্রশ্নোত্তরের খাতা ব্যবহার করলে উক্ত অতিরিক্ত খাতার সঙ্গে তার রোল নম্বর লিখবে এবং তা মূল খাতার সাথে শক্তভাবে সংযুক্ত করে দিবে।

(ঘ) কোন পরীক্ষার্থী প্রবেশপত্র ও পরিচয়পত্র ছাড়া অন্য কোন কাগজপত্রসহ পরীক্ষার হলে প্রবেশ করতে পারবেনা। কারো নিকট এরূপ কাগজপত্র পাওয়া গেলে তাকে তাৎক্ষণিকভাবে পরীক্ষার হল হতে বহিস্কার করা যাবে। পরীক্ষার্থীগণ শুধুমাত্র কর্তৃপক্ষ কর্তৃক সরবরাহকৃত কাগজপত্রে লিখিত/খসড়া হিসাব করতে পারবে। পরীক্ষার খাতা ও অতিরিক্ত খাতা পরীক্ষা শেষে অবশ্যই প্রত্যবেক্ষকের নিকট জমা দিতে হবে এবং এ সব ছেঁড়া বা অন্যের সঙ্গে অদল-বদল করা যাবে না।

(ঙ) কোন পরীক্ষার্থী সাধারণভাবে পরীক্ষা আরম্ভ হওয়ার আধ ঘন্টা পরে পরীক্ষার হলে প্রবেশ করতে পারবেনা এবং পরীক্ষার এক ঘন্টাকাল পূর্ণ না হলে পরীক্ষার হল ত্যাগ করতে পারবেনা।

(চ) পরীক্ষার্থীর হাতে, পোশাকে, স্কেল, বলপেন, পেন্সিলসহ অংকন সম্পর্কিত কোন দ্রব্যে লেখা থাকলে তা অপরাধ বলে বিবেচিত হবে এবং তদানুযায়ী শাস্তিপ্রাপ্ত হতে হবে।

(ছ) পরীক্ষার খাতায় বিষয়বহির্ভূত কিছু লিখা দূষণীয়/অপরাধ বলে বিবেচিত হবে। কোন পরীক্ষার্থী প্রশ্নপত্রের উপরে ও কিছু লিখতে পারবেনা।

(জ) কোন পরীক্ষার্থীর নির্ধারিত টেবিল/চেয়ার পরীক্ষার বিষয়বস্তু সংক্রান্ত কোন কিছু লেখা থাকলে তা পরীক্ষা আরম্ভ হওয়ার পূর্বেই কর্তব্যরত প্রত্যবেক্ষকের গোচরে আনতে হবে। অন্যথায় এটি পরীক্ষার্থী কর্তৃক সংঘটিত অপরাধ বলে বিবেচিত হবে।

(ঝ) এ বিধিতে লেখা নেই এমন কোন বিষয়ে পরীক্ষার্থীগণ কর্তব্যরত প্রত্যবেক্ষকের সিদ্ধান্ত মেনে চলতেবাধ্য থাকবে।

(ঞ) কেউ মোবাইল ফোন পরীক্ষার হলে আনতে পারবেনা। ভুলক্রমে এনে ফেললে পরীক্ষা শুরুর আগে প্রত্যবেক্ষকের কাছে জমা দিতে হবে অন্যথায় কাছে রাখার অপরাধ শাস্তিযোগ্য বলে বিবেচিত হবে।

(ট) পরীক্ষার হলে ধুমপান নিষিদ্ধ।

9. Distribution of Courses:

Sl.#	Course Type		Credit	Credit Hours/week
1.	**Major Courses (CSTE)**			
	Core Courses			
		Theory	84	84
		Lab	31.5	47.25
		Sub-total	**115.5**	**131.25**
2.	**Minor Courses**			
	Humanities (HUM, BMS, BAN)	Theory	7	7
	Business Studies(BBA)	Theory	3	3
	Basic Sciences (PHYS, MATH, STAT and EEE)	Theory	27	27
		Lab	4.5	6.75
		Sub-total	**41.5**	**43.75**
3.		**Viva-Voce**	**04**	**00**
4.	CAPSTONE PROJECT *** Project: Each credit 2 hours/week.**		**05**	**10**
	Total		**166**	**185**

10. Scheme of the Program:

Year-1 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 1101	Computer Application and Structured Programming Fundamental		3	3
2	CSTE 1102	Computer Application and Structured Programming Fundamental Lab		1.5	2.25
3	EEE 1101	Electric Circuit Analysis		3	3
4	EEE 1102	Electric Circuit Analysis Lab		1	1.5
5	PHYS 1101	Physics		3	3
6	PHYS 1102	Physics Lab		1	1.5
7	MATH 1101	Differential and Integral Calculus		3	3
8	BAN 1101	বাংলাভাষা ও সাহিত্য		2	2
9	BMS 1101	History of the Emergence of Independent Bangladesh		2	2

		Total		**19.5**	**21.25**

Year-1 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 1201	Structured Programming Language	CSTE 1101	3	3
2	CSTE 1202	Structured Programming Language Lab	CSTE 1102	1.5	2.25
3	CSTE 1203	Data Structures and Analysis	CSTE 1101	3	3
4	CSTE 1204	Data Structures and Analysis Lab	CSTE 1102	1.5	2.25
5	CSTE 1205	Numerical analysis	CSTE1101	3	3
6	CSTE 1206	Numerical analysis Lab	CSTE 1102	1	1.5
7	CSTE 1207	Discrete Mathematics		3	3
8	EEE 1201	Electronic Devices and Circuits	EEE 1101	3	3
9	EEE 1202	Electronic Devices and Circuits Lab	EEE 1102	1	1.5
10	MATH 1201	Ordinary and Partial Differential equations	MATH 1101	3	3
11	CSTE 1226	Viva Voce		1	0
		Total		**24**	**25.5**

Year-2 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 2101	Object Oriented Programming	CSTE1201	3	3
2	CSTE 2102	Object Oriented Programming Lab	CSTE 1202	1.5	2.25
3	CSTE 2103	Algorithm Design and Analysis	CSTE1203	3	3
4	CSTE 2104	Algorithm Design and Analysis Lab	CSTE 1204	1.5	2.25
5	CSTE 2105	Digital Logic Design	EEE 1201	3	3
6	CSTE 2106	Digital Logic Design Lab	EEE 1202	1	1.5
7	CSTE 2107	Theory of Computation	CSTE 1203	3	3
8	BBA 2101	Industrial Management and Accountancy		3	3
9	MATH 2101	Matrices, Vector Analysis and Co-ordinate Geometry		3	3
		Total		**22**	**24**

Year-2 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 2201	Database Management System		3	3
2	CSTE 2202	Database Management System Lab		1.5	2.25
3	EEE 2201	Digital Electronics and Pulse Technique	EEE 1201	3	3
4	EEE 2202	Digital Electronics and Pulse Technique Lab	EEE 1202	1.5	2.25
5	CSTE 2203	Signals and Systems		3	3
6	CSTE 2205	Data Communication		3	3
7	CSTE 2206	Data Communication Lab		1	1.5
8	CSTE 2207	Computer Architecture and Organization	CSTE2105	3	3
9	CSTE 2208	Computer Architecture and Organization Lab	CSTE 2106	1	1.5
10	STAT 2201	Probability, Statistics and Complex Variables		3	3
11	CSTE 2226	Viva Voce		1	0
		Total		**24**	**25.5**

Year-3 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 3101	Digital Signal Processing	CSTE2203	3	3
2	CSTE 3102	Digital Signal Processing Lab		1	1.5
3	CSTE 3103	Operating Systems and System Programming	CSTE 2103	3	3
4	CSTE 3104	Operating Systems and System Programming Lab	CSTE 2104	1.5	2.25
5	EEE 3101	Electromagnetic Waves and Radiating Systems	PHY1101	3	3
6	CSTE 3105	Microprocessor, Microcontroller and Interfacing	CSTE 2207	3	3
7	CSTE 3106	Microprocessor, Microcontroller and Interfacing Lab	CSTE 2208	1	1.5
8	CSTE 3107	Compiler Construction	CSTE 2107	3	3
9	CSTE 3108	Compiler Construction Lab		1	1.5
10	CSTE 3109	Artificial Intelligence	CSTE 2103	3	3
11	CSTE 3110	Artificial Intelligence Lab	CSTE 2104	1.5	2.25
		Total		**24**	**27**

Year-3 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 3201	Computer Graphics	CSTE1201	3	3
2	CSTE 3202	Computer Graphics Lab	CSTE1202	1	1.5
3	CSTE 3203	Computer Networking		3	3
4	CSTE 3204	Computer Networking Lab		1	1.5
5	CSTE 3205	Software Engineering and Information System Design	CSTE2201, CSTE 2103	3	3
6	CSTE 3206	Software Engineering and Information System Design Lab	CSTE 2202, CSTE 2104	1.5	2.25
7	CSTE 3207	Machine Learning	STAT2201, CSTE 2103	3	3
8	CSTE 3208	Machine Learning Lab		1.5	2.25
9	CSTE 3209	Microwave and Satellite Communication	EEE 3101	3	3
10	CSTE 3210	Microwave and Satellite Communication Lab		1	1.5
11	CSTE 3212	Web Engineering Lab	CSTE 2202	2	3
12	CSTE 3226	Viva Voce		1	0
		Total		**24**	**27**

Year-4 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 4101	Digital Image Processing	CSTE3201	3	3
2	CSTE 4102	Digital Image Processing Lab	CSTE3202	1	1.5
3	CSTE 4103	Wireless and Mobile Communication	CSTE3203	3	3
4	CSTE 4105	Optical Fiber Communication	EEE3101, EEE 1201	3	3
5	CSTE 4106	Optical Fiber Communication Lab	EEE 1202	1	1.5
6	CSTE 4108	Technical Writing and Presentation Lab		1.5	2.25
7	CSTE 4125	Capstone Project I		2	4
		Total		**14.5**	**18.25**

Year-4 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 4201	Cryptography and Network Security	CSTE 3203, CSTE 2103	3	3
2	CSTE 4202	Cryptography and Network Security Lab	CSTE 3204	1	1.5
3	CSTE 4203	Graph Theory	CSTE 1207	3	3
4	HUM-4201	Principle of Economics		3	3
5	CSTE 4225	Capstone Project II		3	6
6	CSTE 4226	Viva Voce		1	0
		Total		**14**	**16.5**
	Grand Total			**166**	**185**

Year-1 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ Per week
1	CSTE 1101	Computer Application and Structured Programming Fundamental		3	3
2	CSTE 1102	Computer Application and Structured Programming Fundamental Lab		1.5	2.25
3	EEE 1101	Electric Circuit Analysis		3	3
4	EEE 1102	Electric Circuit Analysis Lab		1	1.5
5	PHYS 1101	Physics		3	3
6	PHYS 1102	Physics Lab		1	1.5
7	MATH 1101	Differential and Integral Calculus		3	3
8	BAN 1101	বাংলাভাষা ও সাহিত্য		2	2
9	BMS 1101	History of the Emergence of Independent Bangladesh		2	2
		Total		**19.5**	**21.25**

COURSE TITLE: COMPUTER APPLICATIONS AND STRUCTURED PROGRAMMING LANGUAGE FUNDAMENTAL

Course Code: CSTE 1101 **Credit:** 03 **Exam Hours:** 04	**Attendance:** 05 **CIE Marks:** 25 **SEE Marks:** 70

Rational: This course has been designed to develop the basic concepts of computer terminology and ability to solve computing problems using structured programming languages.

Course Objectives:

- Introduce the fundamentals of computing devices.
- Provide the students with fundamental knowledge about structured programming and problem-solving.
- Formulate opinions about the impact of computers on society and why computers are essential components in education, business and relevant areas.
- Focuses on computer literacy that prepares students for life-long learning of computer concepts and skills

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify computer terminology,number system and logic gate.
CLO2	express the Structured Programming.
CLO3	apply the basic concepts into solving problems
CLO4	classifyproblems and design flowcharts.
CLO5	acquire individual and teamwork skills.

Mapping of CLO to PLO (Program Learning Outcome)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
	CLO1	√											
	CLO2	√											
	CLO3	√											√
	CLO4	√											√
	CLO5										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	***Introduction to Computer Basics, Types and Generation of Computers*** Block Diagram of a Computer Demo of computer mother board. Functions of the Different Units Input unit, Output unit, Memory unit, CPU (ALU+CU)	CLO1	Lecture and discussion about the characteristics of computer, data processing and computer's Evaluation.	Questions, quizzes, Homework, exams.
2	Number system, Logic gate	CLO1	Lecture and discussion with problems.	
3	Registers, Different types of Registers. Cache Memory Primary Memory i) RAM a) How data is stored in a RAM b) DRAM and SRAM ii) ROM a) ROM BIOS/ Firmware b) Types of ROM, Secondary Memories i) Hard disk a) Structure of a hard disk, how data is stored in a hard disk, concept of tracks, sectors, clusters, cylinders b) formatting of hard dick (low level formatting and hilevel formatting) ii) Floopy [data storage mechanism] iii) CD [data storage mechanism] Software	CLO1	Lecture and discussion with examples of different types of register.	

4	Software: System Software a. Operating System i. Functions of O/S ii. Types of O/S b. Program Language Translators i. Assembler21 ii. Compiler iii. Interpreter c. Utility Programs d. Communication Software e. Performance Monitoring Software; Application Software: ; overview	CLO1	Lecture and discussion about the RAM and different types of ROM.	**Class Test 1** ***(topicsof the week's 1-4)***
5-6	Computer programming, programming languages, Compilation vs. Interpretation, Problem-solving techniques, Data Flow Diagram. Variable declarations including common data types (e.g., int, float, char, etc.); Constants and its use;	CLO2	Lecture and discussion about basic concept of programming	Questions, quizzes, Homework, exams.
7	**Basic program structure:** 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	CLO2	Lecture and discussion with the basic data type, the 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 the programming language. Example of using variables and constants and expressions.	**Class Test 2** (topics of the week's 5-7)
8-9	**Control Structures & Statements:** Boolean expressions Conditional statements (e.g., if/else, switch case). Nested conditional Structures	CLO2, CLO3	Lecture and discussion with problems, which corresponds to the program flow and logic control.	Questions, quizzes, Homework, exams.

	Standard/ structures programming practices for decision structures. Continue and Break statements Example problems using control structures		Demonstrate various control structures with flow charts and show how to solve the decision-making problem using them. Students will be asked to write and analyze a program that involved decision-making.	
10-11	**Loop Structures:** While, For, Do-While Loops, Nesting of loops, Switch, Continue, Break statements, Jumps in loops, Go To statements.	CLO2, CLO3, CLO4, CLO5	Lecture and discussion with problems that require iterations. Demonstrate repetition essentials, counter-controlled repetition, for repetition statement, break, and continue.	**Class Test-3/ Assignment/presentation**(topics of the week's 8-11)
12-13	**Complex data type (Array):** Array syntax, rules and variable declaration, One-dimensional, Multidimensional arrays, Strings as arrays; initializing arrays	CLO2, CLO3, CLO4	Lecture and discussion with tabular data, sorting, and searching arrays. Multidimensional array Examples using the array.	Questions, quizzes, Homework, exams.

Recommended Books:

1. **Introduction to Computer** by Peter Norton, McGraw-Hill.
2. **Fundamentals of Computers** by Balagurusamy, McGraw-Hill.
3. **Computer Systems** by J. Stanley Warford, Jones & Bartlett Publishers.
4. **Computer Fundamentals** by Pradeep K. Sinha, BPB Publication.
5. **Programming in ANSI C** by E. Balagurusamy, McGraw Hill.
6. **Teach yourself C** by H. Schildt, McGraw Hill.
7. **Theory and problems of programming with C** by Byron S. Gottfried, Schaum's Outline Series, McGraw Hill.
8. **C How to Program** by H. M. Deitel and P. J. Deitel, Pearson Education.

ASSESSMENT PATTERN	
Attendance- 05	
CIE-Continuous Internal Evaluation (25)	**SEE-Semester End Examination (70 marks)**

(Average of best 2 out of 3 will be counted)

Bloom's Category	Test-1 (25)	Test-2 (25)	Test-3/ Assignment/presentation (25)
Remember	5	5	
Understand	10	10	5
Apply	10	10	20
Analyze			
Evaluate			
Create			

Bloom's Category	Test
Remember	20
Understand	25
Apply	20
Analyze	5
Evaluate	
Create	

COURSE TITLE: COMPUTER APPLICATIONS AND STRUCTURED PROGRAMMING LANGUAGE FUNDAMENTAL LAB

Course Code: CSTE 1102 **Credit:** 1.5 **Exam Hours:** 3 Hours	**Attendance:** 10 **Viva:**20 **SEE Marks:** 70

Rationale: This course is designed to develop practical knowledge of computer terminology, Microsoft office and ability to solve real world problems using structured programming language.

Course Objectives:

- Providehands-onexperiencetothestudentssothattheycanputtheoreticalconceptstopractice.
- Introduce the concepts of operatingsystems and build a foundation of strong knowledge required for Word, Spread Sheet, Presentation package and networking.
- Explain computing problems using programming concepts.
- Develop the students for competitive programming contests.
- Review experiments to verify the theories and concepts develop in CSTE 1101 practically.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify the different components of computer and networking devices.
CLO2	use office packages.
CLO3	describe the basic program structure, different control and loop structures, array.
CLO4	apply different programming concepts in solving computational problems.

	CLO5	acquire individual and teamwork skills.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											√
CLO4	√											√
CLO5										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**HARDWARE** Assemble Hardware Components (Desktop andLaptop). **OPERATING SYSTEM** (DOS, Windows, Linux, Mac)	**CLO1**	Discussion and practice First lecture and then Practice	Questions, quizzes, Homework, reports, exams.
2	**WORD PROCESSOR** • Popular word processors Create a test file complete withfigures, columns, andtables.	CLO2	Lecture and discussion with problems.	

3	**SPREAD SHEET** • Popular Spread Sheet • Maintain a small data base • Minor bookkeeping Statistical andgraphical analysis ofdata. **PRESENTATION PACKAGE** • Multimedia slides Animation.	CLO2	Lecture and discussion with problems.	Questions, quizzes, Homework, reports, exams.
4	**INTERNET AND COMPUTER NETWORK** • BrowsingConcepts • Searching in theweb • Email • CableConfigurations: Straight cable, Cross Cable etc. LAN setup and IP addressconfiguration.	CLO1	Lecture and discussion with problems.	Questions, quizzes, Homework, reports, exams.
7	**Basic Program Structure** • Data types • Operators • Memory allocation • Various expressions • Simple arithmetic problems	CLO3	Discussion and practice	Questions, quizzes, Homework, reports, exams.
8-9	**Control Structures & Statements** • If/else • Switch • Nested conditional structure • Continue and break	CLO3, CLO4	Lecture and then Practice	
10-11	**Loop Structures** • Loop structure • Loop control flow • Nested loop • Loop operation	CLO3, CLO4	Lecture and discussion with problems.	Questions, quizzes, Homework, reports, exams.

12	**Array** • Array declaration • Array initialization • Array processing	CLO3, CLO4	Lecture and discussion with problems.	
13	**Final Lab Exam**	CLO1, CLO2, CLO3, CLO4, CLO5	Evaluate result& viva.	Contest programming, or Programming test,Viva

ASSESSMENT PATTERN

Attendance- 10

Viva-20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	30
Analyze	10
Evaluate	
Create	

COURSE TITLE: ELECTRIC CIRCUIT ANALYSIS

Course Code: EEE 1101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Acquaint students with the basic concepts and properties of electrical circuits and networks
- Introduce the basic laws of electricity such as Ohm's law, Kirchhoff's laws, magnetic circuits, and network theorems.
- Familiarize students with the working method and applications of electrical circuits.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	illustrate the basic electrical circuits, theorems and operating fundamentals of electrical engineering equipment and machinery.
CLO2	use the basic principles, laws, and theorems of DC and AC electrical circuits to solve the problem.
CLO3	differentiate different DC and AC electrical circuit using fundamental laws of electrical system.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Circuit Models:** Characteristics & applications of linear circuit elements,	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, Topic wise lecture delivery.	Questions, quizzes, Homework, exams
2	Ideal, and non-ideal sources: Voltage and Current. Series, Parallel and Compound circuit analysis. Loading effects: Ammeter and Voltmeter.	CLO1	Lecture and discussion on theory and problems.	
3	**Circuit Theorem and DC analysis:** Ohm's law, Voltage and current divider rule, Kirchhoff's Laws.	CLO1, CLO2	Lecture and discussion on theory and problems.	
4	**Circuit Theorem and DC analysis:** Mesh analysis and the matrix form of Mesh equations.	CLO1, CLO2	Lecture and discussion on theory and problems.	
5	Nodal analysis. The matrix form of Nodal equations.	CLO1, CLO2	Lecture and discussion on theory and problems.	**Class Test 1** (topics of the week's

				1-4)
6	**Circuit Theorem and DC analysis:** Superposition Theorem, Thevenin's Theorem, Norton's Theorem,	CLO1, CLO2	Lecture and discussion on theory and problems.	Questions, quizzes, Homework, exams
7	Maximum Power Transfer Theorem, and Reciprocity Theorem.	CLO1, CLO2	Lecture and discussion on theory and problems.	
8	**Transients and Time Domain analysis:** Transient in RC and RL circuit and related problems.	CLO1**,** CLO2 ,CLO3	Lecture and discussion on theory and problems.	
9	RLC circuits and related problems. Pulse repetition rate and duty cycle. Average value. RC response to square wave inputs	CLO1, CLO2,CLO3	Lecture and discussion on theory and problems.	**Class Test 2** (topics of the week's 5-8)
10	**AC Circuits:** Periodic functions, average &RMS values, Steady state behavior with sinusoidal, excitation, phasor representation, reactance and impedance, series and parallel AC circuits, resonance	CLO1, CLO2,CLO3	Lecture and discussion on theory and problems related to AC circuits.	Questions, quizzes, Homework, exams
11	**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.	CLO1, CLO2,CLO3	Lecture and discussion on theory and problems related to AC circuits.	
12	**Networks:** Two port network and its parameters. Equivalent circuits. Analog filter design: Elementary filter theory, Characteristics impedance.	CLO1, CLO2,CLO3	Lecture and discussion on two ports network.	**Assignment** (topics of the week's 9-11)
13	A low-pass filter, High pass filter, Band-pass filter, Band-elimination filter.	CLO1, CLO2,CLO3	Lecture and discussion on theory and problems related to analog filter	Questions, quizzes, Homework, exams

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,

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous Internal Evaluation (25) (Average of best 2 out of 3 will be counted)	**SEE-Semester End Examination (70 marks)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	5		
Understand	10	5	
Apply	10	20	15
Analyze			10

Bloom's Category	Test
Remember	**10**
Understand	10
Apply	40
Analyze	10
Evaluate	
Create	

COURSE TITLE:ELECTRIC CIRCUIT ANALYSIS LAB

Course Code: EEE 1102	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

Rational: This lab course is designed to develop student's ability to design, build, and implement basic AC and DC circuits.

Course Objectives:

- Provide hands-on experience to the students so that they can put theoretical concepts to practice.
- Explain physical phenomena in the tests performed (a connection between physical laws and their application).
- Discuss the transient response of series and parallel A.C. circuits.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	illustrate the functions of electrical instruments and machineries
CLO2	apply the concept of circuit laws and network theorems in laboratory measurements and analyze output.
CLO3	acquire individual and teamwork skills.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	To familiarize students with the operation of different electrical instruments.	CLO1	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Questions, quizzes, Homework, reports, exams.
2, 3, 4, 5,6	To verify the following theorems using bread boarding and simulation software (PSPICE): i. KCL and KVL theorem, ii. Superposition theorem, iii. Thevenin's theorem, iv. Norton's theorem and Maximum power transfer theorem	CLO2	Through lecture, Laboratory, and out-of-class assignments.	Questions, quizzes, Homework, reports, exams.
7,8,9	To design and construct of low pass and high pass filter and draw their characteristics curves.	CLO2	Through lecture, laboratory, and out-of-class assignments.	
10, 11	Study the frequency response of an RLC series and parallel circuit and find its resonant frequency.	CLO2	Through lecture, laboratory, and out-of-class assignments.	
12	**Review class**			
13	**Final Lab Exam**	CLO1, CLO2, CLO3		Evaluate result& viva.
ASSESSMENT PATTERN				
Attendance- 10 **Viva- 20**				
SEE-Semester End Examination (70 marks)				

Bloom's Category	Test
Remember	
Understand	**15**
Apply	**40**
Analyze	**15**
Evaluate	
Create	

COURSE TITLE:PHYSICS

Course Code: PHYS 1101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: This course is designed to get idea about the fundamental concept of electric field, magnetic field and nature of light

Course Objectives:

- Make the students familiarize with the idea of fundamental laws of electric field and magnetic field, electric potential, capacitor, inductor, and their application.
- To introduce basic concepts about interference, diffraction, and polarization of light.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the basic laws of the electric and magnetic field, electric potential, capacitance , inductance and the behavior of light.
CLO2	apply the basic laws of physics in solving the problem.
CLO3	contrast the electric circuit using laws of physics.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											

Lesson Plan (as per week):				
Week	**Course Contents**	**CLOs**	**Teaching Learning Strategy (activities directed to achieve outcomes)**	**Assessment Strategy (How they are developed)**
1	Coulomb's law and its application, Electric field and related problem.	CLO1, CLO2	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Questions, quizzes, Homework, reports, exams. **Class Test 1**(topics of the week's 1-4).
2	Gauss's law and its application	CLO1, CLO2	Lecture and discussion with problems.	
3	Electric potential and related problem.	CLO1, CLO2	Lecture and discussion with problems.	
4	Capacitors and capacitance: Capacitors with dielectrics, Dielectrics and atomic view,	CLO1, CLO2	Lecture and discussion with problems.	
5	Charging and discharging of a capacitor and related problem.	CLO1, CLO2, CLO3	Exercise with various mathematical problems.	Questions, quizzes, Homework, reports, exams. **Class Test 2** (topics of the week's5-8)
6	Ohms law and Kirchhoff's law. Application of above law in solving problem.	CLO1, CLO2,CLO3.	Lecture and discussion with problems.	
7	Magnetic field: Magnetic induction, Magnetic force on a current carrying conductor.	CLO1, CLO2	Lecture and discussion with problems.	
8	Torque on a current carrying loop, Hall effect.	CLO1, CLO2	Lecture and discussion with problems.	
9	Faraday's law of electromagnetic induction; Lenz's law;	CLO1, CLO2	Lecture and discussion with problems.	Questions, quizzes, Homework, reports, exams.
10	Ampere's law and its application. Biot-savart law and its application.	CLO1, CLO2	Lecture and discussion with problems.	
11	Self-induction; Mutual induction; Magnetic properties of matter, Hysteresis curve; Maxwell equations, electromagnetic oscillation.	CLO1, CLO2,CLO3	Lecture and discussion with problems.	
12	Interference of light, Young. Double slit experiment, Fresnel Biprism, Newton's ring.	CLO1, CLO2	Understanding and solving the problem.	
13	Diffraction of light: Fresnel and Fraunhofer diffractions; Diffraction by single slit,	CLO1,CLO2	Lecture and discussion with problems.	**Assignment**(topics of the week's 9-13)

	Diffraction from circular aperture and basic concept of polarization.			

Recommended Books:

1. Physics Vol-1 and 2 by D. Halliday and R. Resnick, Wiley Eastern Private Ltd.
2. Vibrations and Waves -The MIT Introductory Physics series by A. P. French, CBS.
3. Heat and thermodynamics by Brijlal and N. Subrahmanyam
4. Physics for engineer by Dr. Giasuddin Ahmed.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	**5**	**5**	
Understand	10	15	5
Apply	10	5	20
Analyze			
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	**10**
Understand	**20**
Apply	**30**
Analyze	**10**
Evaluate	
Create	

COURSE TITLE: PHYSICS LAB

Course Code: PHYS 1102	**Attendance:** 10
Credit: 1	**Final Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Familiarize students with the operation of different 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.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify various equipment's in Laboratory.
CLO2	verify the laws of physics.
CLO3	determine resistances , voltages, focal length, radius of curvature etc. using different methods of physics.
CLO4	acquire individual teamwork skills for working effectively in groups.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	To familiarize students with the operation of different instruments and verify ohm's law, Kirchhoff's law etc.	CLO1, CLO2, CLO3	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Questions, quizzes, Homework, reports, exams.
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.	CLO3, CLO4	Through lecture, Laboratory, and out-of-class assignments.	Questions, quizzes, Homework, reports, exams.

