Course Code: ESC108A

Course Title: Elements of Computer Science and Engineering

Course Leaders:

Roopa G.

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Course Details

- Programme: **B. Tech. Civil Engineering**
  B. Tech. Computer Science and Engineering
  B. Tech. Electrical and Electronics Engineering
- Department: **Computer Science and Engineering**
- Head of the Department: **Prof. Dr. Raghavendra V. Kulkarni**
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- Faculty: **Engineering & Technology**
- Dean: **Prof. H K Narahari (dean.et@msruas.ac.in)**

Why this Course – Civil Engineering

- Refer to B. Tech. Civil Engineering Programme Specifications

The objectives of the course are:

1. To impart knowledge on Civil Engineering systems and their subsystems
2. To enhance the understanding of the underlying engineering principles of civil engineering systems
3. To model, simulate and analyze the behavior of civil engineering systems to predict and improve their performance
4. To design and build civil engineering systems to meet the specific needs
5. To impart training on instrumentation and testing of civil engineering systems
6. To train students on commercial software tools to design, model, simulate civil engineering systems
7. To build and test Civil Engineering systems

Why this Course – Civil Engineering contd.

8. To impart training on professional ethics, history, economics, social sciences and interactive skills relevant to professional practice
9. To provide a general perspective on lifelong learning and opportunities for a career in industry, business and commerce

- **The course is being delivered to meet the highlighted objective of the programme to meet the programme aim.**

Why this Course– Computer Science and Engineering

- Refer to B. Tech. Computer Science and Engineering Programme Specifications

The objectives of the course are:

1. To facilitate the acquisition of knowledge in computing and information technology systems and their subsystems
2. To develop understanding of the underlying logical, algorithmic, architectural and programming principles of computing systems
3. To build the ability to design and implement computing and information systems to meet the specific application needs
4. To model, simulate and analyse the behavior of computing and information systems to predict and improve their performance
5. To train students on development of software products to meet specific customer needs

Why this Course– Computer Science and Engineering contd.

6. To impart training on the processes and practice of engineering, deployment and operation of information technology infrastructure
7. To impart training on professional ethics, history, economics, social sciences and interactive skills relevant to professional practice
8. To provide a general perspective on lifelong learning and opportunities for a career in industry, business and commerce

- **The Course is being delivered to meet the highlighted objective of the programme to meet the programme aim.**

Why this Course– Electrical and Electronics Engineering

- Refer to B. Tech. Electrical and Electronics Engineering Programme Specifications

The objectives of the course are:

1. To impart knowledge on electrical and electronic systems and their subsystems
2. To enhance the understanding of the underlying engineering principles of electrical and electronic systems
3. To model, simulate and analyze the behavior of electrical and electronic systems to predict and improve their performance
4. To design and build models of electrical and electronic systems to meet the specific needs
5. To impart training on instrumentation and testing of electrical and electronic systems
6. To train on industry standard simulation tools for simulation and analysis of electrical and electronic systems

Why this Course– Electrical and Electronics Engineering contd.

7. To build and test electrical and electronic systems
8. To impart training on professional ethics, history, economics, social sciences and interactive skills relevant to professional practice
9. To provide a general perspective and opportunities for a career in industry, business and commerce

- **The Course is being delivered to meet the highlighted objective of the programme to meet the programme aim.**

Subject Aim and Summary

This subject is intended to prepare students to develop computer programs using algorithmic and programming constructs. It introduces the elements and methods of computer science and engineering and their applications to engineering computational problems. Students are taught algorithmic thinking for solving computational problems, fundamental algorithms, programming concepts and constructs, basic algorithms and data structures and algorithmic strategies. They are also exposed to modern computing systems and their scope for engineering applications.

Subject Intended Learning Outcomes

After undergoing this subject students will be able to:

1. Describe the elements and methodology of Computer Science and Engineering
2. Explain the basic principles and techniques of algorithms and programming
3. Design and develop computer programs for simple problems
4. Analyze, test and validate simple computer programs
5. Design and develop computer programs for moderately complex problems

Subject Content

- **Introduction**: Computers and other computing devices, interface between Computer Science and Engineering (CSE) and other disciplines, idea of computing, nature and purpose of CSE, software and computer programs, practice of CSE
- **Algorithmic thinking and fundamental algorithms**: Algorithmic problem solving, fundamental algorithms, efficiency of algorithms
- **Computational problem solving for Engineering**: Application of computer science and engineering to solve numerical problems, computer simulation, signal and image processing and data processing.
- **Elements of computer programming:** Elements and structure of computer programs, program execution, programming languages, fundamental programming concepts, C language and programming, elements of good programming style, random number generation, testing and validation of programs, analysing the efficiency of programs

Subject Content Contd..