6, 7, 8	5. Determination of the focal length of i. a convex lens by displacement method and ii. a concave lens by an auxiliary lens method.	CLO3, CLO4	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.	CLO3, CLO4	Through lecture, laboratory, and out-of-class assignments.	
11, 12,13	8. Determination of the radius of curvature of a planoconvex lens by Newton's method.	CLO3, CLO4	Through lecture,laboratory, and out-of-class assignments.	
	Final Lab Exam (Lab and Viva)			

Recommended Books:

1. Practial Physics, Gias Uddin and Shabuddin

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	**5**
Understand	10
Apply	50
Analyze	5
Evaluate	
Create	

COURSE TITLE: DIFFERENTIAL AND INTEGRAL CALCULUS

Course Code: MATH 1101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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
- Discuss various theorems to solve the problem.
- Provide knowledge about functions and formulas in engineering solutions.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify various types of differentiation and integration.
CLO2	apply differentiation and integration in solving engineering problems
CLO3	use functions and theorems in engineering problems.
CLO4	examine functions and theorem in engineering solutions.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Differential Calculus:** Limits, continuity and differentiability;	CLO1	Lecture and discussion with characteristics parameters of functions. Analyzing	Questions, quizzes, Homework, exams Explanation,
2	Successive differentiation of various types of functions;	CLO2, CLO3		
3	Leibnitz's Theorem; Rolle's Theorem; Mean value Theorem;	CLO3		
4	Expansion of functions; Evaluation of indeterminate forms by L' Hospitals rule;	CLO3		Questions, quizzes, Homework, exams
5	Euler's Theorem; Tangent and Normal;	CLO3		**Class Test 1** (topics

	Maximum and minimum values of functions of single variable; Curvature, Asymptotes		functions.	of the week's 1-4)
6	Partial differentiation;	CLO2		Questions, quizzes, Homework, exams
7	**Integral Calculus:** Definitions of integration; Integration by the method of substitutions;	CLO2		
8	Integration by parts; Standard integrals; Integration by the method of successive reduction;	CLO2		
9	Definite integrals and its use in summing series;			**Class Test 2**(topics of the week's5-8)
10	Walli's formula, Improper integrals, Beta function and Gamma function;	CLO4		Questions, quizzes, Homework, exams
11	Area under a plane curve; Area of the region enclosed by two curves;	CLO2		
12	Volume of solids of revolution; multiple integrals and its application.	CLO2		**Assignment**(topics of the week's9-12)
13	Review topics and Final exam preparation.	CLO1-CLO4	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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**
Remember	5	5	
Understand	5	5	

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	10
Understand	25
Apply	25

Apply	15	10	25	**Analyze**	10
Analyze		5		**Evaluate**	
Evaluate				**Create**	
Create					

কোর্সের নাম : বাংলা ভাষা ও সাহিত্য

কোর্সকোডঃ BAN-1101	উপস্থিতি = ০৫
ক্রেডিটঃ ২	শ্রেণি মূল্যায়ন (CIE) = ২৫
পরীক্ষার সময়ঃ ০৩ ঘণ্টা	ফাইনাল পরীক্ষা (SEE) = ৭০

কোর্সটির যৌক্তিকতা (Rationale)**:** প্রায়োগিক জীবনে বাংলা ভাষার যথাযথ ব্যবহার এবং শুদ্ধ বাংলা চর্চার বিকাশে কোর্সটি যেমন কার্যকরি ঠিক তেমনি ব্যাকরণের প্রাথমিক বিষয়গুলোর সাথে সাহিত্যের মাধ্যমে শিক্ষার্থীদের মানবিক মূল্যবোধ জাগ্রত করার প্রাসঙ্গিকতায় কোর্সটি একটি যৌক্তিক ভিত্তির প্রতিষ্ঠিত।

কোর্সটির উদ্দেশ্য (Course Objectives)**ঃ**

- শিক্ষার্থীদের ভাষাগত দক্ষতা বৃদ্ধিও পাশাপাশি প্রাত্যহিক জীবনে শুদ্ধ উচ্চারণের ব্যবহার বিকাশ ।
- ব্যাকরণের প্রাথমিক জ্ঞান অন্বেষণের মাধ্যমে প্রমিত বানান রীতির ব্যবহার ও লেখন দক্ষতা বৃদ্ধি।
- সাহিত্যে ও অন্তর্নিহিতরস আস্বাদনের মাধ্যমে শিক্ষার্থীদেও মানবিক মূল্যবোধ জাগ্রত করা।

শিখন উপকরণ (Resources Used)ঃহোয়াইট বোর্ড, মার্কার, মাল্টিমিডিয়া, গ্রন্থ, বিগত বছরের প্রশ্ন।

কোর্স শিখন প্রাপ্তি (Course learning outcomes (CLO))	**CLOs**	**বিবরণঃ (কোর্সটির শেষে শিক্ষার্থীরা সক্ষম হবেন)**
	CLO1	বাংলা ভাষার পূর্বাপর পরিচয়, বাস্তবিক ও ব্যবহারিক জ্ঞান, অক্ষর, ধ্বনি, বাংলা ধ্বনির শুদ্ধ উচ্চারণ, বাংলা শব্দ গঠন সম্পর্কিত ধারণা, বাংলা বাক্য গঠন সম্পর্কিত ধারণা, বাংলা বানানের পূর্বাপর ইতিহাস, প্রমিতরীতি সম্পর্কিত জ্ঞান, বাংলা সাহিত্যেও ইতিহাস সম্পর্কে জানতে/ মনে রাখতে সক্ষম হবেন।
	CLO2	ধ্বনি ও অক্ষরের মধ্যে প্রার্থক্য নির্ণয়, গল্প, কবিতা, প্রবন্ধের আঙ্গিকে সাহিত্যেও ধারাক্রমের সাথে যোগাযোগ স্থাপনে সক্ষম হবেন।
	CLO3	কবিতা, গল্প, প্রবন্ধের আঙ্গিকে বাংলা সাহিত্যেও ইতিহাসের গতি প্রকৃতি বিশ্লেষণ করার মধ্য দিয়ে সমাজ ব্যবস্থা তথা

		বাঙালির পূর্বাপর জীবনধারা, সমাজ ব্যবস্থার নানা ত্রুটিবিচ্যুতি তুলে ধওে তা থেকে সমাধানের পথ নির্ণয়ে সক্ষম হবেন।

ম্যাপিং **CLO** থেকে **PLO** (প্রোগাম শিখন প্রাপ্তি) (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):

সপ্তাহ	কোর্সেরবিষয় **Course Contents**	কোর্স শিখন প্রাপ্তি **CLOs**	শিখন পদ্ধতি **Teaching Learning Strategy (activities directed to achieve outcomes)**	মূল্যায়ন পদ্ধতি **Assessment Strategy (How they are developed)**
০১	• ভাষা: সংজ্ঞা, প্রকৃতি ও বৈশিষ্ট্য •বাংলা ভাষার প্রাথমিক পরিচয় বৈশিষ্ট্য ও রূপ বৈচিত্র	CLO1	বক্তব্য উপস্থাপন	কুইজ শ্রেণি উপস্থাপনা ও গ্রুপ আলোচনা
০২	• বাংলা ধ্বনি ও অক্ষরের প্রাথমিক পরিচয় • স্বরধ্বনি ও ব্যঞ্জনধ্বনির বৈশিষ্ট্য ও শ্রেণিবিন্যাস	CLO1, CLO2	বক্তব্য এবং শ্রুতিগ্রাহ্য বাংলা ধ্বনি প্রযুক্তি সহযোগে উপস্থাপন	
০৩	• উচ্চারণ স্থান ও উচ্চারণ রীতি অনুযায়ী বাংলা ধ্বনি বিশ্লেষণ	CLO1	বক্তব্য এবং শ্রুতিগ্রাহ্য বাংলা ধ্বনি প্রযুক্তি সহযোগে উপস্থাপন	
০৪	• বাংলা শব্দ ও বাক্যে ও প্রাথমিক পাঠ এবং বাংলা শব্দ ও বাংলা বাক্য গঠন প্রক্রিয়া	CLO1		
০৫	• বাংলা বানানের সংস্কারের ধারাক্রম: বিশ্বভারতী, কলকাতা বিশ্ববিদ্যালয় পশ্চিমবঙ্গ বাংলা আকাদেমি, বাংলা একাডেমি,ঢাকা।	CLO1		বানান নিয়ে কুইজ। শ্রেণি পরীক্ষা-০১ (**সপ্তাহ ১-৪**)
০৬	•বাংলা সাহিত্যের- সংক্ষিপ্ত ইতিহাস	CLO3		গ্রুপ আলোচনা
০৭	• নির্বাচিত কবিতা (১,২,৩) এর বিষয় বিন্যাস,কবি পরিচিতি, মূলভাব বিশ্লেষণ, চরিত্র-চিত্রণ	CLO2, CLO3		
০৮	নির্বাচিত কবিতা (৪,৫,৬) এর বিষয় বিন্যাস,কবি পরিচিতি, মূলভাব বিশ্লেষণ, চরিত্র-চিত্রণ	CLO2, CLO3		

০৯	ছোট গল্পের সংজ্ঞা,নির্মান কৌশল নির্বাচিত গল্প-০১ এর বিষয় বিন্যাস, লেখক পরিচিতি, মূলভাব বিশ্লেষণ, চরিত্র-চিত্রণ	CLO2, CLO3	বক্তব্য উপস্থাপন	শ্রেণি পরীক্ষা-০২ **(সপ্তাহ ৫-৮)**
১০	নির্বাচিত গল্প-০২ এবং ০৩ এর বিষয় বিন্যাস, লেখক পরিচিতি, মূলভাব বিশ্লেষণ, চরিত্র-চিত্রণ	CLO2, CLO3		অ্যাসাইনমেন্ট
১১	প্রবন্ধের নির্মান কৌশল ও নির্বাচিত প্রবন্ধ-০১ এর বিষয় বিন্যাস, লেখক পরিচিতি, মূলভাব এবং বাস্তবিক প্রয়োগের যথাযথ বিশ্লেষণ	CLO2, CLO3		
১২	নির্বাচিত প্রবন্ধ-২ এবং ৩ এর বিষয় বিন্যাস, লেখক পরিচিতি, মূলভাব এবং বাস্তবিক প্রয়োগের যথাযথ বিশ্লেষণ	CLO2, CLO3		গ্রুপ আলোচনা
১৩	রিভিউ ক্লাস	CLO1, CLO2, CLO3		শ্রেণি পরীক্ষা-০৩ **(সপ্তাহ ১০-১২)**

সহায়ক গ্রন্থঃ

১। ভাষা ও সাহিত্যেরযুগলবন্দি। চন্দনআনোয়ার ও শুভেন্দু সাহা (রচনাওসম্পা.)

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। রবীন্দ্রছোটগল্পেরসমাজতত্ত্ব । ক্ষেত্রগুপ্ত

১৬। কাজীনজরুলইসলাম :কবি ও কবিতা । আবদুলমান্নান সৈয়দ

১৭। নজরুলেরজীবন ও কর্মেপ্রেম । চন্দনআনোয়ার

১৮। আধুনিকবাংলাকাব্য পরিচয়। দীপ্তিত্রিপাঠী

১৯। জীবনানন্দ দাশেরকবিতা : নন্দনতাত্ত্বিকবিচার। মাহবুবসাদিক

২০। সৈয়দ শামসুলহকেরসাহিত্যকর্ম : মোস্তফাতারিকুলআহসান

২১। শামসুররাহমান : নিঃসঙ্গশেরপা : হুমায়ুনআজাদ

২২। রুদ্র মুহম্মদ শহিদুল্লা : স্মারকগ্রন্থ। হিমেলবরকদ সম্পাদিত

২৩। ছোটগল্পের দর্শন ও নিদর্শন । মাসুদ রহমান

২৪। মানিক বন্দ্যোপাধ্যায়ের ছোটগল্প :সমাজচেতনা ও জীবনেররূপায়ণ

২৫। সেলিনা হোসেনেরকথাসাহিত্যেদেশ কালজাতি । মাসুদুজ্জামান ও বরেন্দু মণ্ডলসম্পাদিত

২৬। হাসানআজিজুলহকেরকথাসাহিত্য :বিষয়বিন্যাস ও নির্মাণকৌশল । চন্দনআনোয়ার

২৭। আখতারুমানইলিয়াস :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।

মূল্যায়ন নমূনাঃ

উপস্থিতি = ০৫

শ্রেণি মূল্যায়ন = ২৫

CIE-Continuous Internal Evaluation (25)

(Average of best 2 out of 3 will be counted)

ফাইনাল পরীক্ষা = ৭০

SEE-Semester End Examination (70 marks)

Bloom's Category	শ্রেণি পরীক্ষা-০১ (২৫)	শ্রেণি পরীক্ষা-০২ (২৫)	শ্রেণি পরীক্ষা-০৩ (২৫)
Remember	১০	০৫	
Understand	১৫	১৫	
Apply		০৫	১৫
Analyze			১০
Evaluate			
Create			

Bloom's Category	Test
Remember	২০
Understand	২০
Apply	১৫
Analyze	১৫
Evaluate	
Create	

COURSE TITLE: HISTORY OF THE EMERGENCE OF INDEPENDENT BANGLADESH

Course Code: BMS 1101	**Attendance:** 05
Credit: 02	**CIE Marks:** 25
Exam Hours: 03	**SEE Marks:** 70

Rationale: This course is designed to know the history of the emergence of Bangladesh and thus to bolster patriotism in Bangladeshi citizens.

Course Objectives:

- Make the student knowledgeable about the emergence of Bangladesh.
- Discuss about the ethnical, culture and language of Bangladesh.
- Familiarize them about its people and culture.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	learn the movement of Bangladesh from 1947 to 1971.
CLO2	acquire knowledge about the ethnicity, culture and language of the country.
CLO3	learn the strategy to build Bangladesh after 1971

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√								√			
CLO2	√					√						
CLO3	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Introducing:** History of the Emergence of Independent Bangladesh and its Scope	CLO1	Delivering Lecture	• Assignment • Written Test • Oral test **Classtest-1(1-3)**
2-3	**Description of the Country and its People** • Description of the Country and its People • Ethnical Composition • Language	CLO2	• Delivering Lecture • Power Point (PP) projection • Presenting through image, audio and video. Showing the Evaluation of Bangla fonts	
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	CLO1	• Delivering Lecture Showing reverent images and videos	

	• 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 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	CLO1	• Delivering lectures • Showing relevant image and video Group discussion	Class test-2(4-7)
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	CLO1	• Delivering lectures • Showing relevant image and video • Panel discussion	Class test-3/Assignment(8-13) • Written Test • Assignment • Presentation • Debating • Short Question
10-11	**The War of Liberation and Formation of Independent Bangladesh** • The Spontaneous Early Resistance and Subsequent Organized Resistance (MuktiFouj, MuktiBahini, 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-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	CLO1	• Delivering lectures • Showing relevant images and videos • Role play	

	Formation of Joint Command and the Victory			
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	CLO3	• 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. Rounaq Jahan, Pakistan: Failure in National Integration, The University Press Limited, Dhaka 1977.
3. Talukder Maniruzzaman, Radical Politics and the Emergence of Bangladesh, Mowla, Brothers, Dhaka2003.
৪. সালাহ্উদ্দিনআহমেদ ও অন্যান্য (সম্পাদিত), বাংলাদেশের মুক্তি সংগ্রামেরইতিহাস ১৯৪৭-১৯৭১, আগামীপ্রকাশনী, ঢাকা ২০০২।
৫. সিরাজুল ইসলাম (সম্পাদিত), বাংলাদেশের ইতিহাস ১৭০৪-১৯৭১, ৩ খন্ড, এশিয়াটিক সোসাইটি অব বাংলাদেশ।
৬. শেখ মুজিবুর রহমান, অসমাপ্ত আত্মজীবনী, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১২।
৭. সিরাজউদ্দিনআহমেদ,একাত্তরের মুক্তিযুদ্ধ: স্বাধীনবাংলাদেশের অভ্যুদয়, ইসলামিক ফাউন্ডেশন, ঢাকা ২০১১।
৮. ড. হারুন-অর-রশিদ, বঙ্গবন্ধুর অসমাপ্ত আত্মজীবনী পুনর্পাঠ, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১৩।
৯. ড. আতফুলহাইশিবলী ও ড. মোঃমাহবুবররহমান, বাংলাদেশের সাংবিধানিকইতিহাস ১৭৭৩-১৯৭২, সূবর্ণ প্রকাশনী।
১০. ড. মোঃমাহবুবররহমান, বাংলাদেশের ইতিহাস ১৯৪৭-১৯৭১, সময়প্রকাশনী, ঢাকা ২০১২।
১১. সৈয়দ আনোয়ার হোসেন, বাংলাদেশের স্বাধীনতাযুদ্ধে পরাশক্তির ভূমিকা, ডানাপ্রকাশনী, ঢাকা ১৯৮২।
১২. আবুলমালআবদুলমুহিত, বাংলাদেশ: জাতিরাষ্ট্রের উদ্ভব, সাহিত্য প্রকাশ, ঢাকা ২০০০।
১৩. ড. হারুন-অর-রশিদ,বাংলাদেশ: রাজনীতি, সরকার ও শাসনতান্ত্রিকউন্নয়ন ১৭৫৭-২০০০, নিউ এজ পাবলিকেশন্স।
14. আতিউররহমান, অসহযোগ আন্দোলনেরদিনগুলি: মুক্তিযুদ্ধেও প্রস্তুতিপর্ব, সাহিত্য প্রকাশ, ঢাকা ১৯৯৮।

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous Internal Evaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	10	5	
Understand	15	10	15
Apply			
Analyze		10	15
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	30
Understand	30
Apply	
Analyze	10
Evaluate	
Create	

Year-1 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 1201	Structured Programming Language	CSTE 1101	3	3
2	CSTE 1202	Structured Programming Language Lab	CSTE 1102	1.5	2.25
3	CSTE 1203	Data Structures and Analysis	CSTE 1101	3	3
4	CSTE 1204	Data Structures and Analysis Lab	CSTE 1102	1.5	2.25
5	CSTE 1205	Numerical analysis	CSTE1101	3	3
6	CSTE 1206	Numerical analysis Lab	CSTE 1102	1	1.5
7	CSTE 1207	Discrete Mathematics		3	3
8	EEE 1201	Electronic Devices and Circuits	EEE 1101	3	3
9	EEE 1202	Electronic Devices and Circuits Lab	EEE 1102	1	1.5
10	MATH 1201	Ordinary and Partial Differential equations	MATH 1101	3	3
11	CSTE 1226	Viva Voce		1	0
		Total		**24**	**25.5**

COURSE TITLE: STRUCTURED PROGRAMMING LANGUAGE

Course Code: CSTE 1201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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

Course Objectives:

- Provide the students with the fundamental knowledge about structured programming and problem solving.
- Give idea about basic data types, arrays and other structures of C programming and utilize that knowledge to write codes for various types of problems.

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

Course Learning Outcomes (CLO)	CLOs	Description (At the end of the course, students will be able to)
	CLO1	explain pointer, functions , structures, file manipulation, memory management etc.
	CLO2	apply pointer, functions, structures, file manipulation, memory management etc to solve mathematical problem.
	CLO3	recognize computational complexity of different problems and techniques.

Mapping of CLO to PLO (Program Learning Outcome)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
	CLO1	√											
	CLO2	√											
	CLO3		√										√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	**Basic Structured Programming overview**: Conditional statement, Loop Structures, Array. Processing array using Loops. Example problems using arrays and records	CLO1, CLO2	Lecture and discussion with tabular data, sorting, and searching arrays. Multidimensional array Examples using the array.	Questions, quizzes, Homework, exams **Class Test 1**(topics of the week's 1-4)
3-4	**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	CLO1, CLO2 **CLO3**	Lecture and discussion on Basics of pointers. Array-pointer referencing duality. Strings. Dynamic memory management. Discuss sample problems using Pointer and dynamic memory management.	
5-6	**Functions:** Different parts 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	CLO1, CLO2 **CLO3**	Lecture and discussion on function definition and function call. Function prototypes and header files. Demonstrate the mechanism of recursion and swapping. Example function writing	**Class Test 2** (topics of the week's 5-8)

	& Command line arguments. Sample problems using functions		for programming problems.	
7-8	**Structure:** Basic concept of structure, structure array, pointers for structure, passing structure to function, returning structure from the function Self-referential structure Example problems using structure	CLO1, CLO2, **CLO3**	Lecture and discussion on the basics of structure, structure array, and pointers for structure Example problem using the structure	
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	CLO1, **CLO2,** CLO3	Lecture and discussion on the basics of Union and enum data type. Example problem using Union and enum data type	Questions, quizzes, Homework, exams
10-11	**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	CLO1, **CLO3,** CLO3	Lecture and discussion on file manipulation (e.g., CRUD on File)	
12	**Computer Graphics:** Graphics programming: lines, Drawing & Filling images, patterns, drawing and filling shapes, Palettes & Colors & Text in graphics. Example problems using graphics	CLO1, CLO2, CLO3	Lecture and discussion on basics of graphics in programs. Example problem using graphics	**Class Test 3/ Assignment** (topics of the week's 9-12)
13	Miscellaneous and Final exam preparation	CLO1, CLO2, CLO3	Lecture and discussion on Macros, C preprocessor	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.

ASSESSMENT PATTERN					
Attendance- 05					
CIE-Continuous InternalEvaluation (25) **(**Average of best 2 out of 3 will be counted**)**				**SEE-Semester End Examination (70 marks)**	
Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Test-3/ Assignment (25)**	**Bloom's Category**	**Test**
Remember	5			**Remember**	10
Understand	10	10	10	**Understand**	20
Apply	10	15	15	**Apply**	40
Analyze				**Analyze**	10
Evaluate				**Evaluate**	
Create				**Create**	

COURSE TITLE: STRUCTURETURED PROGRAMMING LANGUAGE LAB

Course Code: CSTE 1202	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 3 Hours	**SEE Marks:** 70

Rationale: This course provides an introduction to structured programming language and solve problems using programming concepts.

Course Objectives:

- Explain computing problems using programming concepts.
- Develop the students for competitive programming contests.
- Review experiments to verify the theories and concepts develop in CSTE 1203 practically.

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

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	gain a deeper understanding on the basic programs using structure, different control and loop structures, array, pointer, function, Structure and Union, and file management system.
	CLO2	use different programming concepts in solving computational problems.
	CLO3	differentiate real-world problems using the structured programming language.
	CLO4	test their solutions with current conventional solutions.
	CLO5	acquire individual and teamwork skills

Mapping of CLO to PLO (Program Learning Outcome)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
	CLO1	√											
	CLO2	√											
	CLO3		√										√
	CLO4		√										
	CLO5										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	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 **Control Structures & Statements** • If/else • Switch • Nested conditional structure • Continue and break **Loop Structures** • Loop structure • Loop control flow • Nested loop • Loop operation **Array** • Array declaration • Array initialization • Array processing	CLO1, CLO2	Discussion and practice Real world problem solving.	Questions, quizzes, Homework, reports, exams.
2-3	**Pointer** • Pointer of array • Array of pointer • Dynamic memory allocation	CLO1, CLO2	Practice with a real-life problem.	
4-5	**Functions** • Function declaration • Argument passing	CLO1, CLO2	Lecture and discussion with problems.	

	• Call by value • Call by reference • Swapping • Recursion			
6-7	**Structure, Union, and Enumerated** • Structure declaration • Structure array • Pointers for structure • Structure passing to a function • Self-referential structure • Union declaration • Union passing to a function • Enumerated data type	CLO1, CLO2	Lecture and discussion with problems.	
8	**File Management** • Create files • Read files • Write files • Update files • Sequential files • Text and binary files • Unformatted files	CLO1, CLO2	Practice with a real-life problem. .	
9-10	**Computer Graphics** • Line drawing • Filling images • Patterns • Shapes • Text in graphics	CLO2	Practice with a real-life problem.	
11-12	**Project**	CLO3, CLO4, CLO5	Evaluate each project.	Presentation
13	**Final Lab Exam (Programming Contest & Viva)**	CLO2, CLO3, CLO4	Evaluate contest result& viva.	Contest programming, Programming test (Offline) Viva
ASSESSMENT PATTERN				
Attendance- 10 **Viva-20**				

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	40
Analyze	10
Evaluate	
Create	

COURSE TITLE: DATA STRUCTURE AND ANALYSIS

Course Code: CSTE 1203	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce the basics of data structures array, linked list, stack, queue, tree, and graphs.
- Perform different data structure operations such as traversing, searching, inserting and deleting.
- Develop programs that implement data structure.
- Explain the complexity of some familiar searching and sorting algorithms.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	clarifylinear and nonlinear data structures such as an array, linked list, stack, queue, tree, and graph.
CLO2	interpret various operations e.g. sorting, searching, inserting, deleting, traversing, merging to solve the real world problem
CLO3	use appropriate data structures for solving computing problems.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√	√										√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Introduction and overview of data structures:** Concept and importance of data and data structure. Major operations of data structures. Mathematical and algorithmic Notations, Asymptotic Notation for complexity of algorithms.	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Questions, quizzes, Homework, exams. **Class Test 1** (topics of the weeks 1-4).
2	**Arrays:** Basic concepts of array, linear array and multidimensional array, representation of arrays in memory, perform different data structures operations (bubble sort, linear search, binary search algorithm etc.). Pointer, Matrices, sparse matrices.	CLO1, CLO2	Lecture and discussion on characteristics, memory allocation and different operations of array.	
3 - 4	**Linked Lists:** Basic concepts of linked lists, representation of linked lists in memory, perform different data structures operations, memory allocation, garbage collection. Header linked list and two way list.	CLO1, CLO2	Lecture and discussion on characteristics, and different operations of stack and queue.	
5 - 6	**Stacks and Queues:** Basic concepts of stacks and queues. Different types (and variations) of stacks and queues, representation of stacks and queues in memory. Divide and Conquer Algorithms basic, Perform different operations and applications of stack (Quick sort, arithmetic expressions, polish notation, recursion etc.) and	CLO1, CLO2, CLO3	Lecture and discussion with problems.	

	queue.			
7 - 8	**Trees:** Basic terminology, binary trees, binary tree representations in memory, different data structures operations (traversing, searching, sorting, insertion, deletion) in tree, binary search tree, basics of AVL, m-way search trees and general trees, Heap tree structure and operations (Heap sort), Huffman's algorithm.	CLO1, CLO2, CLO3	Lecture and discussion with problems.	Questions, quizzes, Homework,exams. **Class Test 2** (topics of the weeks 5-8).
9 - 10	**Graphs:** Introduction, graph theory terminology, representation of graphs in memory, Warshall's algorithm (shortest-path algorithm), different data structures operations on graphs.	CLO1, CLO2, CLO3	Lecture and discussion with problems	Questions, quizzes, Homework, exams.
11 - 12	**Sorting and searching:** Introduction, sorting and searching overview based on different data structures, efficiency considerations, complexity analysis, insertion sort, selection sort, merging, merge sort, radix sort, Hashing, Hash Tables.	CLO1, CLO2, CLO3	Lecture on steps on different sorting algorithms. Discussion with problems.	**Class Test 3** (topics of the weeks 9-12)
13	**Review Class**	CLO2, CLO3	Review lecture and discussions on final exam	Exercise the answering methods in final exam.

Recommended Books:

1. Theory and Problems of Data Structures by Seymour Lipschutz, McGraw Hill (Schaum's outline series)
2. Data Structures with C by Seymour Lipschutz, McGraw Hill (Schaum's outline series)
3. Data Structures and Algorithm analysis in C++ by M.A. Weiss, Addison Wesley
4. Fundamentals of Data Structures by E. Horowitz and S. Sahni, Galgotia

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25) (Average of best 2 out of 3 will be counted)	SEE-Semester End Examination (70 marks)

Bloom's Category	Test-1 (25)	Test-2 (25)	Test-3 (25)
Remember	5	5	
Understand	15	15	10
Apply	5	5	10
Analyze			5
Evaluate			
Create			

Bloom's Category	Test
Remember	10
Understand	25
Apply	20
Analyze	15
Evaluate	
Create	

COURSE TITLE: DATA STRUCTURE AND ANALYSIS LAB

Course Code: CSTE 1204	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Introduce the basics of data structures array, linked list, stack, queue, tree, and graphs.
- Develop programs that implement data structures and different operations based on those data structures.
- Explain the complexity of some familiar searching and sorting algorithms.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	implement different data structures and their operations using a programming language (C/C++/MATLAB).
CLO2	contrast the performance of data structures and algorithms by measuring time and space complexities.
CLO3	justify different data structures for solving problems in different scenarios.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										
CLO3		√										√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	**Arrays** Different problems related to array data structure. Program which will store data in a linear array. Program to traverse, insert and delete in a linear array. Program to find a given item using linear search from the list of numbers. Program to find a given item using Binary Search from the list of number. Find the maximum and minimum value from a given list of numbers. Implement Bubble sort algorithm. Implement basic matrix operations.	CLO1, CLO2, CLO3	Discussion and practice	
3-4	**Linked Lists** Different problems related to linked lists data structure. Program which will store data in a linked list. Program which will implement linked list using linear array and pointer. Program which will perform some basic operations in a singly linked list for instance, traversing, searching, insertion, deletion, and swapping.	CLO1, CLO2, CLO3	Discussion and practice	Questions, quizzes, Homework, exams.
5-6	**Stacks** Different problems related to stack data structure. Implement stack using array and linked	CLO1, CLO2, CLO3	Discussion and practice.	

	list. Perform basic data structure operations using stacks. Implement quick sort algorithm.			
7	**Recursion** Problems to solve using recursive technique.	CLO1, CLO2, CLO3	Discussion and practice.	Exercise with problems.
8	**Queues** Different problems related to queue data structure		Discussion and practice	Questions, quizzes, Homework, exams.
9-10	**Trees** Different problems related to tree data structure. Implement heap sort algorithm.	CLO1, CLO2, CLO3	Lecture, discussion with problems and practice.	
11	**Graphs** Implement BFS and DFS traversal methods.	CLO1, CLO2, CLO3	Discussion and practice	
12	**Sorting** Implement insertion sort, selection sort and merge sort algorithms	CLO1, CLO2, CLO3	Discussion and practice	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	30
Analyze	20
Evaluate	

Create	

COURSE TITLE: NUMERICAL ANALYSIS

Course Code: CSTE 1205	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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

Course Objectives:

- Introduce the fundamental concept of the number system and error calculation.
- Explain different numerical methods in solving linear and non-linear equations, interpolation and extrapolation, differentiation, and integration.
- Discuss various methods for the solution of 1st order differential equation with initial value problems.
- Provide the basic concepts of number theory and recurrence relation.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe the number system, errors estimation and analysis, number theory, and recurrence solution of different problems.
CLO2	use the appropriate method to determine approximate solutions of linear and non-linear equations.
CLO3	solve interpolation and extrapolation problems using different techniques.
CLO4	determine the solutions of complex integration and differentiation, differential equations with initial value problem using various formula.
CLO5	acquire individual and teamwork skills

Mapping of CLO to PLO (Program

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											

Learning Outcome)	**CLO2**	√											
	CLO3	√											
	CLO4	√											
	CLO5										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	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;	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	
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).	CLO1	Lecture and discussion and analyze the accuracy.	Questions, quizzes, Homework, exams. **Class Test 1** (topics of the week's 1-4)
3	**Numerical Solution of System of Linear Equations**: Gauss elimination method; Matrix Inversion; Operations Count;	CLO2	Lecture and computation of linear equation solution methods.	
4	**Numerical Solution of System of Linear Equations**: LU Factorization Method (Crout's Method); Gauss-Jordan Method; Gauss-Seidel Method; Sufficient Condition of Convergence.	CLO2	Lecture and decomposition of linear systems	
5	**Numerical Solution of Algebraic and Transcendental Equations:** Iteration Method; Bisection Method; Secant Method;	CLO2	Lecture and discussion on non-linear equations solution.	Questions, quizzes, Homework, exams.
6	**Numerical Solution of Algebraic and Transcendental Equations:** Regula-	CLO2	Lecture and discussion on non-linear equations	

	Falsi Method; Newton-Raphson Method.		solution.	
7	**Interpolation:** Lagrange's Interpolation, Newton's forward & backward Interpolation Formula.	CLO3	Lecture and problem solving on interpolation.	
8	**Interpolation:** Extrapolation; Newton's Divided Difference Formula; Error; Problems.	CLO3	Lecture and discussion on divided difference and problem solving.	Exercise with various mathematical problems.
9	**Curve fitting:** Fitting with linear equations, Least square method, non-linear curve fitting	CLO2	Lecture and analysis on numerical differentiation with problems.	**Class Test 2** (topics of the week's 5-8) Questions, quizzes, Homework, exams.
10	**Numerical Differentiation:** Use of Newton's forward and backward interpolation formula only.	CLO4	Lecture and discussion on numerical integration methods with problems.	
11	**Numerical Integration:** Trapezoidal formula (composite); Simson's 1/3rd formula (composite); Romberg Integration (statement only); Problems.	CLO4	Lecture and analysis of Differential equations.	
12	**Numerical Solution of Initial Value Problems of First Order Ordinary Differential Equations:** Taylor's Series Method; Euler's Method; Runge-Kutta Method (4th order);	CLO4, CLO5	Lecture and discussion on Differential equations.	**Assignment/** **Presentation**(topics of the weeks 9-11)
13	**Numerical Solution of Initial Value Problems of First Order Ordinary Differential Equations:** Modified Euler's Method and Adams-Moulton Method.	CLO4	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. Numerical Methods by E. Balaguruswamy, Tata McGraw-Hill Education.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25) **(**Average of best 2 out of 3 will be counted**)**	**SEE-Semester End Examination (70 marks)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/Presentation (25)
Remember	5		
Understand	5	5	5
Apply	15	20	20
Analyze			
Evaluate			
Create			

Bloom's Category	Test
Remember	5
Understand	20
Apply	40
Analyze	5
Evaluate	
Create	

COURSE TITLE: NUMERICAL ANALYSIS LAB

Course Code: CSTE 1206	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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

Course Objectives:

- Introduce the fundamental concept of digital computing, including number representation and arithmetic operations.
- Provide the student with numerical methods of solving the non-linear equations, interpolation, differentiation, and integration.
- Discuss numerical methods to obtain approximate solutions to mathematical problems.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	apply different numerical methods for solving problems and their error calculation using the programming language.
CLO2	justify different methods to find numerical solutions of linear and non-linear equations.
CLO3	implement different methods to find missing values using interpolation and extrapolation.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										

	CLO3	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	Lecture and practice	
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	CLO1, CLO2	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 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.	CLO2	Lecture and practice of matrix.	Quiz 1 (Topic of the 1-3 weeks)

	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).	CLO2	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 Internal.	CLO3	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 =	CLO3	Discussion and practice.	Questions, quizzes, Homework, exams.

	0.1.			
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.	CLO3	Discussion and problem solving on numerical integration.	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	30
Analyze	20
Evaluate	10
Create	

COURSE TITLE: DISCRETE MATHEMATICS

Course Code: CSTE 1207	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce mathematical reasoning to read, comprehend and construct mathematical arguments.
- Explain about the count or enumerate objects.
- Provide ideas on how to implement discrete structures include sets, permutations, relations, graphs, trees, finite geometries, random variables, and stochastic processes.
- Emphasize how to analyze certain classes of problems by the specification of an algorithm.
- Discuss the concepts about the classification of different mathematical models.

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

bank, Previous questions.

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	**explain the mathematical objects, reasoning, quantifications, structure, and arguments.**
	CLO2	**implement discrete structures include sets, permutations, relations, graphs, trees, finite geometries, random variables, and stochastic processes.**
	CLO3	**differentiate certain classes of problems by the specification of an algorithm and to classify different mathematical models.**

Mapping of CLO to PLO (Program Learning Outcome)	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):

Week	**Course Contents**	**CLOs**	**Teaching Learning Strategy (activities directed to achieve outcomes)**	**Assessment Strategy (How they are developed)**
1	**Set and set operations:** 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.	CLO1	Overall discussion with the students about the course contents including the objectives, course outcomes, examinations, physical environment. Lecture and discussion on the set theory and all sets operations and demonstrate problem-solving techniques.	Questions, group discussion and homework.
2	**Functions and function applications:** 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.	CLO1, CLO2	Lecture and discussion on several topics of functions. Displaying different graphs of functions, composition of functions and relations of functions and solving several examples in classroom.	Solving problems correctly in classroom. Submitted home works and assignments regularly.
3	**Recurrence relations & Generating**	CLO1, CLO2	Lecture and discussion on	Questions, group

	functions: 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.		several topics of recurrence relations & generating functions and showing various calculations and several problem-solving techniques to solve recurrence relations of functions, power series and recurrence relations using generating functions.	discussion and assignments.
4	**Integer and Algorithms:** Representations of integers, binary expansions, hexadecimal expansions. Algorithms for integer operations, modular exponentiation. Euclidean algorithm.	CLO1, CLO3	Demonstrating various calculations to solve binary and hexadecimal expansions also discussion on algorithms to find out modular exponentiation and the greatest common divisor.	Exercise with various mathematical problems.
5	**Inclusion- Exclusion & Binomial coefficients:** Principle and applications of Inclusion-exclusion. Binomial theorem, examples, PASCAL'S IDENTITY and TRIANGLE.	CLO2, CLO3	Showing several problem-solving techniques to solve several problems on principle of inclusion-exclusion.in the classroom. Demonstrating the technique to draw PASCAL'S Triangle using PASCAL'S IDENTITY.	**Class Test 1** (topics of the week's 1-4)
6	**Permutations-Combinations:** Basic concept of permutation, examples, permutations with repetitions. Basic concept of combination, examples, combinations with repetitions.	CLO2	Lecture and discussion on basic concepts of permutation and combination principles and sample problems using permutation and combination principles.	Q & A session, group discussion, assignments.
7	**Graph terminologies:** Introduction of graphs, types of graphs, graph terminology, bipartite graphs, application of graph, representing graphs.	CLO2	Lecture and discussion on graph terminologies, bipartite graph, application of graph and representing graphs in different ways.	Questions, home works.
8	**Graph applications:** Graph isomorphism, connectivity, Euler path, shortest path algorithm, graph	CLO2, CLO3	Lecture and discussion on graph properties, different types of path and graph	Questions, group discussion, assignments.

	coloring.		coloring.	
9	**Tree terminologies:** Introduction to tree, rooted tree, binary tree, tree parameters, properties of tree, Tree traversal algorithms. The application of tree, representing trees.	CLO1, CLO2	Lecture and discussion on tree terminologies, different types of traversal algorithms to solve related exercises.	**Class Test 2** (topics of the week's 5-8)
10	**Binary and Spanning trees:** Infix, prefix and postfix notations and algorithms, binary tree representation, spanning tree, minimum spanning tree.	CLO3 .	Lecture and explanation on infix, prefix and postfix algorithms to design binary trees and Prim's and Kruskal's algorithms to design minimum spanning tree.	Solving problems correctly in classroom and submitted home works and assignments regularly.
11	**Finite Geometries:** 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.	CLO1, CLO2, CLO3 .	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 and Stochastic Processes:** Random variables, Functions of random variables, Sequences of random variables, Stochastic processes, Markov chains, Markov processes and queuing theory.	CLO1, CLO2	Lecture and explanation on the pros and cons of random Variables and stochastic processes.	**Assignment**(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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember			
Understand	15	10	
Apply	5	10	10
Analyze	5	5	15
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	10
Apply	20
Analyze	30
Evaluate	
Create	

COURSE TITLE: ELECTRONIC DEVICES AND CIRCUITS

Course Code: EEE 1201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: This course is designed to understand the construction, working and uses of unipolar and bipolar devices, Oscillator, and Operational amplifier.

Course Objectives:

- Introduce the behavior of insulators, semiconductors, and conductors based on band theory.
- Explain the working principle of different kinds of diodes and analyze their applications in rectifier, clipper, clamper, regulator, etc.
- Familiarize with the characteristics of BJT, JFET, MOSFET and perform their operation under different configurations.
- Give an idea how to analyze various amplifier circuits using different models and use them.

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

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	illustrate the structure, working, and characteristics of the diode ,transistors and amplifier.
	CLO2	use a diode, transistor, and other electronic devices in different cases of our real-life such as regulation, switch, amplifier, oscillator, etc.
	CLO3	differentiate the circuit using different laws and models.
	CLO4	Acquire individual and teamwork skills.

Mapping of CLO to PLO (Program Learning Outcome)	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):

Week	**Course Contents**	**CLOs**	**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. The p-n junction,	CLO1, CLO2	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	
2	Clipping and clamping circuits, different types of diodes			
3	**Principle of bipolar transistor** Junction transistor, npn and pnp transistors, principle of transistor action, potential distribution through a transistor, transistor current components, emitter efficiency.	CLO1	Lecture and discussion with problems	
4	**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	CLO1	Lecture and discussion with characteristics parameters of transistor families individually.	Questions, quizzes, Homework, exams.

	transistor.			
5	**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.	CLO1,CLO2, CLO3	Lecture and discussion with problems.	
6	**Transistor as an amplifier:** Classification of amplifier, BJT small signal amplifier circuit analysis in three configurations using different biasing circuit. Push-pull amplifier.	CLO1, CLO2, CLO3	Lecture and discussion with problems.	Exercise with various mathematical problems.
7	**BJT AC analysis and Transistor model:** BJT transistor modeling, the r_e transistor model, the hybrid equivalent model	CLO3	Transistor modeling.	Class Test 1 (topics of the week's 1-4) Questions, quizzes, Homework, exams.
8	**Operational amplifier:** Basic differential amplifier, differential amplifier circuits, differential amplifier with current mirror and active load. Basics of operational amplifier.	CLO1, CLO2	Lecture, discussion and design.	
9	The ideal OpAmp, Study of OpAmp parameters, OpAmp circuits, Active filters, Voltage regulation.	CLO1, CLO2	Lecture on design and applications of the circuits.	
10	**Field effect transistor:** JFET: construction, operation, static characteristics, small signal model and parameters.	CLO1, CLO2, CLO3	Lecture on design and applications of the circuits.	Class Test 2 (topics of the week's 5-8) Questions, quizzes, Homework, exams.
11	**MOSFET:** MOSFET: different types, operation, characteristics curves.	CLO1,CLO2	Lecture on design and applications of the circuits.	
12	DC biasing of depletion type and enhancement type MOSFET.	CLO1,CLO2	Lecture on design and applications of the circuits.	
13	Review class	CLO1, CLO2, CLO3,CLO4	Lecture on design and applications of the circuits.	**Assignment/ Presentation** (topics of the weeks 9-11)

Recommended Books:

1. **Electronic and Circuits.** by-Jacob Millmanand Christos C. Halkias, McGraw-Hill Inc.
2. **Electronic Principles.** by-Albert Paul Malvino, Career Education
3. **Electronic Devices and Circuit Theory.** by-Robert L. Boylestad, Prentice Hall.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember	5		
Understand	10	10	
Apply	5	10	10
Analyze	5	5	15
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	20
Evaluate	
Create	

COURSE TITLE: ELECTRONIC DEVICES AND CIRCUITS LAB

Course Code: EEE 1202	**Attendance:** 10
Credit: 1	**CIE Marks:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Deliver hands-on experience to the students so that they can put theoretical concepts to practice.
- Focus on the working of different diodes, transistors, CRO probes, and measuring instruments.
- Expose the V-I characteristics of diode and Zener diode.
- Discuss half-wave, full-wave, clipper, and clamper circuits and to see output wave shape.
- Outlines to design amplifier, inverting and non-inverting circuit.

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

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	gain significant experience with electrical instruments such as function generators, digital multimeters, oscilloscopes, and power supplies, etc.
	CLO2	sketch the characteristics of the diode, BJT, FET, and MOSFET.
	CLO3	design rectifier circuit using a diode, clipper, and clamper circuit.
	CLO4	design amplifier circuit using transistor, inverting and non-inverting circuit using IC.
	CLO5	acquire teamwork skills for working effectively in groups.

Mapping of CLO to PLO (Program Learning Outcome)	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**
CLO1	√											
CLO2	√											
CLO3		√										
CLO4		√										
CLO5										√		

Lesson Plan (as per week):

Week	**Course Contents**	**CLOs**	**Teaching Learning Strategy (activities directed to achieve outcomes)**	**Assessment Strategy (How they are developed)**
1	To familiar with the operation of different electrical instruments.	CLO1	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation method.	Questions about different types of instruments.
2-6	To study of V-I Characteristics curve of a General Diode and Zener diode. To study of Full-Wave Rectification circuit (Bridge & Center tap) and Half-wave circuit. To study of Clipper and Clamper circuit and draw the output wave shape.	CLO2, CLO3, CLO5	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.
7-10	Determination of unknown signal frequency and voltage by using Oscilloscope.	CLO2, CLO5	Through lecture, laboratory, and out-of-class assignments.	

	Study of lead identification and testing of diode, BJT, FET, and MOSFET.			
11-12	Design amplifier circuit using transistor, inverting and non-inverting amplifier circuit using IC to use as summing, subtraction and integration.	CLO4, CLO5	Through lecture, laboratory, and out-of-class assignments.	
12	Submit a mini project in a group			
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	20
Analyze	30
Evaluate	
Create	

COURSE TITLE: ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Course Code: MATH 1201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce different types of the differential equation.
- Discuss various techniques to solve first-order, second-order, and higher-order differential equations.
- Provide knowledge about Laplace transform and its application in the engineering field.

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

Course Learning	**CLOs**	**Description (At the end of the course, students will be able to)**

Outcomes (CLO)	**CLO1**	solve various types of differential equations.
	CLO2	formulate and solve first-order, second-order, and higher-order differential equations in the field of engineering.
	CLO3	use differential equations for complex engineering problems.
	CLO4	apply and analyze Laplace transform in the engineering field.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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	CLO1.	Lecture and discussion with detailed information about topic.	Questions and Homework.
3-4	**First Order Differential Equations** • Linear Equations with Variable Coefficient • Separable Equations • Modeling with First Order Equations • Differences between Linear and Nonlinear Equation. • Autonomous Equations and Population Dynamics • Exact Equation	CLO2, CLO3	Lecture and discussion with detailed information about topic.	Questions and Homework.
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	CLO2, CLO3	Lecture and discussion with problems.	**Class Test 1** (topics of the week's 1-4)

	Nonhomogeneous Equations.			
9-11	**Higher Order Linear Equations** • General Theory of 11-th Order Linear Equations. • Heterogeneous Equations with Constant Coefficients.	CLO2	Lecture and discussion with detailed information about topic.	**Class Test 2** (topics of the week's 5-8)
12-13	**The Laplace Transform** • Definition of the Laplace transforms. • Solution of initial Value Problems • Step Functions. • Differential Equations with Discontinuous Forcing Functions. • Impulse Function.	CLO4	Lecture and discussion with detailed information about topic.	**Assignment**(topics of the week's 9-13)

Recommended Books:

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

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember			
Understand	10	5	
Apply	15	15	25
Analyze		5	
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	50
Analyze	10
Evaluate	
Create	

COURSE TITLE: VIVA VOCE

Course Code: CSTE 1226 **Credit:** 01	**Total Marks:** 100

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 interviews both in the academic and the industrial sector.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	analyze the various application of Computer Science &Telecommunication Engineering in real-life problem solving
CLO2	evaluate overall technical knowledge and industry readiness
CLO3	go under a virtual environment of technical interviews.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3										√		

COURSE CONTENTS	OUTCOME (Student should be able to)
VIVA VOCE (Viva based on major/minor courses of Year-1)	CLO1, CLO2, CLO3

ASSESSMENT PATTERN

Category	Marks (100)
Eye contact	10
Body gesture	10
Communication skill	20
English pronunciation skill	10
Remember	10
Understand	10
Analyzing	20
Evaluating	10

Year-2 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 2101	Object Oriented Programming	CSTE1201	3	3

2	CSTE 2102	Object Oriented Programming Lab	CSTE 1202	1.5	2.25
3	CSTE 2103	Algorithm Design and Analysis	CSTE1203	3	3
4	CSTE 2104	Algorithm Design and Analysis Lab	CSTE 1204	1.5	2.25
5	CSTE 2105	Digital Logic Design	EEE 1201	3	3
6	CSTE 2106	Digital Logic Design Lab	EEE 1202	1	1.5
7	CSTE 2107	Theory of Computation	CSTE 1203	3	3
8	BBA 2101	Industrial Management and Accountancy		3	3
9	MATH 2101	Matrices, Vector Analysis and Co-ordinate Geometry		3	3
		Total		**22**	**24**

COURSE TITLE: OBJECT ORIENTED PROGRAMMING

Course Code: CSTE 2101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: This course has been designed to develop the students' ability to implement programs inaobject-oriented wayto enhance code reusability, productivity, security and flexibility of the application program.

Course Objectives:

- Introduce the basic concept of Object-oriented Programming.
- Discuss how to design, develop, and program with OOP
- Make familiar with OOP tools and implement OOP solution to the real-life problem
- Make familiar with some advanced features of OOP.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the basic principles of object-oriented programming i.e. data abstraction, encapsulation, inheritance, and polymorphism.
CLO2	apply the concept of an object and its relationships in modeling & building object-oriented solutions.
CLO3	determine real-life scenarios for finding feasible object-oriented solutions.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):				
Week	**Course Contents**	**CLOs**	**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-oriented system; Identifying the classes, Assigning Attributes and Behavior, finding relationship between classes, arranging classes into hierarchies: A design example.	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Questions, quizzes, exams.
2-4	**Introduction to class and object:** Declaring and using classes, class members, creation and destruction of objects, accessing data members, dynamic memory allocation.	CLO1	Lecture on characteristics and basic operations. Some standard template libraries will be introduced.	Homework (stream concept and STL), exams.
3-5	**Inheritance:** Derived class and base class, derived class constructors, overriding member functions, classification of inheritance.	CLO1, CLO2	Lecture on basic of inheritance. Explain inheritance with real life example.	Questions, quizzes, exams.
8-10	**Polymorphism:** Polymorphism, Virtual functions, abstract classes, classes within classes.	CLO1, CLO2, CLO3	Lecture on the different types of polymorphism, overridden function using virtual.	
9	**Operator overloading:** Overloading unary operator, overloading a binary operator, data conversion.	CLO2	Lecture on operator overloading with problems solution.	
10	**File processing:** File processing – formatted – unformatted and random files. Microsoft foundation classes: Strings, data structure.	CLO2	Lecture on file processing using IO stream. String processing and some basic data structure.	Homework, examples.
11	**Templates and Lists:** Generic actions & types, function templates, class templates.	CLO2, CLO3	Lecture on the characteristics of generic programming and implement it by template	**Class Test 3** (topics of the week's 9-11)

			with some problem's solution.	
12-13	**Interface and Exception Handling:** Interface and Exception Handling.	CLO2, CLO3	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. Object Oriented Programming in Microsoft C++ by Rober Lafore, Galgotia Book House.
2. Object Oriented Programming in Microsoft C++by E. Balagurusamy, TMH.
3. C++/Java How to Program. Introduction to Object Oriented Design with the UML by Deitel & Deitel, Pearson Education.
4. Programming with C++/Java by Schaum's Outline Series
5. C++- Unleashed The comprehensive Solutions by J. Liberty
6. The Complete Reference C++/Java by Herbert Schildt, TMH.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember			
Understand	10	10	
Apply	10	10	15
Analyze	5	5	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	30
Analyze	20
Evaluate	
Create	

COURSE TITLE: OBJECT ORIENTED PROGRAMMING LAB

Course Code: CSTE 2102	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

Rationale: Practical implementations of the Algorithms that are learned from the course CSTE-2101.

Course Objectives:

- Make familiar with OOP tools and implement OOP solution to the real-life problem
- Develop the students for designing object-oriented programs
- Perform experiments to verify practically the theories and concepts develop in CSTE 2101.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain object-oriented programs using OOP concepts.
CLO2	use object-oriented concepts in solving computational problems.
CLO3	examine real-world problems using an object-oriented programming language.
CLO4	carry out tasks in a team environment.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										
CLO3		√										
CLO4									√			

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-3	**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 references;	CLO1, CLO2	Discussion, practice and case study	Questions, quizzes, Homework, reports, exams.
4-6	**Inheritance** Experiments related to Introducing Inheritance and verification; Inheriting classes and sharing base classes functions;	CLO1, CLO2	Discussion, practice and case study	
7-8	**Polymorphism**	CLO1,	Discussion, practice and	

	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.	CLO2, CLO3	case study	
9-11	**Advance Topic** Problems related to: Static, Abstract Class, Interface, Exception Handling and Template function.	CLO1, CLO2, CLO3	Discussion, Practice with a real-life problem.	
12	**Problem Solving Activities** Problems related to OOP, sharing common algorithms and procedures for different data type, Problems on ACM. Submit project.	CLO2, CLO3, CLO4	Practice with a real-life problem. .	Questions, quizzes, Homework, reports, exams.
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	40
Analyze	20
Evaluate	
Create	

COURSE TITLE: ALGORITHM DESIGN AND ANALYSIS

Course Code: CSTE 2103	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce various data structures and algorithms.
- Discuss the asymptotic performance of different searching, sorting, traversing, tree, and graph algorithms.
- Compare the performance of different algorithms with their feasibility for real-life scenarios.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify different algorithms.
CLO2	execute and implement different types of algorithms.
CLO3	compare the performance of different algorithms.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										√

Lesson Plan (as per week):

Week	Course Contents	CLOs	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	CLO1	Lecture and discussion with some basic questions on complexity analysis time and space complexity.	Question on complexity analysis and Solve some basic problems.
2	**Growth of functions** - Asymptotic notation - Standard notation and common function	CLO1, CLO3	Lecture and discussion on the complexity of the algorithm, analysis and finding the complexity.	Questions, quizzes.
3	**Review**: Basic data structure: stack, queue, BST, Heap, Priority queue, tree traversal, Union find, segment tree , Interval tree.	CLO1	Lecture and discussion on the complexity of the data structures, usefulness, and the basic differences between them. Discussion should be followed by some	Questions on data structures, Solving some real-life problems.

			interesting problems on different data structure.	
4	Introduction to computational complexity	CLO3	a) Lecture and discussion with problems. b) Explain with example step by step.	
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 heap sort algorithm **c. Quicksort** - Description of quicksort - Performance of quicksort - Analysis of quicksort	CLO1 , CLO3	c) Lecture and discussion with problems. d) Explain with example step by step. e) Show real life example.	Class Test 1 (topics of the week's 1-4)
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	CLO1, CLO2, CLO3.	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	CLO1, CLO2,	• General techniques will be	**Class Test 2** (topics of the week's 5-7)

	- What is dynamic programming? - How it works? - Elements of dynamic programming - Example Analysis (Rod cutting problem, Matrix chain multiplication, Longest Common Subsequence)	CLO3.	taught in the lecture. • Exercises will be given in the tutorial and the lecturer (with the participation. • Assignments will be given to the students.	
9	Greedy Algorithm - How greedy algorithm differs from dynamic programming - Elements of the greedy strategy Kruskal's and Prim's algorithm	CLO1, CLO2, CLO3.	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.	Questions, quizzes, Homework
10-11	Graph Algorithms: BFS, DFS, Advance dfs, Exhaustive bfs, MST, Shortest path algorithms, detecting negative cycles, DAG. NP-Hard and NP-Complete : Basic concepts, Non-deterministic algorithm, the classes of NP-Hard and NP-Complete	CLO1, CLO2, CLO3.	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.	**Assignment**(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	CLO2, CLO3	a. Practice with UVA online. b. Can participate online programming contest.	Problem solving.

Recommended Books:

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

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	10	10	
Understand	10	10	10
Apply	5	5	10
Analyze			5
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	30
Apply	20
Analyze	10
Evaluate	
Create	

COURSE TITLE: ALGORITHM DESIGN AND ANALYSIS LAB

Course Code: CSTE 2104	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

Rationale: Practical implementations of the Algorithms that are learned from the course CSTE-2103.

Course Objectives:

- Explain to design and develop a program to implement different algorithms.
- Debug and test the performance of these algorithms in different scenarios.
- Conduct experiments to get time and space complexity.

Resources Used: Multimedia, Whiteboard, Marker, e-Tutorials, Compiler, PowerPoint Slides.

Course Learning Outcomes

CLOs	Description (At the end of the course, students will be able to)
CLO1	implement the different algorithms in engineering problems.