- **Basic algorithms and data structures:** Iterative and recursive algorithms, algorithms for search, sorting algorithms, idea of a data structure, basic data structures and algorithms and their use
- **Algorithmic strategies:** Brute force, divide and conquer, greedy method, dynamic programming and backtracking
- **Computing systems:** Software development process, operating systems, network of computers, distributed computing, high performance computing, Internet and web technology, cloud computing

Method of Assessment

There are two components for assessment in this subject:

Component - 1: 50% weight (CE)

It has two sub components

Part A: Term Test: 25% Weight

Part B: Assignment: 25% Weight

Two tests will be conducted one at the end of 6th week and the other at the end of the 12th week, the average of two tests will be the marks scored in term test for a maximum of 25 marks.

Student is required to submit two word processed assignments each assignment is set for 25 marks, the average of two assignments will be the marks scored in assignment for a maximum of 25 marks.

A student is required to score a minimum of 40% in each of the components and an overall 40% for successful completion of a module and earning the credits.

Method of Assessment

Component - 2 : 50% weight

A 3 hour duration semester end examination will be conducted for maximum marks of 100 and will be reduced to 50% weight.

The assessment questions are set to test the learning outcomes. In each component certain learning outcomes are assessed. The following table illustrates the focus of learning outcome in each component assessed:

Intended Learning Outcome		1	2	3	4	5
Component-1	A	X	X	X		
	B				X	
Component-2		X	X	X		

Both components will be moderated by a second examiner.

References

a. Essential Reading

1. Class Notes

2. Dromey, R. G. (1982), How to solve it by computer. New Delhi: Pearson Education

3. Kernighan, B. W., and Richie, D. (1992), The C programming language. 2nd ed. New Delhi: PHI

b. Recommended Reading

1. Polya, G. (1990), How to solve it: A new aspect of mathematical method. New Delhi: Penguin Books

2. Aho, A. V., Hopcropt, J. E., and Ulman, J. D. (1974), The design and analysis of computer algorithms. New Delhi: Pearson Education

References contd.

c. Magazines and Journals

1. Ubiquity, ACM
2. Communications of the ACM

d. Websites

1. Association of Computing Machinery (ACM), http://www.acm.org/
2. IEEE Computer Society, http://www.computer.org/

Subject Delivery Schedule

Lecture No.	Day	Date	Time	Topic	Delivered by	Additional Activity
1				Introduction to Computer Science and Engineering		
2				History of Computing		
3				Fundamentals of Algorithms		
4				Efficiency of Algorithms		
5				Elements of Computer Programming		
6				Number Systems		
7				Structure of a C Program		

Subject Delivery Schedule contd.

Lecture No.	Day	Date	Time	Topic	Delivered by	Additional Activity
8				Data Types		
9				Operators		
10				Sequential Execution		
11				Condition and Branching		
12				Iteration		
13				Arrays		
14				Strings		

Subject Delivery Schedule contd.

Lecture No.	Day	Date	Time	Topic	Delivered by	Additional Activity
Term Test 1						
15				Functions		
16				Recursion		
17				Pointers		
18				Pointers and Arrays		
19				Dynamic Memory allocation		
20				Files		
21				Structure		

Subject Delivery Schedule contd.

Lecture No.	Day	Date	Time	Topic	Delivered by	Additional Activity
22				Storage Classes		
23				Applying Programming Concepts		
24				Random Number Generation		
25				Algorithms for Searching		
26				Algorithms for Sorting		
27				Data Structures - Stack and Queue		
Term Test 2						

Subject Delivery Schedule contd.

Lecture No.	Day	Date	Time	Topic	Delivered by	Additional Activity
28				Linked List		
29				Tree and Graph		
30				Algorithm Design Approaches 1		
31				Algorithm Design Approaches 2		
32				System Software		
33				Software Development Life Cycle		
34				Testing and Practice of CSE		
35				History of Internet		