(CLO)	**CLO2**	contrast the complexity of different algorithms.
	CLO3	evaluate the performance of different algorithms in real-world problems.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										
CLO3		√			√							√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	**Introduce different types of Algorithm**	CLO1	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	Questions, quizzes, Homework, reports, exams.
3-4	**Sorting Algorithms** a. Bubble Sort b. Insertion Sort c. Selection Sort d. Quick Sort	CLO1, CLO2,CLO3	• Discussion about the problem. • Students will be given to do some problem to solve. • Analysis the complexity.	
5-6	**Design Strategies** **Divide & Conquer** a. Merge sort b. Binary search	CLO1, CLO2,CLO3	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	
7-8	**Search Paradigms:** a. Linear Search b. Binary Search	CLO1, CLO2, CLO3	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	
9-10	**Dynamic Programming**	CLO1, CLO2, CLO3	• Statement of the problem. • Find a strategy to solve it. • Write program with C++or JAVA	

11	**Greedy Algorithm**	CLO1, CLO2, CLO3	• Statement of the problem. • Find a strategy to solve it. Write program with C++or JAVA	
12	**Graph Algorithms:** - Spanning Tree - Shortest path algorithms - DAG.	CLO1, CLO2, CLO3	• Discussion about the problem. • Students will be given to do some problem to solve. • Analysis the complexity.	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	30
Analyze	20
Evaluate	
Create	

COURSE TITLE: DIGITAL LOGIC DESIGN

Course Code: CSTE 2105	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce the basic understanding of digital and logic circuits with their different components.
- Provide knowledge of problem-solving in digital logic circuits & systems.
- Familiarize the students with building blocks of combinational and sequential circuits so that they will be

able to develop circuit solutions.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the basics of digital systems, and could differentiate between analog and digital systems.
CLO2	implement different types of digital circuits such as Flip-flops, Counter, Encoder, Decoder, Multiplexer, De-multiplexer, RAM, ROM, etc using different logic gates.
CLO3	design different logic circuit.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√	√									

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	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.	
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.	CLO1	Lecture and discussion on the universality of NAND and NOR gates and the implementation of logic circuits. Exercise sample problems on logic circuit implementation.	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.	CLO2	Lecture and discussion on SOP and POS logical expression, logic simplification using algebraic and K-Map techniques. Exercise with various logical problems.	
4	**Combinational Logic Circuits Design**: Designing combinational logic circuits, Exclusive OR and Exclusive NOR circuits, Parity generator and checker circuit, Programmable logic devices (PLD), Hardware description language.	CLO2	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.	
5	**Flip-Flops (FF)**: NAND gate latch, NOR gate latch, D latch, Clock signals and clocked Flip-Flops(S-C, J-K, D).	CLO2, CLO3	Lecture on the basics on FF and latch with the introduction of S-C FF.	**CT-1** (topics of the week's 1-4)
6	**Flip-Flops (FF)**: FF applications, FF synchronization, Data storage and transfer. **Arithmetic circuits**: Adder circuits: Half adder (HA), Full adder (FA), Carry propagation. The 2's complement addition, and subtraction system, The BCD adder circuit.	CLO2, CLO3	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.	
7	**Counters and Registers**: Asynchronous counter: Ripple counters, Counters with mod numbers<2^n, Asynchronous up/down counter, Propagation delay.	CLO2, CLO3	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.	Questions, quizzes, Homework etc.
8	**Counters and Registers**: Synchronous counter, Synchronous up/down counters, Decoding a counter, Shift-registers, Counter applications.	CLO2, CLO3	Lecture on the design and implementation of different types of synchronous counter and a digital clock	

			circuit. Exercise on related topics.	
9	**MSI Logic Circuits**: Decoders, BCD-to-decimal decoders, BCD-to-7-segment decoder/drivers.	CLO2	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 Demultiplexers. **Integrated-Circuit Logic Families**: Digital IC terminologies, TTL logic family, MOS digital ICs, CMOS characteristics, MOSFET.	CLO2	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.	Questions, quizzes, Homework etc.
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.	CLO2	Lecture and discussion on the design and operation of ADC and DAC circuit. Exercise on related topics.	
12	**Memory Devices**: General memory operation, Concept of RAM and ROMs.	CLO2	Lecture and discussion on the basic memory operation of RAM and ROM architecture. Exercise on related topics.	**Assignment-1** Exercise the answering methods in final exam.
13	Review topics and Final exam preparation.	CLO1, CLO2, CLO3	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.	

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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**
Remember	5		
Understand	10	10	5
Apply	10	15	10
Analyze			10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	5
Understand	20
Apply	30
Analyze	15
Evaluate	
Create	

COURSE TITLE: DIGITAL LOGIC DESIGN LAB

Course Code: CSTE 2106	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Introduce the principles and methodology of digital logic design at the gate level.
- Design and analyze combinational and sequential logic circuits.
- Design and analyze digital circuits for real-life problem-solving.
- Explain the usages of 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.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe the different gates and IC's.
CLO2	implement and analyze different combinational and sequential logic circuits.
CLO3	design and analyze digital circuits for solving a real-life problems.
CLO4	gain teamwork skills for working effectively in groups.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√										
CLO3		√	√									
CLO4									√			

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	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.	CLO1	First lecture and then Practice.	
2-3	Design, construction and testing of a parity generator and checker circuit. Design, construction and testing of Half Adder & Full Adder circuits.	CLO2, CLO3	Discussion and practice.	
4	Verification of the truth tables of different Flip-Flops.	CLO2	Lecture and discussion on Flip-Flop with tutorials and	Basic questions. Neatness,

			then practice.	organization, completeness and individually written lab reports are due atthe beginning of the lab period. Respected Teacher will be evaluated in lab period.
5-6	Design a clock pulse generator circuit. Design, construction and testing of different asynchronous or synchronous counters.	CLO3	Lecture and discussion on Counter and practice.	
7	Design, construction and testing of a different Decoder circuit using Decoder IC. Design, construction and testing of a different Encoder circuit Encoder IC.	CLO3	Lecture and discussion on Decoder and Encoder circuits with tutorials and then practice.	
8-9	Design, construction and testing of a multiplexer by using logic gate and MUX IC. Design, construction and testing of de-multiplexer by using logic gate and MUX IC.	CLO3	Lecture and discussion on the concepts of Multiplexer and De-multiplexer circuits and practice.	
10-11	Solving some real life problems using a combination of different logic gates.	CLO3 CLO4	Lecture and discussion with real life problems.	Assignment
12	Submit a mini project in a group			
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	10
Understand	10
Apply	40
Analyze	10
Evaluate	
Create	

COURSE TITLE: THEORY OF COMPUTATION

Course Code: CSTE 2107	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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 the mathematical foundations of computation including automata theory; the theory of formal languages and grammars.
- Explain mathematical proofs for computation and algorithms.
- Discuss the notions of algorithm such as decidability, complexity, and computability.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	understand the concepts of finite automata and the transform between equivalent deterministic and non-deterministic finite automata.
CLO2	analyze the structural representations when designing software such as grammars and regular expressions.
CLO3	identify the limits of computation such as decidability and tractability; and time and space management for complex theories.
CLO4	Acquire individual and teamwork skill

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√	√									
CLO3	√	√										
CLO4										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Automata:** Preliminary Concepts of Automata, computability, and complexity, introduction to formal proof, and types of proofs	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Questions, quizzes, Homework, exams.
2	**Finite Automata:** Types of finite automata, examples of finite automata, and designing finite automata.	CLO1	Lecture and discussion about finite automata and types of finite automata such as DFA and NFA.	
3-4	**Finite Automata:** Equivalence of NFA's and DFA's, finite automata with epsilon transitions. **Regular Expressions:** Concepts of regular expression, equivalence with finite automata, and applications of regular expression.	CLO1, CLO2	Lecture and problem solving on DFA, NFA and regular expression	Class test-1(1-4)
4-5	**Regular Languages:** Concepts of regular languages, closure properties of regular language, and equivalence and minimization of automata.	CLO1, CLO2	Lecture and discussion with problems.	Questions, quizzes, Homework, exams.
6	**Regular Languages:**Non-regular Languages - The pumping lemma for regular languages.	CLO2	Lecture and discussion with problems; pumping lemma	
7	**Context-Free Grammars and Languages:** Formal definition of a context-free grammar, examples of context-free grammar, constructing parse trees, and ambiguity in grammars and languages.	CLO2	Lecture and discussion about CFG.	**Class Test-2**(topics of the Week 5-7).
8	**Properties of Context-free Languages:** Context-free Grammar Simplification, and Chomsky normal form.	CLO2	Lecture and discussion on Grammar simplification.	
9	**Pushdown Automata:** Formal definition of pushdown automata, examples of pushdown automata, and equivalence with context-free grammars.	CLO1, CLO2	Lecture and discussion on pushdown automata and its relation with context-free grammars.	Questions, quizzes, Homework, exams.

10	**Computability Theory:** Formal definition of Turing machine, Nondeterministic Turing machines, and Hilbert's problems	CLO1, CLO2	Lecture and discussion on Turing machine.	
11	**Decidability:** Decidable languages, the halting problem – the diagonalization method.	CLO3	Lecture and discussion on language decidability.	
12	**Complexity Theory:** The Classes P and NP, examples of problems in these classes, the differences between P and NP, NP-Completeness, polynomial time reducibility.	CLO3, CLO4	Lecture and discussion on complexity theory.	**Assignment/ Presentation**(topics of the Week 8-12)
13	Review classes.	CLO3, CLO4	Lecture and discussion on the application of complexity theory.	Exercise the answering methods in the final exam.

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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember	5	5	5
Understand	10	5	5
Apply	10	10	15
Analyze		5	
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	20
Understand	15
Apply	20
Analyze	10
Evaluate	5
Create	

COURSE TITLE: INDUSTRIAL MANAGEMENT AND ACCOUNTANCY

Course Code: BBA 2101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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 themselves with business concepts.
- Analyze and apply different strategies of marketing.
- Effective use of basic accounting in different application designs.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	recognize the concept of business, Accounting, management, and management strategy.
CLO2	use basic or fundamental knowledge of management and accounting in different application designs.
CLO3	gather knowledge about human resource management and industrial relation.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2					√				√		√	
CLO3				√								

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Business concepts:** Business and Industry,	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes,	

	Business and society, Business environment, Ethical issues of business		examinations, physical environment and methodology with the students. Brief discussion about business.	
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	CLO1, CLO2	Lecture and discussion with detailed information about management and its principles, functions, levels, roles, responsibilities and skills.	
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.	CLO1	Lecture and discussion about management strategies, SWOT analysis, planning and how it connects with IT industries.	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 management system.	CLO3	Lecture and discussion about marketing and customer's satisfaction survey.	
5	**Human Resource Management and Industrial Relations:**	CLO3	Lecture and discussion about HRM and its functions and models, workers payment	**Class Test 1**(topics of the week's 1-4)

	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		recruitment and job enrichment.	
6	**Health, Safety and Industrial Environment:** Accidents, Safety consciousness, publicity, procedures, and measures. Environmental pollution, control acts for air, water, solid waste and noise.	CLO3	Lecture and discussion about safety, accidents and environment pollution.	
7	Project and project management, Project life cycle, scope management, Proposal, Project scheduling, budgeting and procurement, Project monitoring and evaluation.	CO1, CO2	Lecture and discussion about project management and its life cycle, scope, scheduling, budgeting.	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.	CLO1**,** CLO2	Lecture and discussion about service management and its impact on IT industry.	.
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.	CLO1, CLO2	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:**	CLO2, CLO3	Lecture and discussion about operations research, methods	

	Operation research, charts, and diagram of understanding operations, job analysis, operational planning, decision-making, problem solving methods, Standardization organizations and specifications (ISO).		of job analysis and decision making and concepts of standardization	Questions, quizzes, Homework, exams.
11	**Basics of Accounting:** 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	CLO2	Lecture and discussion about accounting, its cycle journal, ledger, trial balance and financial statement analysis.	
12	**Cost Accounting:** Cost concept, Contribution margin, ratio analysis, Break-even analysis, CVP relationship	CLO2	Lecture and discussion on Cost concepts, break-even analysis and CVP relationship	**Assignment**(topics of the week's9-12)
13	Miscellaneous and Final exam preparation	CLO1, CLO2, CLO3	Lecture and discussion on miscellaneous subjects	Exercise the answering methods in final exam.

Recommended Books:

1. Fundamental of Management by Dr. Mainul Islam
2. Human Resource Management by Dr. Abdul Awal Khan and Dr. Abu Taher.
3. Accounting Principles by JJ Weygandt, DE Kieso, PD Kimmel, Latest Edition, John Wiley.
4. Managerial Accounting by Garrison, R H and Noreen, EW, 10th Edition, McGraw-Hill.
5. Introduction to Management Accounting by Horngren, CT and Gary L Sundem, Prentice.
6. Advanced Management Accounting by Kaplan, RS & AA Atkinson, Prentice Hall.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25) (Average of best 2 out of 3 will be counted)				**SEE-Semester End Examination (70 marks)**	
Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**	**Bloom's Category**	**Test**
Remember	05			**Remember**	10
Understand	10	10	05	**Understand**	15
Apply	5	10	10	**Apply**	15
Analyze	5	5	10	**Analyze**	15
Evaluate				**Evaluate**	10
Create				**Create**	05

COURSE TITLE: MATRICES, VECTOR ANALYSIS AND CO-ORDINATE GEOMETRY

Course Code: MATH 2101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce the basic matrix transformation and its operations.
- Provide knowledge about matrix decomposition using theorem and algorithm
- Explain vector differentiation, vector integration, and concepts of coordinate geometry to solve engineering problems.

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

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	describe different types of matrices and their operations.
	CLO2	explain the relation between matrix and vector.
	CLO3	perform matrix decomposition using different theorems and algorithm.
	CLO4	apply vector differentiation, integration, and coordinate geometry in solving a

		complex engineering problem.

Mapping of CLO to PLO (Program Learning Outcome)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
	CLO1	√											
	CLO2	√											
	CLO3	√											
	CLO4	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	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,	CLO1	Lecture and discussion on matrix	
2	**Matrix Terminology:** augmented matrix, row operation method, rank of Matrices, Mathematical Problems using Matrix, distinguish between determinant and matrix.	CLO1	Lecture and discussion about matrix operation.	Questions, quizzes, Homework, exams.
3	**Matrix Terminology:** Normal Vector, Orthonormal Vectors, Orthogonality, Gram-Schmidt Orthonormalization Process, co-variance matrix,	CLO2	Lecture and problem solving.	
4	**Matrix Decomposition:** Eigen Decomposition Theorem, Singular Value Decomposition (SVD).	CLO3.	Lecture and practice.	Exercise with various mathematical problems.
5	**Matrix Decomposition:** LU Decomposition, QR decomposition, Cholesky decomposition.	CLO3	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.	CLO3	Lecture and problem solving.	

7	**Vector differentiation:** Derivative of vector function-Velocity and acceleration-Scalar and vector fields-Gradient- It's geometrical interpretation	CLO4	Lecture and discussion on vector differentiation.	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).	CLO4	Lecture and problem solving.	
9	**Vector Integration:** Line integral, the surface integral and volume integral-work done by a force-Statement and Verification of Green's theorem	CLO4	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.	CLO4	Lecture and practice.	Questions, quizzes, Homework, exams.
11	**Coordinate geometry of two dimensions:** Change of axes, General equation of second degree.	CLO4	Lecture and discussion on coordinate geometry.	
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;	CLO4	Lecture and discussion on problems.	**Assignment**(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.	CLO4	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 Mathematics by ErwinKreyszig, Wiley Eastern.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	5		
Understand	5	5	
Apply	15	20	25
Analyze			
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	10
Apply	50
Analyze	
Evaluate	
Create	

Year-2 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 2201	Database Management System		3	3
2	CSTE 2202	Database Management System Lab		1.5	2.25
3	EEE 2201	Digital Electronics and Pulse Technique	EEE 1201	3	3
4	EEE 2202	Digital Electronics and Pulse Technique Lab	EEE 1202	1.5	2.25
5	CSTE 2203	Signals and Systems		3	3
6	CSTE 2205	Data Communication		3	3
7	CSTE 2206	Data Communication Lab		1	1.5
8	CSTE 2207	Computer Architecture and Organization	CSTE2105	3	3
9	CSTE 2208	Computer Architecture and Organization Lab	CSTE 2106	1	1.5
10	STAT 2201	Probability, Statistics and Complex Variables		3	3
11	CSTE 2226	Viva Voce		1	0
		Total		**24**	**25.5**

COURSE TITLE: DATABASE MANAGEMENT SYSTEM

Course Code: CSTE 2201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Explain the fundamental concepts of a relational database management system.
- Introduce the physical and logical database designs and database modeling.
- Impart data manipulation using SQL and relational algebra.
- Demonstrate normalization theory.
- Outline the essential DBMS Concepts such as Integrity, security, authentication, transaction, concurrency, Recovery, etc.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	recognized the basic concepts of Database Management System
CLO2	use different techniques of the database management to identify end-user requirements.
CLO3	infer the end-user requirements and design a detailed database system.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√										
CLO3		√	√									√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Basic of Database Management System:** Database-System Applications, Purpose of Database Systems,	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	

	View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems			Questions, quizzes, Homework, exams.
2-3	**Relational Database Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations	CLO1, CLO2, CLO3	Lecture and discussion with some practical scenario.	Exercise with various problems.
4-6	**Writing Queries using SQL:** ***Introduction to SQL:***Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database ***Intermediate SQL:*** Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization ***Formal Relational Query Languages:*** The Relational Algebra,	CLO2, CLO3	Lecture and discussion with problems.	**Class Test 1** (topics of the weeks 1-4). Questions, quizzes, Homework, exams

	The Tuple Relational Calculus, The Domain Relational Calculus			
7-8	**Database Design and the E-R Model:** Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features	CLO1, CLO2, CLO3	Lecture and discussion with problems.	Questions, quizzes, Homework, exams.
9-10	**Relational Database Design:** Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, Database-Design Process, Modeling Temporal Data	CLO1, CLO2, CLO3	Lecture and discussion with some practical scenario.	**Class Test 2**(topics of the weeks 5-8)
11	**Indexing and Hashing** 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.	CLO1, CLO2, CLO3	Lecture and discussion with problems.	Questions, quizzes, Homework, exams.
12-13	**Basic Transactions Management and Crash Recovery:** ***Transactions Management:*** Transaction Concept, Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements ***Crash Recovery:*** Failure Classification,	CLO1, CLO2, CLO3	Lecture and discussion with problems.	**Assignment**(topics of the weeks 9-12)

	the storage Hierarchy, Transaction Model, Log Based Recovery, Buffer Management, Checkpoints, Shadow Paging, failure With Loss of non-volatile Storage, Stable Storage Implementation.			

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 Course Technology

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted)

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	5		
Understand	10	10	
Apply	10	10	15
Analyze		5	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	20
Evaluate	
Create	

COURSE TITLE: DATABASE MANAGEMENT SYSTEM LAB

Course Code: CSTE 2202	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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

Course Objectives:

- Focus on database concepts, technology and practice to groom students into well-informed database application developers.

- Familiarize the data manipulation using SQL.
- Give idea to develop database applications using cutting-edge technology.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	recognize database concepts, structures, and query language.
CLO2	execute SQL queries and perform PL/SQL programming.
CLO3	differentiate and implement database schema that meets desired needs and also manipulate data to modify and summarize results for reporting.
CLO4	evaluate SQL/MySQL/Oracle features and related products for maintaining the integrity and performance of enterprise databases
CLO5	coordinate with team members and work effectively in groups.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√	√	√								
CLO4					√							√
CLO5									√			

Lesson Plan (as per week):

Week	Course Contents	CLOs	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 and sorting data. Single-Row-Functions, Displaying Data from multiple tables, aggregating data using group functions.	CLO1, CLO2	Discussion and practice	Questions, quizzes, Homework,Report exams.

3-4	Sub queries, Multiple Column Sub queries, Producing Readable output with SQL *Plus. Manipulating Data, Creating and Managing Tables including constraints.	CLO3	Discussion and practice.	
5-6	Other Database Objects, Controlling User Access. SQL Workshop.	CLO2	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.	CLO2,CLO3,CLO4	Discussion and practice	Questions, quizzes, Homework, Report exams.
9-11	Interacting with the Oracle Server, Writing Control Structures. Working with Composite Data types. Writing Explicit Cursors, Advanced Explicit Cursors Concepts, Create view, procedures and functions. Handling Exceptions.	CLO2	Lecture, discussion with problems and practice.	
12	Submit project work.	CLO1, CLO2,CLO3,CLO4 CLO5		Project
13	**Final Lab Exam (Lab and Viva)**			
ASSESSMENT PATTERN				
Attendance- 10 **Viva- 20**				

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	40
Analyze	20
Evaluate	
Create	

COURSE TITLE: DIGITAL ELECTRONICS AND PULSE TECHNIQUE

Course Code: EEE 2201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Provide students the fundamental concepts that underlie the physical operation, analysis and design of digital integrated circuits and systems.
- Explain debugging and testing techniques to locate and resolve errors and to determine the effectiveness of a logic circuit.
- Discuss the 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.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	recognize the construction of digital circuits by using electronic devices.
CLO2	apply electronic devices in the digital circuit as per digital principles.
CLO3	analyze the working principle of electronic devices and digital ICs in real-world applications.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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;	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	
2	**Logic applications:** Logic Families: TTL, ECL, IIL and CMOS logic; Logic families and their sub-families	CLO2	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;	CLO1, CLO3	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	CLO2	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.	CLO3	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	CLO3	Lecture and discussion with problems, precision of A-D and D-A converters.	
7	**Memory devices:** Memory architecture, mask ROM design, NMOS and CMOS memories, dynamic registers.	CLO3	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 and clamping	CLO2	Lecture on design and applications of the circuits.	

	circuits, comparator circuits			
9	**Transistor switch, Pulse transmission:** Switching circuits; Pulse transformers, pulse transmission.	CLO1	Lecture on design and applications of the circuits.	**Class Test 2** (topics of the week's 5-8)
10	**Multivibrator:**Monostable, Bistable and Astable multivibrators, Schmitt trigger by using npn transistors.	CLO3	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	CLO3	Lecture on design and applications of the circuits.	
12	Timing circuits; Simple voltage sweeps, linear current sweeps	CLO2	Lecture on design and applications of the circuits.	**Assignment**(topics of the week's 9-12)
13	Review topics and Final exam preparation.		Lecture and discussion on miscellaneous topics.	Exercise the answering methods in final exam.

Recommended Books:

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

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	10		
Understand	15	5	
Apply		10	10
Analyze		10	15
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	20
Evaluate	
Create	

COURSE TITLE: DIGITAL ELECTRONICS AND PULSE TECHNIQUE LAB

Course Code: EEE 2202	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Practical implementation of a complex digital system.
- Explain appropriate truth table from a description of a combinational logic function.
- To design and implement the sequential circuits.

Course rational: Digital Electronics Lab is helpful for the students to acquire the basic knowledge of digital logic levels and its application to construct digital electronics circuits. This course will prepare students to perform the analysis and design of various digital electronic circuits.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	acquire significant knowledge with instruments and devices etc.
CLO2	use the basic logic gates and various reduction techniques of digital logic circuit in detail.
CLO3	design combinational and sequential circuits.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):				
Week	**Course Contents**	**CLOs**	**Teaching Learning 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	CLO2	Demonstration with appropriate devices	Questions, quizzes.
2	Logic Families: TTL, ECL, IIL and CMOS logic; Logic families and their sub-families	CLO1	Demonstration with appropriate devices and manual	
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.	CLO3	Demonstration with appropriate circuits	Circuit construction and interpretation.
4-5	D-A converter by using Op-amp**.**	CLO2, CLO3	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.	CLO2, CLO3	Do.	Circuit construction and interpretation.
7	Design and Construction of Astable/Monostable/Bi-stable multivibrators by using NPN transistors.	CLO2, CLO3	Do.	
8-9	Design and Construction of Astable/Monostable/Bi-stable multivibrators by using PNP transistors.	CLO2, CLO3	Do.	**Class Test 2** (topics of the week's 5-8)
10	Design and Construction of Astable/Monostablemultivibrators by using 555 IC.	CLO2, CLO3	Do.	Circuit construction and interpretation.
11-12	Design and Construction of a Relaxation oscillator by using Op-amp. /UJT.	CLO2, CLO3	Do.	**Class Test 3** (topics of the week's 9-12)
13	**Final Lab Exam (Lab and Viva)**			
ASSESSMENT PATTERN				
Attendance- 10 **Viva- 20**				

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	30
Analyze	20
Evaluate	
Create	

COURSE TITLE: SIGNALS AND SYSTEMS

Course Code: CSTE 2203	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 03	**SEE Marks:** 70

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:

- Introduce students to the concept and theory of signals and systems needed in computer science and telecommunication engineering fields.
- Provide students the basic idea of signal and system analysis and its characterization in the time and frequency domain.
- Explain 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, Previous questions.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	interpret the signals in various forms.
CLO2	carry out Fourier/Laplace analysis of continuous-time signals.
CLO3	analyze various signals in time domain and frequency domain systems.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, Topic wise lecture delivery.	Questions, quizzes, Homework, exams.
2	**Signal classifications:** Response of test signals to LTI systems, representation of signals using impulse function.	CLO1	Lecture and discussion on different types of signals.	
3	**Systems:** Classification, Properties of system- Linearity, causality, time invariance, memory, stability, and invariability.	CLO1	Lecture and discussion on different properties of systems.	
4	**Time domain analysis of LTI systems:** Differential equations- system representation, order of the system, solution techniques, zero state and zero input response, system properties;	CLO2	Lecture and discussion on differential equation of system response.	Exercise with various mathematical problems.
5	**Time domain analysis of LTI systems:** Impulse response- convolution integral, determination of system properties;	CLO3	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;	CLO2	Lecture and discussion on how to apply Fourier analysis to periodic and aperiodic signals	Questions, quizzes, Homework, exams.
7-8	**Frequency domain analysis of LTI systems:** Fourier transformation- properties, system transfer function, system response and distortion-less systems.	CLO2	Lecture and discussion on how to apply Fourier transform techniques to ths.	
9-10	**Applications of time and frequency domain analyses:** Solution of analog electrical and mechanical systems.	CO2		**Class Test 2** (topics of the week's 5-8)
11	**Laplace transformation:** Fourier to Laplace, Properties, inverse transform, solution of system equations, system transfer function.	CLO2	Lecture and discussion on how to analyze LTI systems by transform techniques	Questions, quizzes, Homework, exams.

12	**Laplace transformation:** System stability and frequency response and application, Convolution integral and its application, Superposition integral.	CLO2	Lecture and discussion on how to analyze LTI systems by transform techniques	**Assignment**(topics of the week's 9-12)
13	Review topics and Final exam preparation.	CLO1, CLO3	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. De Carlo, Pen-Min Lin

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**
Remember			
Understand	15	10	
Apply	5	10	10
Analyze	5	5	15
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	10
Understand	10
Apply	40
Analyze	10
Evaluate	
Create	

COURSE TITLE: DATA COMMUNICATION

Course Code: CSTE 2205	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: After understanding electronic communication systems, it is important to proceed further on to the concepts related to Data Communication. The field of communication is the fastest growing technology and undoubtedly heading towards to a runaway growth in future which makes it important toknow how data transfer takes place from one system to another, through different channels and

computer networks. This course is the cornerstone of modern telecommunications.

Course Objectives:

- Introduce the essentials of data communication and networking including a study of the Open Systems Interconnection (OSI) and TCP/IP network models.
- Deliver the concepts of different types of digital and analog conversion techniques.
- Provide the concepts of multiplexing and switching techniques.
- Explain different error detection and correction techniques.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe the concepts of data communication with its different components.
CLO2	interpret different types of multiplexing and switching techniques.
CLO3	differentiate between different digital and analog conversion techniques.
CLO4	analyze different error detection and correction techniques.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										
CLO4		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	**Introduction**: Data communication components, Data representations, Data flow types, Transmission modes, Network topologies, Protocols, Standards, **Network Model:** Basics of OSI and TCP/IP model.	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, topic wise lecture delivery.	Questions, quizzes, Exercise with various mathematical problems.
3	**Data and Signals:** Analog and digital data, Analog and digital signals, Nyquist theorem, Information theory, Shannon capacity, Performance measurement of	CLO1	Lecture and discussion on the concepts of analog/digital data and signal.	

	data network, Bandwidth-delay product.			
4-5	**Digital Transmission:** Digital to digital conversion- Line coding- NRZ, RZ, Manchester, Differential Manchester, AMI, Pseudoternary, Block coding and Scrambling.	CLO3	Lecture and discussion on the different types of digital to digital conversion techniques including line coding, block coding and scrambling with their performance analysis.	
6	Pulse modulation: PAM, PWM, PPM; Analog to digital conversion: PCM, DPCM.	CLO3	Lecture and discussion on the different types of analog to digital conversion techniques.	**CT-1** (topics of the week's 1-5).
7	**Analog Transmission:** Analog modulation- AM.FM, PM, QAM.Digital to analog conversion: ASK, FSK, PSK and QPSK/8-PSK, 16-PSK.	CLO3	Lecture and discussion on the different types of digital to analog and analog to analog conversion techniques.	Questions, quizzes, Exercise with various mathematical problems.
8	**Bandwidth Utilization-Multiplexing and Spreading:** FDM, WDM, TDM, Interleaving, Spread spectrum.	CLO2	Lecture and discussion on the types of multiplexing and spread spectrum technique.	
9	**Switching:** Circuit switched network, packet switched network, Datagram network, Virtual circuit network.	CLO2	Lecture and discussion on different types of switching technique.	Questions. **CT-2** (topics of the week's 6-9)
10	**Introduction to Coding Theory**: Single bit error, Burst error, Huffman code, Error detecting and correcting Codes; Block coding- Hamming distance, Linear block codes.	CLO4	Lecture and discussion on the performance of different error control coding technique.	Questions, quizzes, Homework.
11	**Introduction to Coding Theory**: Hamming codes, Cyclic codes-Cyclic redundancy check (CRC), Checksum, Convolution codes.	CLO4	Lecture and discussion on the performance of different error control coding technique.	
12	**Multiple Access Technique:** FDMA, TDMA and CDMA,	CLO1	Lecture and discussion on the advantage, disadvantage and applications of different types of multiple access technique.	Questions. **Assignment**
13	Review topics and Final exam	CLO1, CLO2,	Students will be asked to answer the questions orally	Exercise the answering methods

	preparation.	CLO3, CLO4	on previous lectures and review the contents of the course. Discussion on the better answering methods for the final examinations.	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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	5	5	
Understand	10	10	10
Apply	10	5	5
Analyze		5	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	30
Apply	10
Analyze	20
Evaluate	
Create	

COURSE TITLE: DATA COMMUNICATION LAB

Course Code: CSTE 2206	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

Rationale: This lab course is designed to give students ability to design, 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 can put theoretical concepts to practice.
- Discuss the concept of different analog and digital conversion techniques, error detection and correction methods, multiplexing techniques by different experiments.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	familiarize themselves with different data communication equipment.
CLO2	implement and analyze different data conversion and multiplexing experiments.
CLO3	implement and evaluate the effectiveness of error detection and correction techniques.
CLO4	apply the knowledge to solve the real life problem.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√										
CLO3		√										
CLO4									√			√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	To get familiar with the operation of different data communication equipment.	CLO1	Lecture and discussion with detailed information about the lab course, including the objectives, course outcomes, lab examinations and evaluation methods.	Questions about different types of data communication equipment.
2-3	**Digital to digital conversion:** **Using Board:** **Line Coding** Unipolar-NRZ/ Bipolar-NRZ/ signal encode-decode Unipolar-RZ/ Bipolar-RZ signal encode-decode	CLO2	Lecture, discussion and practice.	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.
4	Manchester/Differential Manchester signal encode-decode. Alternate Mark Inversion/ signal encode-	CLO2	Lecture, discussion and practice.	Question, Answer and check the practical

	decode.			implementation
5	**Analog to Digital conversion:** **Using Board:** PAM/PWM/PPM/PCM/DM modulator-demodulator	CLO2	Through lecture, discussion, practice, and out-of-class assignments.	
6	**Digital to Analog conversion:** **Using Board:** ASK/FSK/BPSK/QPSK modulator-demodulator	CLO2	Through lecture, laboratory, and out-of-class assignments.	
7-8	**Analog to Analog conversion:** AM/FM/PM/QAM modulator-demodulator	CLO2	Lecture, discussion and practice.	
9	**Multiplexing:** FDM/WDM/TDM	CLO2	Lecture, discussion and practice.	Question, Answer and check the practical implementation.
10	**Error Detection and Correction:** Hamming codes, Cyclic Redundancy Check (CRC).	CLO3	Through lecture, discussion, practice, and out-of-class assignments.	
11	Acquaint with Simulation program/real life problem (MATLAB)	CLO2, CLO3, CLO4	Through lecture, discussion, practice, and out-of-class assignments.	
12	Submit a mini project in a group			
13	**Final Lab Exam (Lab and Viva)**			
ASSESSMENT PATTERN				
Attendance- 10 **Viva- 20**				

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	20
Analyze	30
Evaluate	10
Create	

COURSE TITLE: COMPUTER ARCHITECTURE AND ORGANIZATION

Course Code: CSTE 2207	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Familiarize students about the basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user.
- Explain different hardware components of computer systems including arithmetic unit, logic unit, shifter, and different types of the adder circuit.
- Analyze the performance of the processor and memory with an improved approach.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify the basics of computer systems and it's organization.
CLO2	use the various components of computer systems with their working procedure.
CLO3	contrast the performance of computer systems using different performance improvement approaches like multiprocessing, instruction pipelining, and parallel processing, etc.

Mapping of CLO to PLO (Program Learning

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											

Outcome)	CLO2	√											
	CLO3		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	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.	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.	CLO1	Lecture and discussion on computer structure, computer performance, Harvard & Von-Neumann architecture, Microcontroller & Microprocessor etc.	
3	**Micro-operations:** Arithmetic micro-operation, Logic micro-operation, Shift micro-operation. **Instruction Set**: Instruction format, instruction types, CPI, IPS, MIPS & FLOPS, addressing modes of Instruction.	CLO2, CLO3	Lecture and discussion on micro-operations, computer instructions. Exercise on system performance calculation and addressing modes.	
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.	CLO2	Demonstration on arithmetic, logic and different types of the adder circuit.	
5	Combinational circuit shifter design, Addition-subtraction logic network. **Multiplier & divider**: Unsigned binary multiplication, Booths multiplier, array multiplier, restoring &nonrestoring		Lecture and discussion on addition-subtraction, multiplier, divider and shifter circuit	**CT-1** (topics of the week's 1-4)

	divider.			
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.	CLO2	Lecture and discussion on I/O device and I/O modules.	
7	**CPU organization**: Fundamentals, Processor-memory communication with & without cache, an overview of CPU functions, Single accumulator based organization, General register organization, Stack organization.	CLO2	Lecture and discussion on cache memory and CPU organization. Exercise on instruction formats.	
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). **Tristate bus & Bus interconnection**: Register transfer & RTL notation.	CLO2	Lecture and discussion on control unit design and pipelining.	Questions, quizzes, Homework etc.
9	**RISC & CISC based architecture**: Examples of RISC processor (SPARC & C490), introduction to superscalar & VLIW architectures.	CLO2	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.	CLO2	Lecture and discussion on memory characteristics with detail classification.	
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.	CLO2	Lecture and discussion on cache mapping and memory hierarchy with exercise.	Questions, quizzes, Homework etc.
12	**Multiprocessors**: types, performance, single bus multiprocessors,	CLO2, CLO3	Lecture and discussion on multiprocessor and parallel	**Assignment**

	multiprocessors connected by network, clusters, parallel processing.		processing system.	
13	Review topics and Final exam preparation.	CLO1, CLO2, CLO3	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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	10	5	
Understand	15	10	10
Apply		5	5
Analyze		5	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	20
Evaluate	
Create	

COURSE TITLE: COMPUTER ARCHITECTURE AND ORGANIZATION LAB

Course Code: CSTE 2208	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Introduce the basic operations of various functional modules of the computer.
- Provide knowledge about the implementation of the various functional modules of the computer.
- Acquire teamwork skills for working effectively in groups.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	operate of various functional modules of the computer.
CLO2	implement various functional modules of the computer.
CLO3	gain teamwork skills for working effectively in groups.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3									√			

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1- CLO3	Lecture and discussion on AU and LU circuit with practical implementation and testing.	Questions. 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. .
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.	CLO1- CLO3	Discussion with practical implementation and testing.	
5-6	Design, Construction and Testing of different Adder circuit.	CLO1- CLO3	Discussion and practice.	

7	Design, Construction and Testing of Addition-Subtraction Logic Unit. Design, Construction and Testing of Shifter circuit.	CLO1- CLO3	Discussion and practice.
	Design, Construction and Testing of 2-bit, 4-bit magnitude comparator. Design, Construction and Testing of Registers.	CLO1- CLO3	Discussion with practical implementation and testing. Demonstration with e-Tutorials.
	Design of a combinational multiplier. Design of Direct Mapped and Associative cache. Perform other experiments relevant to this course.	CLO1- CLO3	Demonstration with e-Tutorials.
12	Submit a mini project in a group		
13	**Final Lab Exam (Lab and Viva)**		

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	20
Evaluate	
Create	

COURSE TITLE: PROBABILITY,STATISTICSANDCOMPLEX VARIABLES

Course Code: STAT 2201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: This course has been designed to improve the students' ability to think critically, to analyze a real problem and solve it using a wide array of mathematical tools. They will also be able to apply these ideas to a wide range of problems that include the Engineering applications.

Course Objectives:

- Introduce the fundamental concepts of the complex variable theory.
- Discuss the complex function, differentiation and integration with related problems.
- Explain descriptive measures of statistics, correlation, regression, random variables and distribution function.
- Illustrate sampling distribution and statistical inference.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	illustrate the algebraic, geometric, and topological structures of the complex number, complex differentiation and integration.
CLO2	use theorems and formula to solve complex differentiation and integration
CLO3	explain descriptive measures of statistics, random variable and its distribution and statistical techniques.
CLO4	apply statistical techniques to a wide range of data.
CLO5	examine numerical data using different statistical methods.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4	√											√
CLO5		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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-Riemann Equations (Cartesian only)-Harmonic Function-Orthogonal system-velocity potential.	CLO1,CLO2	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Questions, quizzes, Homework, exams.
2	**Conformal mapping:** Mapping by w=1/z, $w=1/z^2$,$w=e^z$, w=z+1/z, w=sinz, w=cosz, Bilinear transformation-fixed points-Problems to find the	CLO1, CLO2	Lecture and discussion about mapping	

	transformation when three points and their images are given.			
3	Line integrals-simple problems-Statements of Cauchy's integral theorem, Cauchy's integral formula-Formula for higher order derivatives-Evaluation of integrals using the above results. Taylor and Laurent series (no proof)-simple problems. Singularities-Residues-Cauchy's Residue theorem (no proof)-problems Evaluation of real definite integral.	CLO1, CLO2	Lecture and discussion with problems.	.
4	Variable and attributes, Collection and presentation of statistical data, Frequency distribution and Graphical representation. Analysis of statistical Data: Location, Dispersion and their measures. Skewness, Kurtosis, and their measures. Moments and Cumulants.	CLO3, CLO4	Lecture and discussion with problems.	
5	**Correlation theory**: Linear Correlation, Measures of correlation and its significance.	CLO3, CLO4	Lecture and discussion with problems.	**Class Test 1**(topics of the week's 1-4)
6	Regression and curve fitting: Linear and non-linear regression. Method of least squares. Curve fitting.	CLO3, CLO4	Lecture and discussion with problems.	Questions, quizzes, Homework, exams.
7	Discrete and continuous random variables. Density and distribution functions Mathematical expectation and variance. Conditional Expectation and conditional variance. Expected values and variances of the density distributions. Moments and cumulant generating functions. Characteristics functions.	CLO3, CLO4	Lecture and discussion with problems.	Questions, quizzes, Homework, Exams.
8	Study of Binomial, Poisson, Normal, Geometric, Negative, Binomial, Hypergeometric, exponential, lognormal, logarithmic, Beta and Gamma distributions.	CLO3, CLO4		
9	**Sampling Distribution:** Fisher's Lemma, Study of $\chi 2$ Distribution, T-distribution and F distribution properties, uses and Applications.	CLO3, CLO4,CLO5	Lecture and discussion with problems.	
10	Distribution of sample correlation coefficient in the null case. Sampling distribution of the medians and range.	CLO3, CLO4,CLO5	Lecture and discussion with problems.	**Class Test 2**(topics of the week's5-8)
11	Statistical decisions; Statistical hypothesis; Critical region, Best critical region; Two types of	CLO3, CLO4,CLO5	Lecture and discussion with problems.	Questions, quizzes, Homework, exams.

	error; the procedure of test of hypothesis; Most powerful test, standard Errors.			
12	**Test of Significance:** Test of single mean and single variance. Comparison of two sample Means, proportions, and Variances. Bartlett's test for homogeneity of variances. Test for correlation Regression coefficients**.**	CLO3, CLO4,CLO5	Lecture and discussion with problems.	Questions, Quizzes, Homework, exams.
13	Review class	CLO1,CLO2, CLO3, CLO4,CLO5	Lecture and discussion with problems.	**Assignment**(topics of the week's9-12)

Recommended Books:

1. Taylor, Michael. Introduction to Complex Analysis (PDF - 1.3MB)
2. Beck, Matthias, Gerald Marchesi, Dennis Pixton, and Lucas Sabalka. A First Course in Complex Analysis (PDF - 1MB)
3. Fundamental of statistics, S.C. Gupta and V.K. Kapoor.
4. Probability with Statistical Applications by Mosteller, Rourkeand Thomas, Addison-Wesley
5. Probability by S. Lipschutz, McGraw-Hill,
6. Elements of Probability and Statistics by F.L. Wolf, McGraw-Hill.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment(25)**
Remember	10		
Understand	10	5	
Apply	5	15	20
Analyze		5	5
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	10
Understand	10
Apply	40
Analyze	10
Evaluate	
Create	

COURSE TITLE: VIVA VOCE

Course Code: CSTE 2226 **Credit:** 1	**Total Marks:** 100

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 interviews both in the academic and the industrial sector.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	point out the various application of Computer Science &Telecommunication Engineering in real-life problem solving
CLO2	evaluate overall technical knowledge and industry readiness
CLO3	go under a virtual environment of technical interview.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3										√		

COURSE CONTENTS	OUTCOME (Student should be able to)
VIVA VOCE (Viva based on major/minor courses of Year-2)	CLO1, CLO2, CLO3

ASSESSMENT PATTERN

Category	Marks (100)
Eye contact	10
Body gesture	10
Communication skill	20
English pronunciation skill	10
Remember	10
Understand	10
Analyzing	20
Evaluating	10

Year-3 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 3101	Digital Signal Processing	CSTE2203	3	3
2	CSTE 3102	Digital Signal Processing Lab		1	1.5
3	CSTE 3103	Operating Systems and System Programming	CSTE 2103	3	3
4	CSTE 3104	Operating Systems and System Programming Lab	CSTE 2104	1.5	2.25
5	EEE 3101	Electromagnetic Waves and Radiating Systems	PHY1101	3	3
6	CSTE 3105	Microprocessor, Microcontroller and Interfacing	CSTE 2207	3	3
7	CSTE 3106	Microprocessor, Microcontroller and Interfacing Lab	CSTE 2208	1	1.5
8	CSTE 3107	Compiler Construction	CSTE 2107	3	3
9	CSTE 3108	Compiler Construction Lab		1	1.5
10	CSTE 3109	Artificial Intelligence	CSTE 2103	3	3
11	CSTE 3110	Artificial Intelligence Lab	CSTE 2104	1.5	2.25
		Total		**24**	**27**

COURSE TITLE: DIGITAL SIGNAL PROCESSING

Course Code: CSTE 3101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce signals, systems, time and frequency domain concepts, and the associated mathematical tools

that are fundamental to all DSP techniques.

- Discuss the concepts of z-transform and discrete-time Fourier transform.
- Discuss various sampling techniques.
- Explain the functionalities of different types of the digital filter.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the fundamentals of digital signal processing.
CLO2	distinguish the digital systems using z-Transform, Discrete-Time Fourier Transform, and Fast Fourier Transform.
CLO3	design FIR and IIR filters using a variety of techniques.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√										
CLO3	√	√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	Questions, quizzes, Homework, exams.
2	**Discrete time signals & systems:** Linear convolution, Circular convolution Cross Correlation, Autocorrelation. Linear constant coefficient difference equations	CLO1	Lecture and discussion and analyze the accuracy.	
3	**Discrete time signals & systems:** sampling theorem & sampling process. Reconstruction of sampling data, convolution.	CLO1, CLO2	Lecture and computation of linear equation solution methods.	

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.	CLO1, CLO2	Lecture and decomposition of linear systems	
5	**The Z-transform:** Definition, properties of the region of convergence for the Z-transform, Z-transform properties.	CLO2	Lecture and discussion on non-linear equations solution.	**Class Test 1** (topics of the week's 1-4)
6	**The Z-transform:** Inverse Z-transform using contour integration, complex convolution theorem, Parseval's, unilateral Z-transform, stability interpretation using Jury's array.	CLO2	Lecture and discussion on non-linear equations solution.	
7	**Discrete Fourier Transform:** Discrete Fourier series, properties of discrete Fourier series, Discrete Fourier transform, properties of DFT, circular convolution using discrete Fourier transform.	CLO1, CLO2	Lecture and problem solving on interpolation.	Questions, quizzes, Homework, exams.
8	**Discrete Fourier Transform:** Decimation in time FFT algorithm, decimation in frequency FFT, FFT of long sequences using overlap add and overlap save method.	CLO2	Lecture and discussion on divided difference and problem solving.	
9	**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.	CLO1	Lecture and analysis on numerical differentiation with problems.	**Class Test 2** (topics of the week's 5-8)
10	**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.	CLO2	Lecture and discussion on numerical integration methods with problems.	Questions, quizzes, Homework, exams.
11	**Filter design Techniques:** Design of discrete time IIR filters from continuous	CLO3	Lecture and analysis of	

	time filters.		Differential equations.	
12	**Filter design Techniques:** frequency transformations of low pass IIR filters. Design of FIR filters by windowing.	CLO3	Lecture and discussion on Differential equations.	**Assignment**(topics of the weeks9-13)
13	**Filter design Techniques:** FIR filter design by Kaiser window method. Frequency sampling method.	CLO3	Lecture and discussion on concrete mathematics.	

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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**
Remember	5	5	
Understand	5	5	5
Apply	15	5	10
Analyze		10	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	15
Understand	20
Apply	10
Analyze	15
Evaluate	10
Create	0

COURSE TITLE: DIGITAL SIGNAL PROCESSING LAB

Course Code: CSTE 3102	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Develop the knowledge on signals used in digital signal processing.

- Introduce signals, systems, time and frequency domain concepts, and the associated mathematical tools that are fundamental to all DSP techniques.
- Provide a thorough understanding and working knowledge of design, implementation, analysis, and comparison of digital filters for processing of discrete-time signals.
- Introduce 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.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe signal and system, errors estimation and analysis, number theory, and recurrence solution of different problems.
CLO2	compare the digital systems using z-Transform and Discrete-Time Fourier Transform.
CLO3	differentiate the discrete-time signals and systems in the frequency domain using Discrete Fourier Transform and Fast Fourier Transform.
CLO4	design FIR and IIR filters using a variety of techniques.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√										
CLO3	√	√										
CLO4	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	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	CLO1	Lecture and discussion on digital signals	Question, Homework, Exams and reports.

	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)).			
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.	CLO1	Lecture and problem discussion about linear convolution and digital systems	
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).	CLO1, CLO3	Lecture and problem solving on z-transform and sampling.	
7-8	Write a MATLAB program to perform the 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).	CLO1, CLO3	Lecture and problem solving.	Question, Homework, Exams and reports.
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	CLO2	Lecture and problem solving on Filter designing.	

11	Write a MATLAB program to find the response of type I, type II, type III, type IV FIR filter for a given sequence.	CLO2	Practice.	Question, Homework, Exams and reports.
12-13	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.	CLO1, CLO3	Discussion and application of GSP processor.	

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	5
Understand	15
Apply	20
Analyze	20
Evaluate	10
Create	0

COURSE TITLE: OPERATING SYSTEMS AND SYSTEM PROGRAMMING

Course Code: CSTE 3103	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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

Course Objectives:

- Provide the fundamental knowledge of the operating system concept.
- Make the students understand the services provided by and the design of an operating system.
- Discuss the synchronizing and scheduling processes of the CPU.

- Explain different approaches to memory management.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify and describe functions and facilities of the operating system.
CLO2	apply and analyze different algorithms linked to operating system performances.
CLO3	develop a system program to implement operating system functions using system service calls.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	Introduction to operating system, operating system structures, services, user interface, and system calls.	CLO1	Lecture and discussion with some basic questions on the role of operating system in computer system. Demonstrate various OS structures with real life examples.	Questions using practical examples on operating systems from the user viewpoint.
2	Process scheduling, operations on processes, IPC, Threading, Scheduling criteria, scheduling algorithms.	CLO1, CLO2, CLO3	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.	CLO1, CLO2, CLO3	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.
4	Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, avoidance and detection**.**	CLO1, CLO2, CLO3	Lecture and discussion with examples on the topic Provide exercise problems	Questions on the topic Discuss among them on the topic Participate in the quiz
5	Memory management strategy, swapping, paging, segmentation.	CLO1, CLO2, CLO3	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	
6	Virtual memory management, demand paging and page replacement.	CLO1, CLO2, CLO3	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	
7	File systems, access methods, file system mounting.	CLO1, CLO2, CLO3	Lecture and discussion with examples on the topic Conduct lab session on the topic	
8	Disk structure, Disk scheduling, RAID structure.	CLO1, CLO2, CLO3	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	
9	I/O System, I/O hardware, application I/O Interface, Transforming I/O requests to Hardware Operations.	CLO1, CLO2, CLO3	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	
10-11	System Security, System and Network Threats, Cryptography as a security tool, user authentication.	CLO1, CLO2, CLO3	Lecture and discussion with examples on the topic Arrange pop-up quizzes.	
12-13	System Security, System and Network Threats, Cryptography as a security tool, user authentication.	CLO1, CLO2, CLO3	Answer basic questions on the topic Discuss among them on the topic Participate in the quiz	

Recommended Books:

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

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted)

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember			
Understand	15	10	
Apply	10	10	15
Analyze		5	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	20
Understand	25
Apply	20
Analyze	5
Evaluate	
Create	

COURSE TITLE: OPERATING SYSTEMS AND SYSTEM PROGRAMMING LAB

Course Code: CSTE 3104	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Describe functions and facilities of operating systems and fundamental operating system abstractions.
- Provide hands-on experiences with OS in both user and system/kernel modes.
- Explain operating system administrative functions based on a commonly available operating system.
- Familiarize the various features of distributed OS like UNIX, Linux, windows etc.
- Design and develop system programs to implement operating system functions using system service calls.

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

Course Learning Outcomes	CLOs	Description (At the end of the course, students will be able to)

(CLO)	**CLO1**	explain the functions and facilities of the operating system.
	CLO2	apply algorithms to improve operating system performances.
	CLO3	evaluate the design and performance of major components of operating systems.
	CLO4	construct a system program to implement operating system functions using system service calls.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										
CLO4		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	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 – 1.5 hrs	CLO1	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.	CLO1, CLO2	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	CLO1, CLO2	Lecture in the lab class with demonstration of	Do lab task.

	with editors- 2.5hrs. Present the concept of the project in a team – 30mins		customizing and editing session. Providing simple lab tasks based on the demonstration. Arrange team presentation.	Solve Exercise Present the concept of the project (Presentation 1)
9	Processes in Linux, Process Scheduler, Deadlock avoidance– 3hrs	CLO2, CLO3	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.	CLO2, CLO3	Demonstration of Shell Scripting b. Providing simple lab tasks based on the demonstration	
11	Decision making and Loop control structure- 1.5hrs.	CLO2, CLO3	Demonstration of Shell Scripting Providing simple lab tasks based on the demonstration	Do lab task Solve Exercise
12-13	Shell Administration- Adding and removing users, Daily administrative works, File management. Disk management, Monitoring system and Ensuring system security	CLO2, CLO3, CLO4	a. Demonstration of administrative commands b. Providing simple lab tasks based on the demonstration	

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	30

Analyze	10
Evaluate	10
Create	

COURSE TITLE: ELECTROMAGNETIC WAVE AND RADIATING SYSTEM

Course Code: EEE 3101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce Maxwell equations and propagation of the wave in free space, dielectric, and conducting medium.
- Explain electromagnetic plane-wave reflection and transmission properties at interfaces between different media, characteristics of waves between parallel plane and waveguide.
- Provide the knowledge of uniform transmission lines to predict and design specified characteristic impedances and propagation constants.
- Discuss 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.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe Maxwell equations ,wave equations, scalar and vector potential, plane wave reflection, transmission, and power flow of EM wave.
CLO2	apply different electromagnetic equations to solve the problem.
CLO3	use different kinds of antenna in communication
CLO4	point out uniform transmission lines to predict and design specified characteristic impedances and propagation constants.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	Maxwell equations and plane wave propagation in isotopic medium.	CLO1, CLO2	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	
2	Reflection, refraction, diffraction and polarization of EM waves: Pointing vector and power flow.	CLO1, CLO2	Lecture and discussion of propagation of EM waves in different medium.	Questions, quizzes, Homework, exams.
3	Waves between parallel planes, TE, TM, TEM waves and their characteristics, Attenuation in parallel plane guides, wave impedances.	CLO1, CLO2	Lecture and discussion with problems.	
4	Rectangular wave guides, TE waves in rectangular wave guides and their characteristics.	CLO1, CLO2	Lecture and discussion with problems.	
5	Wave velocity, guide wavelength, wave impedances, field configurations.	CLO1, CLO2	Lecture and discussions.	**Class Test 1**(topics of the week's 1-4)
6	Transmission lines: Transmission line equation and their solution. Transmission line parameters, characteristics impedance, propagation constant, attenuation constant and phase constant.	CLO4	Lecture, discussions and power point presentation.	Questions, quizzes, Homework ,exams.
7	Waveform distortion, distortion less transmission lines, loading of transmission lines, reflection coefficient and VSWR. Equivalent circuit of transmission lines, transmission lines at radio frequency, open and short circuit line, Smith chart, sub matching.	CLO4	Lecture, discussions and power point presentation.	
8	Potential: Scalar and vector potentials, retarded potentials, field due to a current element, the power radiation and radiation resistance for field due to a dipole.	CLO1, CLO2	Lecture, discussions and power point presentation.	
9	Antenna, Reciprocity theorem applied to an antenna gain and aperture of antenna, radiation intensity, directivity and antenna gain.	CLO3	Lecture, discussions and power point presentation.	**Class Test 2**(topics of the week's5-8)
10	Array: Two element arrays and their	CLO3	Lecture, discussions and	

	directional characteristics, linear array analysis, broad side and end-fire arrays, pattern mortification, binomial arrays, Design of broadcast array for a specific pattern.		power point presentation.	Questions, quizzes, Homework, exams.
11	Antenna: Basic principles of parabolic reflectors, analysis and power pattern, lens antennas, analysis and power pattern, lens antennas, folded dipole.	CLO3	Lecture, discussions and power point presentation.	
12	Turnstile and Yagi antenna, log periodic antenna, horn antenna, travelling wave antennas.	CLO3	Lecture, discussions and power point presentation.	**Assignment**(topics of the week's9-12)
13	Review Classes	CLO1, CLO2, CLO3,CLO4	Lecture and discussion on miscellaneous topics.	Questions, quizzes, Homework, exams.

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 by W.H. Hayt& J.A. Buck, McGraw Hill.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted)

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	5	5	
Understand	10	5	
Apply	10	10	15
Analyze		5	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	25
Apply	25
Analyze	10
Evaluate	
Create	

COURSE TITLE: MICROPROCESSOR, MICROCONTROLLER AND INTERFACING

Course Code: CSTE 3105	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Familiarize with Intel 8085, 8086, 80286, 80386, 80486, and 80586 microprocessors.
- Discuss the architecture, instruction sets, and addressing modes of an Intel 8086 microprocessor.
- To give ideas about Assembly Language Programming as well as the design of various types of digital and analog interfaces.
- Focus on the interface of various devices to the microprocessor.
- Illustrate the microcontroller architecture, addressing mode, instruction sets, and various programmable interfacing devices.
- Show the performances among various programmable interfacing devices using assembly language programming.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the Intel 8085, 8086, 80286, 80386, 80486, and 80586 microprocessors and also the architecture, instruction sets, and addressing modes of an Intel 8086 microprocessor in details.
CLO2	implement the interface of various devices with the microprocessor using Assembly Language Programming.
CLO3	classify certain classes of problems in various interfacing devices with the microprocessor.
CLO4	evaluate the performances among various programmable interfacing devices.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

	CLO4		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Microprocessor Fundamentals and Architecture:** Evaluation 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.	CLO1 .	Overall discussion with the course contents including the objectives, course outcomes, examinations, physical environment and methodology and demonstrating the microprocessor architecture and its related functional parts.	Questions, group discussion, assignments.
2	**Programming Model:** Programming model of 8086 processor, segment-offset address and physical address calculations, even and odd addressing, and the introduction of different addressing modes, Operating systems and BIOS, Memory organization of PC.	CLO1, CLO2	Delivering lecture and overall discussion on several topics of programming model of 8086 processor interactively and solving several examples of addressing modes.	Solving problems in classroom. Submitted Home works and assignments regularly.
3	**Assembly Language:** 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.	CLO1	Lecture and overall explanation about several topics of assembly language programming and demonstrating various solving techniques to run a program.	Exercise with various programming problems.
4	**Status Register and Flow Control:** 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	CLO1, CLO3	Demonstrating various techniques to solve the design of a program and run a program correctly using flowcharts.	

	and looping structures.			
5	**Logic Operation:** Logic, Shift and Rotate Instruction, some common applications of Shift and Rotate operations and related examples.	CLO1, CLO2	Demonstrating several problem-solving techniques to solve several problems on logical, shift and rotate instructions.	**Class Test 1** (topics of the week's 1-4)
6	**Data Structure:** The Stack and Introduction to Procedures, Basic stack operations, Procedures Declaration, Communication between procedures, calling a procedures.	CLO1, CLO2	Lecture and discussion on stack operations, procedures declaration, communication between procedures, calling a procedure and also to solve sample programs using stack operations.	Exercise with various programming problems, group discussion.
7	**Arithmetic Operation:** Multiplication and Division Instructions, signed versus unsigned multiplications, divide overflow, Signed Extension of Dividend.	CLO1, CLO2	Lecture and explanation on arithmetic terminologies to run related programs.	
8	**Arrays and String Manipulation:** 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. Classification certain classes of problems in various interfacing devices to the microprocessor.	CLO1, CLO2, CLO3	Lecture and discussion on arrays and String to solve related programs.	Questions, exercises, home works.
9	**Microcontroller:** Introduction to microcontroller, microcontroller architecture, addressing mode and instruction sets, introduction to 8051 family architecture, pin diagram, operation, ports, addressing modes, internal & external memory, SFR, flags, organization, counters and timers, serial communication.	CLO1, CLO2	Lecture and explanation on different microcontroller terminologies.	**Class Test 2** (topics of the week's 5-8) Questions on topic.
10	**PPI 8255, Keyboard and Display Interfaces:**	CLO1, CLO4	Lecture and discussion on PPI 8255, Keyboard and	

	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.		Display Interfaces.	
11	**8237, 8259, 8295:** 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.	CLO1, CLO4	Lecture and explanation on DMA, Interrupt and Printer controller interface devices.	Question, Homework and assignment.
12	**8254, AVR,** **ARM Microcontroller:** 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.	CLO1, CLO4	Lecture and discussion on the pros and cons of 8254, AVR, ARM Microcontrollers.	**Assignment** (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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment(25)
Remember	5		
Understand	10	5	
Apply	5	10	10
Analyze	5	5	10
Evaluate		5	5
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	15
Analyze	15
Evaluate	10
Create	

COURSE TITLE: MICROPROCESSOR, MICROCONTROLLER AND INTERFACING LAB

Course Code: CSTE 3106	**Attendance:** 10
Credit 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Provide ideas on how to operate the microprocessor MDE-8086 kit.
- Provide concepts on how to execute a typical machine code program using the MDE-8086 kit.
- Develop various Interface, Interrupt, and Serial monitor-based experiments by using 8255A I/O controller and MDE-8086 kit.
- Show various Assembly Language Programs by using MASM translator in PC.
- Illustrate techniques how to design various interfacing systems based on microprocessors and microcontrollers.

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

	CLOs	Description (At the end of the course, students will be able to)
Course Learning Outcomes		

(CLO)	**CLO1**	operate microprocessor MDE-8086 kit and execute a typical machine code program using the MDE-8086 kit.
	CLO2	develop and analyze various Interface, Interrupt, and Serial monitor based experiments by using 8255A I/O controller and MDE-8086 kit.
	CLO3	develop and analyze various Assembly Language Programs by using MASM translator in PC.
	CLO4	design various interfacing systems based on microprocessors and microcontrollers.
	CLO5	acquire teamwork skills for working effectively in groups.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										
CLO3		√										
CLO4		√										
CLO5									√			

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**MDE-8086 kit:** Introduction on Microprocessor MDE-8086 kit. Operation of microprocessor MDE-8086 kit successfully.	**CLO1**	Demonstrating of different key functions, addressing, instructions and related functional parts of MDE-8086 kit in classroom.	Questions, Home works and reports
2	**Experiments on 8255A Interface:** a) 7-segment display interface to display the hexadecimal character. b) LED interface.	**CLO1, CLO2** .	Delivering lecture and discussion on 7-segment display interface and LED interface using 8255A module into MDE-8086 kit and several machine code programs.	
3	**Experiments on Interface:** Interfacing a speaker with microprocessor and to operate on by the program	**CLO1, CLO2**	Demonstrating various solving techniques to interface speaker by MDE-8086 kit.	Exercise with

				various instruction code programs.
4	**Experiments on Interface:** Dot matrix LED displays.	**CLO1, CLO2**	Demonstrating various solving techniques to display dot matrix LED by MDE-8086 kit.	
5	**Experiments on Interface:** Stepper Motor Interface to control speed. Design analog/digital control systems using Stepper Motor.	**CLO1, CLO2, CLO4, CLO5**	Demonstrating various solving techniques to control the speed of stepper motor by MDE-8086 kit.	Design analog/digital control systems using Stepper Motor.
6	**Experiments on Interrupt:** a) Interrupt due to division by zero b) Interrupt due to overflow c) Interrupt due to user defined software.	**CLO1, CLO2** .	Demonstrating various techniques to solve various Interrupt based experiments.	
7	**Experiments with serial monitor:** a) Execution of different serial monitor commands b) Loading and executing assembly language program.	**CLO1, CLO2**	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.	**CLO3**	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. c) A program to read a character from the	**CLO3**	Lecture and explanation on program terminologies to run related programs.	Assignments, group discussion.

	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.	**CLO3**	Demonstrating various techniques to solve various arithmetic operations and loop related programs.	Questions, home works and reports.
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.	**CLO3**	Lecture and discussion on procedure and macro related programs.	Questions, Home works and reports
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	**CLO3**	Demonstrating various techniques to solve various string, arrays and sort related programs.	

	Descending order.			
13	**Final Lab Exam (Lab and Viva)**			

Recommended Books:

1. MDE-8086 kit Manual.

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	10
Apply	25
Analyze	25
Evaluate	
Create	

COURSE TITLE: COMPILER CONSTRUCTION

Course Code: CSTE 3107	**Attendance:** 05
Credit: 03	**Viva:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce the concept in the areas of language translation and phases of compiler.
- Discuss tokens using the notation of regular expressions and convert regular expression into finite automata
- Deliver the knowledge of parser by parsing LL parser and LR parser.
- Explain code optimization techniques, machine code generation, and use of symbol table.

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

	CLOs	Description (At the end of the course, students will be able to)
Course Learning Outcomes (CLO)	**CLO1**	illustrate the different phase of a compiler and their role in executing a program, and the grammar for a programming language to develop a compiler.
	CLO2	perform syntactic and semantic analyses of source programs.
	CLO3	use different parsing techniques to input the program and to optimize the program using different optimization techniques.

	CLO4	select and use appropriate code generation and optimization techniques

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										
CLO3	√											
CLO4		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	**CLO1**	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	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.	**CLO1**	Lecture and problem discussion about lexical analyzer.	
3	**Syntax Analysis:** The role of Parser, Top-down parsing, predictive Parsers.	**CLO2**	Lecture and discussion on parsing technique.	
4	**Syntax Analysis:** Bottom-up parsing. L.R. Parsers (SLR, CLR & LALR), Implementation of LR Parsers.	**CLO2, CLO3**	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.	**CLO2, CLO3**	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 Translation:** Intermediate Code, Postfix notation, Parse tree and Syntax Trees.	**CLO2**	Lecture and discussion with problems about different syntax directed translation notations.	Questions, quizzes, Homework, 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.	**CLO2**	Lecture and discussion about semantic rules	
8	**Symbol Tables:** Contents, Data structures for symbol tables, representing scope information.	**CLO1**	Lecture and discussion on scope management.	
9	**Symbol Tables:** Error detection and Recovery: Error handling. Lexical-phase, Syntactic phase and semantic phase.	**CLO1, CLO4**	Lecture and discussion on error detection.	**Class Test 2**(topics of the weeks5-8) Questions, quizzes, Homework, exams.
10	**Code Generation:** Issues in Code Generation, Target Machine, Runtime storage management.	**CLO1, CLO4**	Lecture and discussion on code generation.	
11	**Code Generation:** Basic block and flow graphs, Simple code generator, register allocation and assignment.	**CLO1, CLO4**	Lecture and discussion and code generation from flow graph.	
12	**Code Generation:** DAG, Peephole Optimization, Generation Code from DAG's. Three address codes, quadruples, triples.	**CLO1, CLO4**	Lecture and discussion on DAG.	**Assignment**(topics of the weeks9-13)
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	**CLO1, CLO4**	Lecture and discussion on code optimization.	

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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment/ Presentation (25)**
Remember	5	5	
Understand	5		5
Apply	10	10	10
Analyze	5	10	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	5
Understand	20
Apply	25
Analyze	15
Evaluate	5
Create	

COURSE TITLE: COMPILER CONSTRUCTION LAB

Course Code: CSTE 3108	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	**Description (At the end of the course, students will be able to)**
CLO1	identify compiler construction tools to automatically generate lexical analyzer and syntax analyzer.
CLO2	develop a lexical analyzer for given regular expressions.
CLO3	develop a syntax analyzer for a given context-free grammar.
CLO4	implement appropriate algorithms for lookup and insert operations on a symbol table.

Mapping of CLO to PLO

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**

(Program Learning Outcome)													
	CLO1	√											
	CLO2	√											
	CLO3	√											
	CLO4	√		√									√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	Write a Lex/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 Lex/C program to find comments in a given file or text. Write a Lex/C program that shows whether a variable is valid or not	CLO1, CLO2	Discussion and practice.	Questions, quizzes, Homework, exams.
3-4	Write a LEX/C program to find keywords in a program. Write a LEX/C program to find different types of variables. Write a LEX/C program to find numbers in a text file. Write a LEX/C program to simulate lexical analyzer for validating operators. Write a LEX/C program to find operator precedence parsing for an expression like ((x+y*z) +p/q) +z	CLO1, CLO2	Lecture and Discussion with problems.	
5	Write a LEX/C program to validate string by a given regular expression like $a*b^{+}$, (a|b)*abb, (ab)*aba.	CLO1, CLO2	Lecture and discussion about regular expression and grammars.	Quiz 1 (Topic of the 1-5 weeks) Homework
6	Write a LEX/C program to check whether a string belong to a grammar or not.	CLO1, CLO3	Lecture and discussion with problems	

7-8	Write a YACC/C program to eliminate left recursion in a production. Write a YACC/C program to identify first and follow of a grammar.	CLO1, CLO3	Lecture and discussion with problems	Quiz 2 (Topic of the 6-7 weeks)
9-10	Write a YACC/C program to construct parsing table for a predictive parser. Write a YACC/C program to LL(1) parsing for a given input expression.	CLO1, CLO3	Lecture and discussion on parsing	Homework
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. Write a C program to generate machine code from abstract syntax tree generated by the parser.	CLO1, CLO4	Lecture and discussion about semantic rules	
12	Write a YACC/C program to generate machine code from abstract syntax tree generated by the parser.	CLO4	Lecture and discussion code generation.	Questions, Homework Quiz 3 (Topic of the 8-12 weeks)
13	**Final Lab Exam (Lab and Viva)**			

Recommended Books:

1. Theory and Practices of Compiler Writing by Trembly and Sorensen, McGraw-Hill

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	30
Analyze	20
Evaluate	
Create	

COURSE TITLE: ARTIFICIAL INTELLIGENCE

Course Code: CSTE 3109	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Introduce the basic concepts of Artificial Intelligence.
- Familiarize search problems and implement search algorithms using admissible heuristics.
- Describe games as adversarial search problems and implement optimal and efficient solutions.
- Explain natural language processing and learn how to apply basic algorithms in this field.
- Introduce the applications of Fuzzy set theory and design Fuzzy controllers.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	Identify the role of decision-making strategies in simulating intelligence.
CLO2	apply knowledge representation, reasoning, and learning techniques to real-world problems.
CLO3	recognizereasoning strategies for inference in the presence of incomplete information.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√			√							
CLO3		√										√

Lesson Plan (as per week):				
Week	**Course Contents**	**CLOs**	**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	CLO1	Lecture and discussion on history of AI, intelligent agents.	Questions, quizzes, Homework, exams. **Class Test 1 (Week 1 – Week 4)**
2	**Solving problem by searching:** Problem solving agent, Formulating Problems, Example problems, Searching for solution, Uninformed Search strategies.	CLO1, CLO2, CLO3	Lecture and discussion on problem solving agent and searching.	
3	**Informed search techniques:** Informed (heuristic) search strategies, heuristic function, local search algorithms and optimization problems.	CLO1, CLO2, CLO3	Lecture and discussion on informed search techniques.	
4	**Genetic Algorithms:** Basic Outline, Encoding system, Crossover, Mutation, Selection.	CLO1, CLO2, CLO3	Lecture and discussion on genetic algorithms.	
5-6	**Adversarial search:**Games, Optimal decisions in games, optimal strategies, the min-max algorithm, optimal decisions in multiplayer games, Alpha-beta pruning, Imperfect decisions, Evaluation functions, cutting off search, Games including elements ofchance.	CLO1, CLO2, CLO3	Lecture and discussion on adversarial search techniques.	Questions, quizzes, Homework, exams **Class Test 2 (Week 5 – Week 8)**
7	**Knowledge and reasoning I:** Knowledge-based agent, Logic, Propositional logic, First Order Logic.	CLO1, CLO2, CLO3	Lecture and discussion on knowledge and reasoning I	
8	**Knowledge and reasoning II:** Representing Knowledge using Logic. Semantic Nets, Introduction to Logical reasoning	CLO1, CLO2, CLO3	Lecture and discussion on knowledge and reasoning II	
9	**Uncertainty:** Reasoning under uncertainty, Bayes' Rule, Bayesian Net, Dempster-Shafer Theory	CLO1,	Lecture and discussion on Uncertainty	

		CLO2, CLO3		
10	**Fuzzy Logic:** Crisp vs Fuzzy Set Theory, Fuzzy controller, Fuzzification, Inference rules and Defuzzification techniques	CLO1, CLO2, CLO3	Lecture and discussion, Fuzzy logic	
11	**Probabilistic Reasoning:** Semantics of Bayesian network,Hidden Markov Models	CLO1, CLO2, CLO3	Lecture and discussion on probabilistic reasoning.	Questions, quizzes, Homework, exams **Class Test 3/Assignment (Week 9 – Week 12)**
12	**Introduction to Artificial Neural Networks:** History and concepts of Artificial Neural Networks (ANN), Models of ANN, Learning algorithms	CLO1, CLO2, CLO3	Lecture and discussion on artificial neural network	
13	Review topics and Final exam preparation.		Lecture and discussion on miscellaneous topics.	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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	5	5	
Understand	10	10	5
Apply	5	5	10
Analyze	5	5	10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	20
Understand	20
Apply	20
Analyze	10
Evaluate	
Create	

COURSE TITLE: ARTIFICIAL INTELLIGENCE LAB

Course Code: CSTE 3110	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the concepts of search and Minimaxing algorithms.
CLO2	implement the reasoning, deduction and assertion problems using Prolog.
CLO3	apply the Bayesian network and Neural network

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√										
CLO3	√				√							√

Lesson Plan (as per week):

Week	Course Contents	CLOs	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	CLO1	Discussion, Demonstration of sample programing codes to guide students	

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	CLO1	Discussion, Demonstration of sample programing codes to guide students	
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	CLO1	Discussion, Demonstration of sample programing codes to guide students	
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	CLO1	Discussion, Demonstration of sample programing codes to guide students	
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	CLO2	Discussion, Demonstration of sample programing codes to guide students	Home task, assignments, Report, Lab exam
9	**Bayesian network:** Implement Bayesian Network to design a reasoning/ prediction system (i.e. Disease-Symptom Checker) using	CLO3	Discussion, Video tutorial, Demonstration of sample programing codes to guide students	

	MATLAB/C++			
10-13	**Neural Network:** Implement AND/OR gate and XOR gate using Backpropagation learning.	CLO3	Discussion, Video tutorial, Demonstration of sample programing codes to guide students	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	40
Analyze	20
Evaluate	
Create	

Year-3 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 3201	Computer Graphics	CSTE1201	3	3
2	CSTE 3202	Computer Graphics Lab	CSTE1202	1	1.5
3	CSTE 3203	Computer Networking		3	3
4	CSTE 3204	Computer Networking Lab		1	1.5
5	CSTE 3205	Software Engineering and Information System Design	CSTE2201, CSTE 2103	3	3
6	CSTE 3206	Software Engineering and Information System Design Lab	CSTE 2202, CSTE 2104	1.5	2.25
7	CSTE 3207	Machine Learning	STAT2201, CSTE 2103	3	3
8	CSTE 3208	Machine Learning Lab		1.5	2.25
9	CSTE 3209	Microwave and Satellite Communication	EEE 3101	3	3
10	CSTE 3210	Microwave and Satellite Communication Lab		1	1.5
11	CSTE 3212	Web Engineering Lab	CSTE 2202	2	3
12	CSTE 3226	Viva Voce		1	0

		Total		**24**	**27**

COURSE TITLE: COMPUTER GRAPHICS

Course Code: CSTE 3201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: Computer graphics have many real applications, including scientific visualization, engineering design and modeling of the complex structure. It is also used for creating motion pictures, and making animation films.

Course Objectives:

- Explain the basic principles of computer graphics. In detail, this course will focus on understanding how algebra, geometry, algorithms, and data structures interact in the design of graphics.
- Introduce hardware system architecture for computer graphics. This includes, but it is not limited to: graphics pipeline, fame buffers, and graphic co – processors.
- Discuss briefly different algorithms used in computer graphics, such as modeling 2D/3D object representations, transformations, modeling algorithms, and rendering algorithms, etc.
- Build design thinking skills across disciplines in computer graphics, as well as solid understanding of how to apply computer graphics in the digital age.
- Provide an overview of the fundamental building blocks of multimedia, along with an examination of how these blocks work with current technologies and tools.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe the fundamental concepts of computer graphics.
CLO2	apply different algorithms used in computer graphics, such as modeling 2D/3D object representations, transformations, modeling algorithms, and rendering algorithms, in order to manipulate complex graphics scenarios.
CLO3	distinguish different modeling, rendering, shading and animation techniques to build design thinking skills across disciplines in computer graphics.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√	√										√
CLO3	√	√										√

Lesson Plan (as per week):				
Week	**Course Contents**	**CLOs**	**Teaching Learning Strategy (activities directed to achieve outcomes)**	**Assessment Strategy (How they are developed)**
1.	**Introduction to Computer Graphics:** Definition of computer graphics, History of computer graphics, graphics architectures and software, Application areas of Computer Graphics.	CLO1	Lecture and discuss detailed information about the course, including the objectives, course outcomes and fundamentals of computer graphics.	Questions, quizzes, Homework, exams.
2	**Image Representation:** The RGB Color Model, Direct Coding, Lookup Table, Display Monitor, Printer, Image Files, Setting the Color Attribute of Pixels, Visualizing the Mandelbrot Set	CLO1	Lecture and discuss detailed information on image representation.	
3-4	**Scan Conversion:** Scan-Converting a Point, Scan-Converting a Line, Scan-Converting a Circle, Scan-Converting an Ellipse, Scan-Converting Arcs and Sectors, Scan-Converting a Rectangle, Region Filling, Scan-Converting a Character, Anti-Aliasing	CLO1, CLO2, CLO3	Lecture and discussion scan conversion algorithms.	

5	**Two-Dimensional Transformation:** Geometric Transformations, Coordinate Transformations, Composite Transformations, Instance Transformations	CLO1, CLO2	Demonstrate examples of two-dimensional transformations.	**Class Test 1** (topics of the week's 1-4) Questions, quizzes, Homework, exams.
6-7	**Two-Dimensional Viewing and Clipping:** Window-to-Viewport Mapping, Point Clipping, Line Clipping, Polygon Clipping, 2D Graphics Pipeline	CLO1, CLO2, CLO3	Lecture and discussion about two-dimensional viewing and clipping.	
8	**Three-Dimensional Transformations:** Geometric Transformations, Coordinate Transformations, Composite Transformations, Instance Transformations	CLO1, CLO2	Lecture and discussion about three-dimensional transformations.	
9	**Mathematics of Projection:** Taxonomy of Projection, Perspective Projection, Parallel Projection	CLO1, CLO2, CLO3	Lecture and discussion about mathematics of projects.	Questions, quizzes, Homework, exams. **Class Test 2** (topics of the week's 5-8)
10	**Three-Dimensional Viewing and Clipping:** Three-Dimensional Viewing, Clipping, Viewing Transformation, 3D Graphics Pipeline	CLO1, CLO2, CLO3	Lecture and discussion about three-dimensional viewing and clipping..	
11-12	**Geometric Representation:** Simple Geometric Forms, Wireframe Models, Curved Surfaces, Curve Design,	CLO1, CLO2, CLO3	Lecture and discuss about geometric representation, hidden surface, and animation basic.	**Assignment**(topics of the week's 9-11) Exercise the answering methods in final exam.

	Hidden Surface: Depth Comparisons, Z-Buffer Algorithm **Computer animation:** Design of animation sequence, General computer animation functions, Raster animation, Key frame systems, Motion specifications			
13	Miscellaneous and Final exam preparation	CLO1	Lecture and discussion on miscellaneous subjects	

Recommended Books:

1. Computer Graphics: A Programming approach by St even Harrington, McGraw Hill.
2. Computer Graphics by Donald Hearnand M. Pauline Baker, Prentice Hall.
3. Computer Graphics: Schaum's Outlines, McGraw Hill.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**
Remember	5		
Understand	10	10	
Apply	15	10	10
Analyze		5	10
Evaluate			5
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	20
Understand	20
Apply	20
Analyze	10
Evaluate	
Create	

COURSE TITLE: COMPUTER GRAPHICS LAB

Course Code: CSTE 3202	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

Rationale: This lab course aims to implement the theoretical knowledge of computer graphics practically.

Course Objectives:

- Identify, formulate and solve engineering problems using computer graphics techniques.
- Explain different algorithms related to drawing geometric shapes of different types of objects.
- Develop 2D/3D models using OpenGL API.

Resources Used: Programming language software (C/C++, OpenGL), Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials, Device manual.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify different algorithms related to drawing line, circle, ellipse, arc, and sector correctly.
CLO2	apply different algorithms for drawing, scan conversion of various characters and designs, and transformation.
CLO3	examinedifferent computer graphics geometric shape designing techniques.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2			√		√							√
CLO3			√		√							√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	• Discuss about programming language basic-OpenGL, C/C++ to draw different types of geometric shapes. • Draw a Line using Polynomial Line Algorithm, DDA Line	CLO1, CLO2, CLO3	• Give instructions about problem solving tools and techniques. • Discuss about the problems, and solving technique.	Solving the assigned

	Algorithm, Bresenham's Line Algorithm • Draw a Circle using Midpoint Circle Algorithm, Polynomial circle algorithm, Trigonometric circle algorithm, Bresenham's circle algorithm			problems and answering the basic questions and homework. **Assignment/Problem Solving (CT-1)** based on the basis of weeks 1-4
3-4	• Draw an Ellipse using the Polynomial algorithm, Trigonometric algorithm. • Draw an Arc and a sector.	CLO1, CLO2, CLO3	Discuss about the problems, and solving technique.	
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.	CLO1, CLO2, CLO3	Discuss about the problems, and solving technique.	Solving the assigned problems and answering the basic questions and homework. **Assignment/Problem Solving (CT-2)** based on the basis of weeks 5-8
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 by rotating an object	CLO1, CLO2, CLO3	Discuss about the problems, and solving technique.	
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 draw NSTU Shahid Minar using OpenGL. • Projection of 3D cube.	CLO1, CLO2, CLO3	Discuss about the problems, and solving technique.	Solving the assigned problems and answering the basic questions and homework. **Assignment/Problem Solving (CT-3)** based on the basis of weeks 9-12
11-12	• Line & polygon clipping problems. • To perform also other experiments relevant to this course.	CLO1, CLO2, CLO3	Discuss about the problems, and solving technique.	
13	**Final Lab Exam (Lab and Viva)**			

Recommended Books:

1. OpenGL 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.

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	30
Analyze	20
Evaluate	
Create	

COURSE TITLE: COMPUTER NETWORKING

Course Code: CSTE 3203	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the internal structure of Networking layers, Protocol applications, etc.
CLO2	determine error detection and correction for the effectiveness of the network.
CLO3	apply protocols for troubleshooting and network management.
CLO4	acquire individual and teamwork skill

Mapping of CLO to PLO (Program Learning Outcome)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
	CLO1	√											
	CLO2		√										
	CLO3		√										
	CLO4										√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	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,	CLO1	Lecture and discussion with detailed information about network devices, types of networks.	Questions, Design, development, explanation, quizzes, Homework, exams.
2	OSI reference model, TCP/IP reference model, Example networks – Novell NetWare, Internet, X.25.	CLO2	Lecture and discussion with characteristics OSI model and protocols in several network types- LAN, MAN, WAN	
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.	CLO1, CLO3	Lecture and discussion with problems.	
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	CLO2	Lecture and discussion with problems in multiple access control.	Exercise with various problems in media access.

	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.			
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.	CLO2, CLO3	Lecture and discussion on various types of link management	**Class Test 1**(topics of the week's 1-4) Performance analysis of flow control protocols, quizzes, Homework, exams.
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.	CLO2, CLO3	Lecture and discussion with problems in error control, flow control	
7	**The Network layer:** Network Layer design issues – services provided to the transport layer, an Internal organization of the network layer,	CLO3	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,	CLO3, CLO4	Lecture on performance of router	Presentations, quizzes, Homework, exams
9	Congestion – Control algorithms, Pre-	CLO3	Lecture and discussion	**Class Test 2**(topics

	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).		about congestion control	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,	CLO3	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).	CLO3	Lecture on Transmission Control Protocol TCP, User Datagram Protocol	
12	**The presentation Layer:** Presentation layer design issues-Data representation, Text Compression, Network security and privacy. The OSI presentation, Service primitives, Substitution Ciphers, Transposition Ciphers, Public key Encryption, Secrecy and Digital Signature with Public Key encryption.	CLO1	Lecture on security issues and applications of them.	**Assignment**(topics of the weeks9-12)
13	Review topics and Final exam preparation.		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.

ASSESSMENT PATTERN

Attendance- 05	
CIE-Continuous InternalEvaluation (25) **(**Average of best 2 out of 3 will be counted**)**	**SEE-Semester End Examination (70 marks)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember	5		
Understand	10	5	
Apply	5	10	10
Analyze	5	5	10
Evaluate		5	5
Create			

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	10
Evaluate	10
Create	

COURSE TITLE: COMPUTER NETWORKING LAB

Course Code: CSTE 3204	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the internal structure of Networking layers, Protocol applications, etc.
CLO2	determine error detection and correction for the effectiveness of the network.
CLO3	apply protocols for troubleshooting and network management.
CLO4	examine real-world problems and finding solutions.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										
CLO3	√											
CLO4						√						√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	The Use of Computer Network – Network Hardware, OSI model.	CLO1	Discussion with Hands on manual	Questions, quizzes, homework, report, exam.
2	Installation of a virtual machine	CLO2, CLO3, CLO4	Demonstration with RHEL6.iso and bootable pen drive with rhel6	
3	Network setup with appropriate IP of real host and guest machine. ping, traceroute, arp, learning remote login using telnet session, ssh. Study of Network IP. TTL, ICMP	CLO3	Ensure and testing communication between computers.	
4	FTP, vsftpd configuration, NFS	CLO3, CLO4	Demonstration with FTP	
5	IP forwarding, dig, nslookup	CLO3, CLO4		
6	Web server in Redhat OS, httpd configuration	CLO3	Hands on instruction	
7	Email server setup in Redhat OS.	CLO3, CLO4	Hands on instruction	
8	User add, user delete, recreate user name	CLO3, CLO4	Hands on instruction	
9	Manual using for instruction, yum server installation	CLO3, CLO4	Demonstration	
10	DNS	CLO3, CLO4	Hands on instruction	
11	DHCP server	CLO3, CLO4	Hands on instruction	
12	Virtualization, Docker, Container	CLO4	Demonstration	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	30
Analyze	30
Evaluate	
Create	

COURSE TITLE: SOFTWARE ENGINEERING AND INFORMATION SYSTEM DESIGN

Course Code: CSTE 3205	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe the fundamentals of software engineering, including development process models, requirement engineering, design principles, testing, maintenance, and ethical responsibilities of software professionals
CLO2	apply software engineering knowledge to identify the challenges of complex software engineering problems
CLO3	identify the challenges of software engineering problems to decide functional, nonfunctional, and domain requirements to produce efficient, reliable and cost-effective software solutions.
CLO4	recognize ethical and professional responsibilities in engineering situations and make informed judgments which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.

Mapping of CLO to PLO

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12

(Program Learning Outcome)													
	CLO1	√											
	CLO2	√											
	CLO3		√										√
	CLO4						√		√				

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Introduction:** Professional software development, Software engineering ethics, Case studies	CLO1, CLO4	Lecture and discussion with detailed information about the course, and professional software development, software engineering ethics, case studies.	Questions, quizzes, Homework, exams. **Class Test 1** (topics of the week's 1-4)
2	**Software processes:** Software process models, Process activities, Coping with change, The rational unified process	CLO1	Lecture and discussion with software process models, process activities, coping with change, the rational unified process	
3	**Agile software development:** Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods	CLO1	Lecture and discussion with problems related to agile methods, plan-driven and agile development, extreme programming, agile project management, scaling agile methods etc.	
4-5	**Requirements engineering:** Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes,	CLO1, CLO2, CLO3, CLO4	Lecture and discussion on different types of functional and non-functional requirements, software requirements document, requirements specification, requirements engineering processes,	

	Requirements elicitation and analysis, Requirements validation, Requirements management		requirements elicitation and analysis, requirements validation, requirements management etc.	
6-7	**System modeling:** Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering	CLO1, CLO2, CLO3, CLO4	Lecture and discussion on elements of different types of context models, interaction models, structural models, behavioral models, Model-driven engineering	Questions, quizzes, Homework, exams. **Class Test 2** (topics of the week's 5-8)
8	**Architectural design:** Architectural design decisions, Architectural views, Architectural patterns, Application architectures	CLO1, CLO2, CLO3, CLO4	Lecture and discussion with problems and its solution on architectural design decisions, architectural views, architectural patterns, application architectures.	
9-10	**Design and implementation:** Object-oriented design using the UML, Design patterns, Implementation issues, Open source development	CLO1, CLO2, CLO3,CLO4	Lecture and discussion with problems and its solution on object-oriented design using the UML, design patterns, implementation issues, open source development.	
11-12	**Software testing:** Development testing, Test-driven development, Release testing, User testing	CLO1, CLO2, CLO3, CLO4	Lecture on software testing including development testing, test-driven development, release testing, user testing	**Assignment**(topics of the week's 9-12)
13	**Software Evaluation:**	CLO1, CLO2,	Lecture on software Evaluation processes,	

	Evaluation processes, Program Evaluation dynamics, Software maintenance, Legacy system management	CLO3,CLO4	program Evaluation dynamics, software maintenance, legacy system management	

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 Sharam Hekmat

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment (25)
Remember	5	5	
Understand	10	10	10
Apply	10	10	10
Analyze			5
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	25
Apply	20
Analyze	15
Evaluate	
Create	

COURSE TITLE: SOFTWARE ENGINEERING AND INFORMATION SYSTEM DESIGN LAB

Course Code: CSTE 3206	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

Rationale: This course focuses on experiments to verify practically the theories and concepts develop in CSTE 3205.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	discussthe processes, concepts, and standards related to the discipline of software engineering.
CLO2	use modern engineering tools necessary for engineering practice.
CLO3	designand development a software using appropriate software development strategies and tools for any given software project.
CLO4	apply project management tools to develop a software project.
CLO5	coordinate with team members and work effectively in groups.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2					√							
CLO3		√	√	√		√		√				√
CLO4											√	
CLO5									√	√		

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1, CLO2	Discussion, practice and case study	Questions, Homework, Quizzes, Report, Project submission.
4-5	Library management system to run a library.	CLO3, CLO4.	Discussion, practice and case study	
6-7	Payroll system.	CLO1, CLO2	Discussion, practice and case study	

8-9	Lubricating oil management system.	CLO1, CLO2	Discussion, practice and case study	
10-11	Super shop management system.	CLO1, CLO2, CLO4		
12	To perform other experiments relevant to this course, Submit project work	CLO3, CLO5.	Discussion, practice and case study	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	40
Analyze	20
Evaluate	
Create	

COURSE TITLE: MACHINE LEARNING

Course Code: CSTE 3207	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: This course 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:

- Introduce the basic theory underlying machine learning.
- Discuss a range of machine learning algorithms along with their strengths and weaknesses.
- Emphasize how to apply machine learning algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
- Explain the importance of visualization in the data analytics solution.

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

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	identify the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
	CLO2	detect the underlying mathematical relationships within and across machine learning algorithms and the paradigms of supervised and unsupervised learning.
	CLO3	apply machine learning algorithms to solve problems of moderate complexity.
	CLO4	design and implement various machine learning algorithms in a range of real-world applications.

Mapping of CLO to PLO (Program Learning Outcome)	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**
CLO1	√											
CLO2	√	√										
CLO3	√											
CLO4			√	√	√			√	√			√

Lesson Plan (as per week):

Week	**Course Contents**	**CLOs**	**Teaching Learning Strategy (activities directed to achieve outcomes)**	**Assessment Strategy (How they are developed)**
1	**Introduction to machine learning:** What is machine learning,Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation, learning algorithms.	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	
2	**Data Preprocessing/Evaluation Metric:** Data Preprocessing (overview, data cleaning and integration, data reduction - PCA), Evaluation and credibility issues, performance evaluation metrics and methods, model estimation, model comparison, model selection	CLO1	Lecture and discussion on data preprocessing and evaluation metric.	Questions, quizzes, Homework, exams. **Class Test 1**(topics of the Week 1-5)
3	**Supervised learning I (Regression):** Linear regression, Logistic regression, Non-parametric methods.	CLO2, CLO3, CLO4	Lecture and discussion on linear regression and logistic regression.	
4 - 5	**Supervised learning II (Classification):**	CLO2,	Lecture and problem	

	Linear classification, non-linear classification, multi-class classification.	CLO3, CLO4	solving on linear and non-linear classification.	
6	**Probabilistic Classifiers:** Bayes classifier, estimated probability densities from data, risk of bayes classifier; Naïve bayes classifier, estimated probability densities from data, risk of naïve bayes classifier.	CLO2, CLO3, CLO4	Lecture and problem solving on generative and discriminative classifiers such as gaussian and naïve bayes classifiers.	Questions, quizzes, Homework, exams. **Class Test 2**(topics of the Week 6-9)
7 - 8	**Neural Networks:** Neural network architecture, multi-layer perceptron, forward propagation, backward propagation, Neural networks for object recognition, deal with large input spaces, convolution layer, basic of convolutional neural networks.	CLO2, CLO3, CLO4	Lecture and discussion with problems on neural networks, backpropagation, gradient descent for single and multi-layer neural networks, problems about object recognition using neural networks, how to deal with large input spaces, convolutional neural networks.	
9	**Computational Learning Theory:** Basic of Learning theory, overfitting, underfitting, Bias/Variance trade-off, model complexity, PAC learning, VC dimension	CLO1, CLO2	Lecture and discussion about learning theory	
10 - 11	**Clustering:** Unsupervised learning, overview of basic clustering methods, partitioning methods (k-means clustering), hierarchical clustering, Gaussian mixture model (GMM).	CLO2, CLO3, CLO4	Lecture and discussion about unsupervised learning algorithms, k-means clustering and gaussian mixture model.	Questions, quizzes, Homework, exams Exercise the answering methods in the final exam. **Class Test 3/Assignment** (topics of the Week 10-13)
12	**Ensemble Learning:** Ensemble methods, working principle of ensemble methods, bootstrap estimation, bagging, boosting (Adaboost, Gradient Boosting, XGBoost).	CLO2, CLO3, CLO4	Lecture and discussion on ensemble methods.	
13	**Real-world Applications:** Practical application of machine learning algorithms.	CLO4	Lecture and discussion on the application of machine learning in real-world scenario.	

Recommended Books:

1. **Data Mining: Concepts and Techniques** by J. Han, M. Kamber, and J. Pei, Morgan Kaufmann
2. **Machine Learning** by Tom Mitchell, McGraw-Hill.
3. **Pattern Recognition and Machine Learning** by Christopher M.Bishop, Springer

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember			
Understand	5	5	5
Apply	10	10	10
Analyze	10	5	5
Evaluate		5	5
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	5
Understand	20
Apply	15
Analyze	20
Evaluate	10
Create	

COURSE TITLE: MACHINE LEARNING LAB

Course Code: CSTE 3208	**Attendance:** 10
Credit: 1.5	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

Rationale: This course guides students to implement Machine learning algorithms they have learnt in the CSTE-3207 course for real world data science problems.

Course Objectives:

- Introduce the basic concepts and techniques of Machine Learning through python programming.
- Develop skills of using recent machine learning packages for solving real-world problems.
- Make the students of doing independent study and research.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	outline python and able to generate, analyze and interpret data using Python.
CLO2	apply machine learning algorithms to solve problems of moderate complexity.
CLO3	implement various machine learning algorithms in a range of real-world applications.
CLO4	determine and evaluate outcomes of the real-world problem using python

Mapping of CLO to PLO (Program Learning Outcome)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
	CLO1	√											
	CLO2	√	√										
	CLO3		√	√									
	CLO4				√	√			√	√			√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-2	**Python:** Introduction to python, python libraries and packages for Machine Learning (Pandas, Numpy, Scikit-learn, TensorFlow, Keras, Matplotlib etc.), importing and applying packages, importing datasets, different data related operations, data visualization	CLO1	Discussion and practice	Questions, quizzes, Homework, exams. **Class Test 2**(topics of the week's 1-4)
3	**Jupyter Notebook:** Common python operations in jupyter notebook	CLO1	Discussion and Practice	
4-5	**Data Preprocessing/Evaluation Metric:** Explore real world data (data source: UCI machine learning repository, Kaggle datasets and/or other real-world data), apply different preprocessing techniquesusing python to process and clean the data	CLO1, CLO2	Discussion, Practice and case study	
6	**Feature Selection:**Experiments demonstrating Feature selection and dimensionality reduction	CLO1, CLO2	Discussion, Practice and case study	Questions, quizzes, Homework, exams. **Class Test 2**(topics of the week's 5-8)
7-8	**Regression:** Model building, training and testing using linear regression and logistic regression methods, model evaluation using different evaluation metrics	CLO1, CLO2, CLO3,CLO4	Discussion, Practice and case study	
9-10	**Classification:** model building, training, testing, and model evaluation using differentLinear and non-linear classifiers,	CLO1, CLO2, CLO3,CLO4	Discussion, Practice and case study	

	probabilistic classifiers. Example classifiers: Decision Tree (DT), Support Vector Machine (SVM), KNN, Naïve Bayes etc. Implement DT and KNN			
11	**Clustering:** implement, apply and evaluate k-means clustering, hierarchical clustering on real-world data	CLO1, CLO2, CLO3,CLO4	Discussion, Practice and case study	**Assignmet**(topics of the week's 9-12).
12	**Ensemble Learning:** Model building, training, testing and model evaluation using Random Forest, Adaboost, Gradient Boosting, XGBoost algorithms	CLO1, CLO2, CLO3,CLO4	Discussion, Practice and case study	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	30
Analyze	20
Evaluate	10
Create	

COURSE TITLE: MICROWAVE AND SATELLITE COMMUNICATION

Course Code: CSTE 3209	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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:

- Impart Radio communication in general and also the special aspects that relate to microwave and satellite communications.
- Discuss the use of microwave radio systems in communications highlighting the design, deployment and

operational challenges of microwave radio communications

- 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.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	describe the concept of basic RF/ Microwaves, Microwave devices, applications, satellite communication, and their multiple access techniques
CLO2	identify the use of microwave components and devices in microwave applications.
CLO3	examine the link budget of satellite/terrestrial signal for proper communication and different types of the subsystem.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations, topic wise lecture delivery.	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	CLO3	Lecture and discussion with details concept of microwave transmission	
3	**Microwave Antenna:** Half wave dipoles. parabolic reflector, array, and Yagi-Uda antenna.	CLO2	Lecture and discussion on brief outline and choosing of microwave antenna for	

			long haul and short haul.	
4	**Microwave transmission lines:** Introduction to transmission lines,. Reflection coefficient, Transmission coefficient, VSWR, Impedance transformation in RF lossless lines. Impedance measurement.	CLO2	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:** Scattering parameters, Directional couplers etc.	CLO1, CLO2	Lecture and discussion on various type of microwave components.	**Class Test 1**(topics of the week's 1-4)
6	**Microwave Devices:** Microwave transistors; IMPATT diode, Gunn Diode, Schottky Barrier diode	CLO1, CLO2	Lecture and discussion on how the microwave devices work properly and why need these devices.	
7	**Microwave Devices:** Klystron; TWT, Microwave filters.	CLO1, CLO2	Lecture and discussion on how the microwave devices work properly and why need these devices.	Questions, quizzes, Homework exams.
8	**Applications of Microwave:** Radar systems - Pulsed radar, MTI.	CLO1	Lecture and discussion with various types of radar and its applications.	
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.	CLO1	Lecture and discussion with fundamental concepts of satellite communication.	**Class Test 2**(topics of the week's 5-8) Questions, quizzes, Homework exams.
10	**Space craft subsystem: -**Altitude and orbit control system, Telemetry tracking and command power system, communication subsystem. **Satellite link design.**	CLO1, CLO3	Lecture and discussion on the design of satellite link budget and different types of subsystem which is very important for controlling.	Assignment ((topics of the week's 9-12)
11-12	**Multiple access techniques: Application of multiple access technique for satellite communication.**	CLO1	Lecture and discussion on the importance of software defined radio	
13	Review topics and Final exam preparation.		Lecture and discussion on miscellaneous topics.	
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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25) (Average of best 2 out of 3 will be counted)				**SEE-Semester End Examination (70 marks)**	
Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**	**Bloom's Category**	**Test**
Remember	5			**Remember**	
Understand	10	10		**Understand**	20
Apply	5	10	10	**Apply**	20
Analyze	5	5	15	**Analyze**	20
Evaluate				**Evaluate**	10
Create				**Create**	

COURSE TITLE: MICROWAVE AND SATELLITE COMMUNICATION LAB

Course Code: CSTE 3210	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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:

- Provide hands-on experience to the students so that they can put theoretical concepts to practice.
- Emphasize teamwork skills for working effectively in groups.
- Develop technical writing skills for effective communication.
- Familiarize with basic microwave measurements.
- Characterize microwave and microwave components/devices by measuring parameters.
- Motivate students toward space by providing "real world" satellite design, fabrication, test, launch, and operational experience.

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

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	summarize the significant experience with microwave and satellite communication equipment.

	CLO2	apply the knowledge to generate microwave frequency, VSWR, power and attenuation measurement techniques, communication between uplink transmitter-satellite transponder-downlink receiver and real-world satellite design.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	To get familiar with different equipment related to microwave and satellite communication.	CLO1	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.
2-6	• To measure the microwave frequency using microwave bench set up. • To Measure the guide wavelength using microwave test bench set up. • To Measure the cutoff wavelength for microwave test bench set up. • To measure the VSWR using microwave test bench set up. • To measure the power and attenuation using microwave test bench set up.	CLO1, CLO2	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. Hands on experience in simulation environment
7-10	• To establish a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal. • To set up an active satellite link and demonstrate link fail operation. • To establish voice signal	CLO2	Through lecture, laboratory, and out-of-class assignments.	

	communication through satellite transponder. • To check the communication link by varying the uplink and downlink frequencies. • To transmit PC data through satellite transponder.			
11-12	• To calculate satellite uplink and downlink budget • To calculate the carrier to noise ratio/signal to noise ratio of an established satellite link.	CLO2	Through lecture, and problem design in simulation environment.	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	10
Apply	30
Analyze	30
Evaluate	
Create	

COURSE TITLE: WEB ENGINEERING LAB

Course Code: CSTE 3212	**CIE Marks:** 30
Credit: 2	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 50

Rationale: This course has been designed to focus to develop an industry standard web application or web services.

Course Objectives:

- Impart the concept of Web Application Development and its Architecture.
- Discuss web development frameworks, version controls, and system analysis.
- Introduce the challenges of a web development project to solve industry-standard real-world problems.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify the Essentials of Web Application Development;
CLO2	analyze requirements of a web application;
CLO3	evaluate a web application with desired requirements;
CLO4	develop a web-based project.
CLO5	to carry out tasks in a team environment.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										
CLO3		√										
CLO4					√							√
CLO5									√			

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Overview:** Project-related discussion, web application/web service/website-related project discussion.	CLO1	Discussion	-Home task
2	**Project proposal and Framework:** The project proposal discussion and feedback.	CLO1, CLO2	Discussion with problems.	Questions, quizzes, and Homework.

	Framework-based discussion (Differ based on student project), introducing project collaboration environment.			
3	**Feasibility Study:** A feasibility study based on the projects and feedback. **Requirement Analysis:** requirement analysis of the project and integration of feedback from previous weeks.	CLO2, CLO3	Lecture and discussion with problems.	Home Task and assessment of project proposal.
4	**System Design:** E-R diagram, Schema diagram, Interaction diagram.	CLO3, CLO4	Evaluation of system design and feedback.	Assessment of project design.
5-11	**Implementation:** Continuous implementation of the project. Front-end and Back-end design based on the features of the project.	CLO4, CLO5	Continuous evaluation of the project and feedback based on the implementation.	Continuous assessment of the project.
12	**Testing:** testing the project and feedback	CLO3, CLO5	Testing of the implemented project and feedback.	
13	**Final Lab Presentation (Lab and Viva)**			

ASSESSMENT PATTERN

Viva- 20

CIE-Continuous InternalEvaluation (30)

(Will be added to the final marks)

Category	Marks
Continuous Involvement	**05**
Project Proposal	**10**
Database Design/System Design	10
Interaction Diagram	05

SEE-Semester End Examination (50 marks)

Bloom's Category	Test
Project Report	**20**
Integrity	**15**
Challenges and Uniqueness	**10**
Completeness	**5**

COURSE TITLE: VIVA VOCE

Course Code: CSTE 3226 **Credit:** 01	**Total Marks:** 100

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 interviews both in the academic and the industrial sector.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	analyze the various application of Computer Science &Telecommunication Engineering in real-life problem solving
CLO2	evaluate overall technical knowledge and industry readiness
CLO3	defend under a virtual environment of technical interview.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3										√		

COURSE CONTENTS	**OUTCOME** (Student should be able to)
VIVA VOCE (Viva based on major/minor courses of Year-2)	CLO1, CLO2, CLO3

ASSESSMENT PATTERN

Category	Marks (100)
Eye contact	10
Body gesture	10
Communication skill	20
English pronunciation skill	10
Remember	10
Understand	10
Analyzing	20
Evaluating	10

Year-4 Term-1

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week
1	CSTE 4101	Digital Image Processing	CSTE3201	3	3
2	CSTE 4102	Digital Image Processing Lab	CSTE3202	1	1.5
3	CSTE 4103	Wireless and Mobile Communication	CSTE3203	3	3
4	CSTE 4105	Optical Fiber Communication	EEE3101, EEE 1201	3	3
5	CSTE 4106	Optical Fiber Communication Lab	EEE 1202	1	1.5
6	CSTE 4108	Technical Writing and Presentation Lab		1.5	2.25
7	CSTE 4125	Capstone Project I		2	4
		Total		**14.5**	**18.25**

COURSE TITLE: DIGITAL IMAGE PROCESSING

Course Code: CSTE 4101	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: There are many real life applications of digital images including social media, medical sector, astronomy, computer vision, etc. This course has been designed to introduce the fundamental concepts of digital image processing to the undergraduate level students as they can apply their acquired knowledge in different practical fields.

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/Python.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain basic digital image processing techniques.
CLO2	apply conventional image processing techniques/tools on different real world problems to identify challenges.
CLO3	analyze different image processing techniques to solve the challenges.

Mapping of CLO to PLO (Program Learning

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											

Outcome)	CLO2		√										√
	CLO3		√										√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Digital Image Fundamentals:** Image sensing and acquisition, Image sampling and quantization, Basic relationships between pixels, Basic mathematical tools used in digital image processing.	CLO1	Lecture and discussion about digital image fundamentals.	Questions, quizzes, Homework etc.
2	**Image Enhancement in the Spatial domain:** Basic intensity transformation functions, Histogram processing, Basic of spatial filtering, smoothing spatial filters, sharpening spatial filters, Fuzzy techniques for intensity transformation and spatial filtering.	CLO1, CLO2,CLO3	Lecture and discussion about intensity transformation functions and different spatial filters.	
3	**Image Enhancement in the frequency domain:** The basics of filtering in frequency domain, Image smoothing in lowpass frequency domain filters, Image sharpening using highpass filters.	CLO1, CLO2,CLO3	Lecture and discussion about the image enhancement in the frequency domain.	**Conduct a class test/Assessment** on the topics of weeks 1-3.
4	**Color Image Processing:** Color models, Pseudocolor image processing, Color transformations, Color image smoothing and sharpening.	CLO1, CLO2,CLO3	Lecture and discussion about color image processing.	
5-6	**Image Compression and Watermarking:** Compression fundamentals, Basic compression methods-Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-length coding, Bit-plane coding, Digital image watermarking.	CLO1, CLO2,CLO3	Lecture and discussion about different compression technique and digital image watermarking.	Questions, quizzes, Homework etc.
7-8	**Morphological Image Processing:** Erosion and Dilation, Opening and closing, The Hit-or-Miss Transformation, Basic Morphological algorithms – Boundary extraction, Hole filling, Convex	CLO1, CLO2,CLO3	Lecture and discussion about different basic morphological algorithms.	**Conduct a class test/Assessment** on the topics of weeks 4-8.

	Hull, Thinning, Thickening, Skeletons, Pruning.			
9-10	**Image Segmentation:** point, line and edge detection, region-based segmentation, segmentation using morphological watersheds, Image segmentation using Snakes, Segmentation using Level sets.	CLO1, CLO2,CLO3	Lecture and discussion about image segmentation and detection techniques.	Questions, quizzes, Homework etc.
11-12	**Feature Extraction:** Boundary Preprocessing, Boundary feature descriptors, Region feature descriptors, principal components as feature descriptors, Whole-image features.	CLO1, CLO2,CLO3	Lecture and discussion on feature extraction technique.	
13	**Image pattern classification:** Pattern and pattern classes, pattern classification by prototype matching	CLO1, CLO2,CLO3	Lecture and discussion about image pattern classification technique.	**Conduct a class test/Assessment** on the topics of weeks 9-13.

Recommended Books:

1. **Digital Image Processing** by Rafael C. Gonzalez and Richard E. Woods, Fourth Edition, Pearson.

2. **Fundamentals of Digital Image Processing:** A practice Approach with Examples in Matlabby Chiris Solomon and Toby Breckon, Wiley

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	**Test-1 (25)**	**Test-2 (25)**	**Assignment (25)**
Remember	7	7	
Understand	7	7	10
Apply	6	6	15
Analyze	5	5	
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	**Test**
Remember	20
Understand	20
Apply	20
Analyze	10
Evaluate	
Create	

COURSE TITLE: DIGITAL IMAGE PROCESSING LAB

Course Code: CSTE 4102	**Attendance: 5**
Credit: 1	**CIE:25**
Exam Hours: 03	**SEE:** 70

Rationale: This lab course aims to implement the theoretical knowledge of digital image processing practically.

Course Objectives:

- Learn basic image processing theories and their real-world applications, including social media, medical diagnosis.
- Design and conduct digital imaging experiments and analyze and interpret image data, 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 hardware and software for image acquisition, storage and conversion.

Resources Used: Programming languages-Matlab, Python, Multimedia, Whiteboard, Marker, Handouts, pdf books, e-Tutorials.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify real-world digital image processing problems.
CLO2	apply different image processing techniques to solve the problems.
CLO3	analyze the different image processing techniques.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										√
CLO2			√	√	√						√	√
CLO3			√	√	√				√		√	√

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	Programming language basic-Matlab/Python. Some basic Image Processing commands: Image read, display, resize, and write to a particular	CLO1, CLO2	Give instructions about problem solving tools and techniques.	Assignment1(1-7)

	folder. Write a program to zoom and shrink an image.			
2	• Write a program to add any two given images and write the result into a file in BMP/PNG format. • Write a program to perform subtraction of two given BMP/PNG image. Save the output image in BMP/PNG file. Input images may be of different size. • Write a program to draw histogram for any given image.	CLO1, CLO2	Discuss about the problems, and solving technique.	
3	• Students are given an image. Write a program to make it a negative image. Save the output image in BMP file. • Students are given an image. Write a program to perform log transformation. Save the output image in BMP file	CLO1, CLO2	Discuss about the problems, and solving technique.	
4-5	• Write a program to draw histogram for any image, equalize the histogram and redraw the equalized image. • Students are given a blurred image. Write a program to make it smooth using smoothing filter (filter size may be varied). • Write a program to make an image sharpening using Laplacian.	**CLO1, CLO2**	Discuss about the problems, and solving technique.	
6-7	• Write a program to discretize an image using Fourier transformation. • Write a program to eliminate the high frequency components of an image.	**CLO1, CLO2**	Discuss about the problems, and solving technique.	Assignment 2(8-12)
8-9	• Students will be given a file of fixed-length binary string. Write a program to compress the file using Halfman coding. • Students will be given a file of fixed-length binary string. Write a program to compress the file using Truncated Halfman coding. • Students will be given a file of	**CLO1, CLO2, CLO3**	Discuss about the problems, and solving technique.	

	binary stream. Write a program to compress the file using ID run-length coding in accordance with the given length-code table.			
10	• Write a program to detect point. • Write a program to detect line. • Write a program to detect edge.	**CLO1, CLO2**	Discuss about the problems, and solving technique.	
11-12	• Write a program to segment an image. • Write program to extract feature from whole image. • Write a program to classify pattern using minimum distance classifier.	**CLO1, CLO2**	Discuss about the problems, and solving technique.	
13	**Final Lab Exam (Lab and Viva)**			

Recommended Books:

1. Digital Image Processing using MATLAB by R. C. Gonzalez, R. E. Woods and S. L. Eddins, Pearson Education.

ASSESSMENT PATTERN

Attendance- 5

CIE-25

SEE- 70

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	**20**
Apply	40
Analyze	10
Evaluate	
Create	

COURSE TITLE: WIRELESS AND MOBILE COMMUNICATION

Course Code: CSTE 4103	**Attendance:** 05
Credit: 3	**CIE Marks:** 25
Exam Hours: 4	**SEE Marks:** 70

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.

Resources Used:

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	explain the wireless and mobile cellular communication systems, basic concepts on FDD, TDD, FDMA, TDMA, CDMA, and different modulation techniques in detail.
CLO2	implement GSM, GPRS, and wireless network systems using diversity transmission and reception techniques.
CLO3	analyze and synthesis RTS/CTS mechanism, cellular services, radio propagation and path loss model, WLAN, special wireless network systems, and other ADHOC families.
CLO4	evaluate the significance of MANET, VANET, and other ADHOC families.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										
CLO4		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Introduction to wireless communication:** Evaluation of mobile radio communications, wireless communication system definitions,	CLO1	Overall discussion about the course contents including the objectives, course outcomes, examinations, physical	Questions, group discussion, assignments.

	FDD and TDD, cordless and cellular mobile systems, different generations of wireless networks, modulation techniques for wireless communication.		environment and methodology.	
2	**FDMA, TDMA and CDMA:** FDMA, TDMA and CDMA multiple access techniques for wireless communications. Setup encoding and decoding techniques by using CDMA.	CLO1, CLO2	Delivering lecture and discussion on several techniques of multiple access. Showing the comparison among FDMA, TDMA and CDMA in classroom.	Draw the circuit diagrams to design the multiple accesses in classroom. Questions. Assignments, home works.
3	**GSM and GPRS:** GSM and GPRS: services and implementation of system architecture, radio interface, protocols, handover, security. services,	CLO1, CLO2	Delivering lecture and discussion on GSM and GPRS systems. Demonstrate block diagrams and video tutorials GSM and GPRS systems in the classroom.	
4	**Special Wireless Network Systems:** 2.5G systems, EDGE, TETRA, TDMA frame structure of TETRA, 3G systems, UMTS, Spreading and scrambling technique, UTRAN, 4G and beyond	CLO1, CLO2, CLO3	Demonstrating various techniques to solve the design of all wireless networks.	
5	**CDMA Terminologies:** IS-95 System architecture, Air interface, Physical and Logical channel, Handover and Security, and Introduction to CDMA 2000, W-CDMA. Draw the block diagrams of different categories of CDMA system.	CLO1, CLO3	Delivering lecture and overall discussion on different categories CDMA system.	**Class Test 1**(topics of the weeks 1-4) Questions, group discussions, assignments.
6	**Cellular Mobile Concepts:** 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.	CLO1	Lecture and explanation on cellular Mobile Concepts.	

7	**Cellular Services:** Frequency reuse, cell splitting, registration, terminal authentication, handoff.	CLO1, CLO2	Lecture and discussion on different cellular services to expand cellular coverage and capacity.	
8	**Radio Propagation and Path Loss Model:** 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.	CLO2, CLO3	Demonstrating on various path loss models for outdoor and indoor communications.	Questions, group discussions, assignments.
9	**Fading:** 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.	CLO1, CLO2	Lecture and explanation on different fading problems. Solving the problems by applying diversity schemes.	**Class Test 2**(topics of the weeks 5-8) Questions, group discussions, assignments.
10	**Wireless Communication Technology:** Frequency planning, noise and interference in wireless communication systems, antenna & radio wave propagation in the mobile environment fading.	CLO1, CLO2 .	Delivering lecture and overall discussion on several topics of basic wireless communication system in classroom.	
11	**Wireless LAN:** IEEE 802.11 standard, WLAN Family, WLAN modulation system, WLAN protocol architecture, Collision Sense Multiple Access with	CLO1, CLO2, CLO3	Lecture and discussion on WLAN basics, family and modulation system, protocol architecture and CSMA/CD mechanism.	

	Collision Detection (CSMA/CD) and CSMA Collision avoidance (CSMA/CA).			
12	**WLAN and ADHOC families:** IEEE 802.11 Distributed Coordinate System (DCF) and Point Coordination Function (PCF), WLAN family (HAN, WPAN, and Wireless ATM. HIPERLAN: Requirements &Architecture. BLUETOOTH architecture & protocol stack. Brief introductions to 3G and 4G Cellular Mobile Communications Systems. Adhoc network (MANET, VANET)	CLO1, CLO2,CLO3, CLO4	Lecture and explanation on the pros and cons ofdifferent WLAN and ADHOC network systems.	**Assignment**(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.	

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 Kamilo Feher, Prentice Hall.
5. Wireless Communications by Andrea Goldsmith, Cambridge University Press.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember	15	5	
Understand	5	10	10
Apply	5	5	10
Analyze		5	5
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	10
Evaluate	10
Create	

COURSE TITLE: OPTICAL FIBER COMMUNICATION

Course Code: CSTE 4105	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	compare general and optical fiber communications with its history.
CLO2	apply and explain the concepts of different components such as optical source, transmitter, fiber, amplifier, an optical detector, and receiver, etc with their working procedure.
CLO3	analyze and plan link budget calculation of optical fiber communication networks.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	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.	
2	The advantage of optical fiber	CLO2	Lecture and discussion on	Questions, quizzes,

	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.		the fundamentals of light property and some other related topics. Exercise on some basic topics.	Homework etc.
3	**Optical fiber waveguide:** Basics: Refractive index, Critical propagation angle, Total internal reflection, Fiber optic waveguide. Fiber classification.	CLO2	Discussion on the basics of optical fiber waveguide and the characteristics of different fiber types. Exercise on refractive index and some other basic topics.	
4	**Optical fiber waveguide:** Acceptance angle, Numerical aperture, Normalized frequency and Cut-off wavelength. Fiber impairments, Bit rate and Bandwidth.	CLO2	Lecture and discussion in detail on optical fiber waveguide, attenuation, absorption, dispersion etc. Exercise on NA, attenuation, dispersion etc.	.
5	**Preparation of optical fibers:** Liquid phase (melting) technique, Vapor phase deposition technique.	CLO2	Demonstration on optical fiber preparation techniques.	**CT-1** (topics of the week's 1-4)
6	**Optical sources and transmitter:** Light emitting diode (LED), Principle and characteristics, Spontaneous and stimulated emission, Homostructure and heterostructure LEDs.	CLO2	Lecture and discussion on the basics of a light source and working principles of different types of LED. Exercise on related topics.	Questions, quizzes, Homework etc.
7	**Optical sources and transmitter:** Laser diode (LD), Principle and characteristics, Fabry-Perot laser diode, Optical transmitter.	CLO2	Lecture and discussion on working principles of different types of LD. Exercise on related topics.	
8	**Optical detectors and receiver:** p-n photodiode, p-i-n photodiode, Avalanche photodiode (APD), Phototransistors, Optical receiver.	CLO2	Lecture and discussion on the basics of an optical detector and working principles of different types of optical detector. Exercise on related topics.	
9	**Optical fiber connection:** Joints and couplers, Fiber splices, Fiber connectors.	CLO2	Lecture and discussion on fiber joint and couplers.	**CT-2** (topics of the week's 5-8)

			Exercise on joint and coupling loss calculations.	Questions, quizzes, Homework etc.
10	**Optical amplifiers:** Types of an optical amplifier, Semiconductor optical amplifier (SOA), Erbium-doped fiber amplifier (EDFA). **Optical link connections in electronic networks:** FDDI, Ethernet, fiber channel.	CLO2	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.	
11	**Optical link connections in electronic networks:** SONET, SDH, ATM, WDM, add-drop multiplexers, optical switching.	CLO2	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.	
12	**Optical fiber applications**. **Optical link budget**.	CLO3	Discussion on optical fiber applications. Exercise on optical link budget calculations.	**Assignment-1**
13	Review topics and Final exam preparation.	CLO1, CLO2, CLO3	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.	

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.

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25) (Average of best 2 out of 3 will be counted)	SEE-Semester End Examination (70 marks)

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember	10	10	
Understand	10	10	10
Apply	5	5	10
Analyze			5
Evaluate			
Create			

Bloom's Category	Test
Remember	10
Understand	20
Apply	20
Analyze	20
Evaluate	
Create	

COURSE TITLE: OPTICAL FIBER COMMUNICATION LAB

Course Code: CSTE 4106	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify different data communication equipment.
CLO2	implement and analyze different modulation and multiplexing techniques for optical fiber communication systems.
CLO3	develop optical fiber communication system.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2		√										

	CLO3	√											

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1-3	Study the basic structure and types of the optical fiber, optical source and detector, connector, coupler and splices.	CLO1, CLO3	Lecture and discussion	Questions. 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.
4-5	Carry out measurements on the fiber splices/ joints/ couplers.	CLO1	Discussion and practice.	
6-7	Optical signal transmission using transmitter and receiver. Character data from computer/ audio/ video data transmission and reception.	CLO2	Discussion with practical implementation and testing.	
8-12	Optical data transfer using single mode step index, multi-mode step index and multimode graded index fiber for an input bit sequence. Measure the bit error rate for single mode and multimode step index fiber. Measure the signal power output and signal to noise ratio for singe mode step index fiber.	CLO2	Lecture, discussion and simulation.	
13	**Final Lab Exam (Lab and Viva)**			

ASSESSMENT PATTERN

Attendance- 10

Viva- 20
SEE-Semester End Examination (70 marks) **Bloom's Category** / **Test** **Remember** / **Understand** / 20 **Apply** / 40 **Analyze** / 10 **Evaluate** / **Create** /

COURSE TITLE: TECHNICAL WRITING AND PRESENTATION LAB

Course Code: CSTE 4108	**Attendance: 10**
Credit: 1.5	**Presentation:20**
Exam Hours: 03	**Viva: 20**
	SEE Marks: 50

Rationale: This course has been designed to develop the technical writing and presentation skills for research activities.

Course Objectives:

- Introduce how to write a research proposal
- Focus on structure of a scientific report
- Emphasize of writing abstract, introduction, methods, results and discussion.
- Focus on writing a journal paper or conference paper.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
CLO2	acquire individual and teamwork skills.
CLO3	adapt with any technical change.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1										√		
CLO2									√			
CLO3												√

Lesson Plan (as per week):				
Week	**Course Contents**	**CLOs**	**Teaching Learning Strategy (activities directed to achieve outcomes)**	**Assessment Strategy (How they are developed)**
1-4	Outlines of writing introduction	CLO1,CLO2,CLO3	Lecture and discussion with the published paper.	Through lab report, Presentation and viva.
5-7	Outlines how to write different techniques used in research	CLO1,CLO2,CLO3	Lecture and discussion with the published paper	
7-9	Explanation how to write result of research.	CLO1,CLO2,CLO3	Lecture and discussion with the published paper	
10 11	Explanation how to write discussion and conclusion.	CLO1,CLO2,CLO3	Lecture and discussion with the published paper.	
12	Methods of writing abstract.	CLO1,CLO2,CLO3	Lecture and discussion with the published paper.	
13	Methods of writing of reference	CLO1,CLO2,CLO3	Lecture and discussion with the published paper.	

Recommended Books:

1. Writing for computer Science by Justin Zobel
2. Writing and Impactful research paper by Martins Zaumanis

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

Presentation(20)

Category	Marks
Eye contact	5
Body gesture	5
Communication skill	5
English pronunciation skill	5

SEE-Semester End Examination (50 marks)

Rubric	Test
Organization of report	10
Writing abstract	5
Writing introduction	10
Writing Methods	10
Result analysis	10
Discussion	5

COURSE TITLE: CAPSTONE PROJECT I

Course Code: CSTE 4125	**Presentation:** 20
Credit: 2	**Viva:** 20
	Project/Thesis Evaluation: 60

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:

- Focus on real-life problems related to the courses of CSTE
- Give a clear idea of the related work/project accomplished by the different authors.
- Discuss project/research methodologies that propel the students to do good project/research work.

Resources Used:

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify the real life problem related to computation or communication.
CLO2	analyze and design the problem and identify the outcomes.
CLO3	select modern tools to solve the problem.
CLO4	identify sub-components of the problem, prepare time-line and appropriate budget.
CLO5	write an effective proposal.
CLO6	acquire individual and teamwork skills.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1												√
CLO2		√	√									

CLO3					√								
CLO4											√		
CLO5										√			
CLO6									√				

Lesson Plan (as per week):

Course Contents	**CLOs**
Study the problems related to Computer Science and Telecommunication Engineering.	CLO1 ,CLO2
Study different modern tools	CLO3
Design a project about contemporary issues.	CLO3, CLO4
Write effective reports	CLO5, CLO6

ASSESSMENT PATTERN

Viva-20

Presentation (20)

Category	**Marks**
Eye contact	**5**
Body gesture	**5**
Communication skill	**5**
English pronunciation skill	**5**

Report Evaluation (60 marks)

Rubric	**Test**
Identify the real world problem	**10**
Analyze the problems and identify outcomes	**10**
Choice of methods	**10**
The challenge and novelty of the topic for research	**20**
Report writing	**10**

Year-4 Term-2

Sl.#	Course Code	Course Title	pre-requisite	Credit	Credit Hours/ week

1	CSTE 4201	Cryptography and Network Security	CSTE 3203, CSTE 2103	3	3
2	CSTE 4202	Cryptography and Network Security Lab	CSTE 3204	1	1.5
3	CSTE 4203	Graph Theory	CSTE 1207	3	3
4	HUM-4201	Principle of Economics		3	3
5	CSTE 4225	Capstone Project II		3	6
6	CSTE 4226	Viva Voce		1	0
		Total		**14**	**16.5**

COURSE TITLE: CRYPTOGRAPHY AND NETWORK SECURITY

Course Code: CSTE 4201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	recognize the general concepts of cryptography and network security.
CLO2	explain the various key distribution and management schemes.
CLO3	differentiate symmetric and public-key encryption techniques.
CLO4	analyze various techniques/protocols for network security.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										
CLO4		√										√

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	**CLO1**	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.	
2	**Symmetric Cryptosystem:** Symmetric Cipher Model, Substitution Technique: Caesar Cipher, Monoalphabetic Cipher, Polyalphabetic Cipher, Playfair Cipher, Hill Cipher; Transposition Technique: Rail Fence Technique, Columnar Transposition; Rotor Machines, Steganography.	**CLO1, CLO3**	Lecture and discussion on basics of symmetric cryptosystem with a variety of substitution and transposition symmetric ciphers encryption-decryption technique. Exercise on substitution and transposition symmetric ciphers encryption-decryption technique.	Questions, quizzes, Homework etc.
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.	**CLO1, CLO3**	Detailed discussion on DES encryption-decryption technique with examples.	
4	**AES:** Basic Structure, Primitive Operation, Inverse Cipher, Key Expansion, Rounds, Inverse Rounds, Simplified AES; Double DES, Triple DES.	**CLO1, CLO3**	Detailed discussion on DES encryption-decryption technique with examples and introduce with DES extension techniques.	**CT-1** (topics of the week's 1-3)
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	**CLO1**	Lecture and discussion on different types of block cipher modes of operation.	

	(CTR).			
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.	**CLO2**	Lecture and discussion on stream cipher technique, to identify potential locations where encryption function should deploy in networks and symmetric key management procedures.	Questions, quizzes, Homework etc.
7	**Public Key Cryptosystems:** Requirements for Public Key Cryptography, Principles of Public Key Cryptosystems, **RSA** Algorithms, Security of RSA.	**CLO1**	Discussion on the basics of public key cryptosystem and detailed discussion on RSA algorithm with examples.	
8	**Key Management:** Distribution of Public Keys, **Diffie-HellmanKey Exchange;** Authentication Requirements, Authentication Functions, Message Authentication Codes.	**CLO2**	Lecture and discussion on public key management procedure with a detailed analysis of Diffie-Hellman key exchange technique and discussion on message authentication technique.	**CT-2** (topics of the week's 4-7) Questions, quizzes, Homework etc.
9	**Hash Functions; Digital Signature Standards:** RSA Approach, DSS Approach.	**CLO1, CLO3**	Lecture on different approaches to digital signature.	
10	**IP Security:** Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.	**CLO4**	Lecture and discussion on network security, E-mail security and IP security.	Questions, quizzes, Homework etc.
11	**Web Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Electronic Translation.	**CLO4**	Lecture and discussion on web security.	
12	**Firewalls:** The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Configurations.	**CLO4**	Discussion on the security issues in Firewall, Router, and Gateway.	**Assignment-1**
13	Review topics and Final exam preparation.	**CLO1, CLO2,CLO3, CLO4**	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.	

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.
4. Understanding Cryptography by Christof Parr and Jan Pelzal , Springer

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted**)**

Bloom's Category	Test 1 (25)	Test 2 (25)	Assignment(25)
Remember	10		
Understand	10	10	10
Apply	5	15	10
Analyze			5
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	20
Understand	25
Apply	15
Analyze	10
Evaluate	
Create	

COURSE TITLE: CRYTOGRAPHY AND NETWORK SECUROTY LAB

Course Code: CSTE 4202	**Attendance:** 10
Credit: 1	**Viva:** 20
Exam Hours: 03	**SEE Marks:** 70

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.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify and apply different Substitution and Transposition techniques.
CLO2	implement and analyze intrusion detection systems like snort.
CLO3	adapt with any technological change.

Mapping of CLO to PLO (Program Learning Outcome)		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
	CLO1	√											
	CLO2		√										
	CLO3												√

Lesson Plan (as per week):

Week	Course Contents	CLOs	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.	CLO1	Discussion and practical implementation of Caesar cipher, Monoalphabetic Cipher and Polyalphabetic Cipher.	Questions, quizzes, Homework, Reports, exams.
3-4	Find out the corresponding Playfair Cipher and Hill Cipher of a plaintext. And then find the original text from the cipher text.	CLO1	Discussion and practical implementation of Playfair cipher and Hill Cipher.	
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.	ClO1	Lecture and discussion with practical implementation of Transposition Cipher.	
7	Implement the encryption and decryption of 8- bit data using 'Simplified DES Algorithm' (created by Prof. Edward Schaefer) in 'C'.	CLO1	Discussion with practical implementation of DES encryption and decryption techniques.	
8-9	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'.	CLO1	Discussion and practice	
10	Encrypt the plaintext message using RSA algorithm. Then perform the reverse operation to get original plaintext.	CLO1	Discussion with practical implementation of RSA encryption and decryption techniques.	

11	Demonstrate intrusion detection system (ids) using any tool (snort or any other) Perform other experiments relevant to this course.	**CLO1, CLO2, CLO3**	Demonstration on intrusion detection with e-Tutorials.	
12	Submit a mini project in a group			
13	**Final Lab Exam (Lab and Viva)**			

Recommended Books:

ASSESSMENT PATTERN

Attendance- 10

Viva- 20

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	
Understand	20
Apply	20
Analyze	20
Evaluate	10
Create	

COURSE TITLE: GRAPH THEORY

Course Code: CSTE 4203	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

Rationale: This course has been designed to provide the students with knowledge of modeling many types of relations and processes in physical, biological, social and information systems with a set of nodes and connections that helps to abstract complex dynamic systems easily.

Course Objectives:

- Introduce the basic concept of graphs theory.
- Discuss theories and concepts to test and validate intuition and independent mathematical thinking in problem-solving.
- Explain theoretical knowledge of graph theory to solve real-world problems.

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

Course Learning Outcomes (CLO)	**CLOs**	**Description (At the end of the course, students will be able to)**
	CLO1	gain the essential knowledge of graph theory which includes basic concepts of graphs, directed graphs, weighted graphs, properties of bipartite graphs, particularly in trees, concept of colorings, Eulerian and Hamiltonian graphs, planar graph, etc.
	CLO2	apply theoretical knowledge of graph theory to solve real world problems.
	CLO3	analyze the real world problems using techniques of graph theory.
	CLO4	design a real life problem using methods of graph theory

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√				√							√
CLO3		√										
CLO4			√						√			

Lesson Plan (as per week):

Week	Course Contents	CLOs	Teaching Learning Strategy (activities directed to achieve outcomes)	Assessment Strategy (How they are developed)
1	**Introduction Graphs and Their Applications**	CLO1	Lecture and discussion about applications of graph theory in real world.	Questions, quizzes, Homework, exams.
2-3	**Basic Graph Terminologies:** Graphs and Multigraphs, Adjacency, Incidence, Degree, Subgraphs, Important Trivial Classes of Graphs, Operations on Graphs, Graph Isomorphism, Degree Sequence, Data Structures and Graph Representation.	CLO1	Lecture and discussion some definitions of basic graph theoretic terminologies and know some preliminary results of graph theory.	
3-4	**Paths, Cycles, and Connectivity:** Walks, Trails, Paths, Cycles,	CLO1	Lecture and discussion with examples of Walks, Trails,	

	Eulerian Graphs, Hamiltonian Graphs, Connectivity.		Paths, Cycles, Eulerian Graphs, Hamiltonian Graphs, Connectivity.	
5-6	**Trees:** Properties of a Tree, Rooted Trees, Spanning Trees of a Graph, Counting of Trees, Distances in Trees and Graphs, Graceful Labeling	CLO1, CLO2, CLO3, CLO4	Lecture and discussion about the Properties of a Tree, Rooted Trees, Spanning Trees of a Graph, Counting of Trees, Distances in Trees and Graphs, Graceful Labeling	**Class Test 1** (topicsof the week's 1-4)
6-7	**Matching and Covering:** Matching, Independent Set, Covers, Dominating Set, Factor of a Graph	CLO1,CLO2	Lecture and discussion about Matching and Covering	Questions, quizzes, Homework, exams.
8	**Planar Graphs:** Characterization of Planar Graphs, Plane Graphs, Thickness of Graphs, Straight-Line Drawings of Planar Graphs	CLO1, CLO2, CLO3, CLO4	Lecture and discussion planar graphs and analyze their characteristics	
9	**Graph Coloring:** Vertex Coloring, Edge Coloring, Face Coloring (Map Coloring), Chromatic Polynomials, Acyclic Coloring	CLO1, CLO2	Lecture and discussion about graph coloring and its applications.	**Class Test 2** (topics of the week's 5-8) Questions, quizzes, Homework, exams.
10-11	**Digraphs:**	CLO1, CLO2	Lecture and discussion	

	Digraph Terminologies, Eulerian Digraphs, Hamiltonian Digraphs, Digraphs and Tournaments, Flow Networks		about digraphs.	
12-13	**Special Classes of Graphs:** Outerplanar Graphs, Triangulated Plane Graphs, Chordal Graphs, Internal Graphs, Series-Parallel Graphs, Treewidth and Pathwidth	CLO1, CLO2, CLO3	Lecture and discussion about special classes of graphs and tryto solve those problems for the special classes of graphs.	**Class Test 3/Assignment**(topics of the week's 9-13)

Recommended Books:

1. Douglas Brent West ,'Introduction to Graph Theory', ISBN-13: 978-0130144003 . ISBN-10: 0130144002.
2. Bondy,J. A. and Murty,U.S.R., 'Graph Theory with Applications', Springer, 2008.
3. Diestel, R. Graph Theory (Graduate Texts in Mathematics). New York, NY: Springer-Verlag, 1997. ISBN: 3540261834
4. Md. SaidurRahman ,'Basic Graph Theory', ISBN: 978-3-319-49475-3, DOI: https://doi.org/10.1007/978-3-319-49475-3.
5. N. Alon and J. Spenser, "Probabilistic Methods", John Wiley and Sons, 2nd edition, 2000. Bollobás, B. Modern Graph Theory (Graduate Texts in Mathematics). New York, NY: Springer Verlag, 1998. ISBN: 0387984917

ASSESSMENT PATTERN

Attendance- 05					
CIE-Continuous InternalEvaluation (25) (Average of best 2 out of 3 will be counted)				**SEE-Semester End Examination (70 marks)**	
Bloom's Category	**CT-1**	**CT-2**	**CT3/Assignment**	**Bloom's Category**	**Test**
Remember	5			**Remember**	10
Understand	10	5		**Understand**	20
Apply	10	10	15	**Apply**	30
Analyze		10	10	**Analyze**	10
Evaluate				**Evaluate**	
Create				**Create**	

COURSE TITLE: PRINCIPLE OF ECONOMICS

Course Code: HUM 4201	**Attendance:** 05
Credit: 03	**CIE Marks:** 25
Exam Hours: 04	**SEE Marks:** 70

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

Course Objectives:

- Introduce the basic concepts of economics.
- Explain the economic parameters such as market structure, inflation, tax, monetary fund, GDP, etc.
- Grow interest among the students in the economic environment.
- Acquire the necessary quantitative skills used in economic analyses.

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

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	identify the nature, scope, and basic elements of economics.
CLO2	explain the major feature of national income, national income capital formation, and a major feature of economics.
CLO3	analyze the determinants of supply and demand and how changes in these determinants affect equilibrium price and output.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										

Lesson Plan (as per week):				
Week	**Course Contents**	**CLOs**	**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 classification wealth-Income– Money Near money- Credit money-Utility, features, and kinds of utility –	CLO1	Lecture and discussion with detailed information about the course, including the objectives, course outcomes, examinations. Topic wise lecture delivery.	
2	Concept of national income: -Methods of calculating GDP, GNP, NMP etc. at factor cost, at market prices etc.	CLO2	Lecture and discussion with practical scenarios.	
3	Numerical problems on National income, Capital formation, savings and Investment relationship, Economic estimation.	CLO2	Lecture and discussion with problems solution.	Questions, quizzes, exams.
4	Bangladeshi economic growth in rates and their estimation. Bangladeshi economic growth in recent years, saving investment equality, LM, IS curves.	CLO1, CLO2	Lecture and discussion with examples.	
5	**Basic laws in Economics:** Law of Diminishing marginal utility – Demand, Law of Demand and demand curve-	CLO2	Lecture and discussion with examples.	**Class Test 1**(topics of the week's 1-4) Questions or quizzes
6	The concept of supply- Supply schedule and supply curve.	CLO3	Lecture and discussion with practical scenarios.	
7	**Market structure:** Classifications – Pricing under different markets as perfect competition, monopoly, and oligopoly. Pricing under monopolistic competition.	CLO2, CLO3	Lecture and discussion with practical scenarios.	
8	**Inflation:** Measures to control inflation – Monetary measures and fiscal measures – Effects of inflation.	CLO2	Lecture and discussion with practical scenarios.	
9	**Tax:** Classification of Taxes – Direct &Indirect	CLO2	Lecture and discussion with practical scenarios.	**Class Test 2**(topics of the weeks5-8)

	taxes specific and Ad-Valorem taxes			
10	Personal income- tax – characteristics of a good tax system – Tax evasion.	CLO3	Lecture and discussion with practical scenarios.	Questions, quizzes, exams.
11	**Monetary Fund:** Issues & Challenges – International liquidity –	CLO2	Lecture and discussion with examples.	
12	Special Drawing Rights - Bangladesh & IMF	CLO2	Lecture and discussion with practical scenarios.	**Class Test 3**(topics of the week's9-13)
13	**Welfare Economics:** Old Welfare Economics -Pigou's Analysis – New Welfare Economics Pareto's welfare criterion.	CLO1	Lecture and discussion with examples.	Questions, quizzes, exams.

Recommended Books:

1. Modern Economic theory by K. K Dewtt.
2. Elements of Economic Analysis by Prof. G. Narendra Babu
3. Money, Banking, Trade & Finance by Sundaran K.P.M

ASSESSMENT PATTERN

Attendance- 05

CIE-Continuous InternalEvaluation (25)

(Average of best 2 out of 3 will be counted)

Bloom's Category	Test-1 (25)	Test-2 (25)	Assignment/ Presentation (25)
Remember	10	5	
Understand	15	10	
Apply		10	15
Analyze			10
Evaluate			
Create			

SEE-Semester End Examination (70 marks)

Bloom's Category	Test
Remember	10
Understand	15
Apply	25
Analyze	20
Evaluate	
Create	

COURSE TITLE: CAPSTONE PROJECT II

Course Code: CSTE 4225 **Credit:** 3	**Presentation:** 20 **Viva:** 20 **Project/Thesis Evaluation:** 60

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:

- Focus on techniques to solve the problem identified in CSTE 4125.
- Emphasize on result analysis and synthesis of information
- Outlines on writing a report or paper.

Resources Used:

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	design of the experiments, analyze and interpret data , synthesis of the information to reach valid conclusions.
CLO2	assess professional, ethical, and social impacts and responsibilities of the design project.
CLO3	comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
CLO4	acquire individual and teamwork skills.
CLO5	adapt with any technical change.

Mapping of CLO to PLO (Program Learning Outcome)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2						√	√	√				
CLO3										√		
CLO4									√			
CLO5												√

Lesson Plan (as per week):

Course Contents	CLOs
Identify the proper techniques and apply them in solving the engineering problem.	CLO1
Analyze the data and results obtained from experiments, and synthesis of the information.	CLO1
Impact on society, environment and responsibility of the design project.	CLO2
Comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	CLO3, CLO4, CLO5

ASSESSMENT PATTERN

Viva-20

Presentation (20)

Category	Marks
Eye contact	5
Body gesture	5
Communication skill	5
English pronunciation skill	5

Report Evaluation (60 marks)

Rubric	Test
Organization the report	10
Choice of methods	10
Analyze the data and synthesis of the information	30
The challenge and novelty of the topic for research	20

COURSE TITLE: VIVA VOCE

Course Code: CSTE 4226 **Credit:** 01	**Total Marks:** 100

Rationale: This course has been designed to develop the students' ability to realize practical situation of job environment.

Course Learning Outcomes (CLO)

CLOs	Description (At the end of the course, students will be able to)
CLO1	analyze the various application of Computer Science & Telecommunication Engineering in real-life problem solving
CLO2	evaluate overall technical knowledge and industry readiness
CLO3	perform under a virtual environment of technical interviews.

Mapping of CLO to PLO (Program

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										

Learning Outcome)	**CLO2**		√										
	CLO3										√		

COURSE CONTENTS	**OUTCOME** (Student should be able to)
VIVA VOCE (Viva based on major/minor courses of Year-1 to Year 4)	CLO1, CLO2, CLO3

ASSESSMENT PATTERN

Category	**Marks (100)**
Eye contact	10
Body gesture	10
Communication skill	20
English pronunciation skill	10
Remember	10
Understand	10
Analyzing	20
Evaluating	10