

ACADEMY OF TECHNOLOGY TEACHING PLAN

ACADEMIC YEAR 2023

Course Name: Programming for Problem Solving		Course Code: ES-CS 201	
Department: ECE		Semester: 2nd	
Course Type: Theory	Credit: 3	Contact Hours per week: 3	

Faculty Name(s): Prof Oendrilla Samanta

Dept. of Faculty: Computer Science & Engineering

Prerequisite Courses: If any

Code	Course Name	Semester

Course Outcomes (CO): NBA 3.1.1, NAAC 2.6.1

At the end of this module the students will be able to

CO No.	Outcome	Bloom's Taxonomy Level
CO.01.	<ul style="list-style-type: none"> To list the history of C programming languages and terminology used in computer programming. 	<ul style="list-style-type: none"> L1 (Remembering) L5 (Understanding)
CO.02.	<ul style="list-style-type: none"> To analyze the problem and design, compile, and debug the program with respect to the problem using C language. To formulate simple algorithms for arithmetic and logical problems. To translate the algorithms to programs (in C language). 	<ul style="list-style-type: none"> L2 (Understanding) L4 (Analyzing)
CO.03.	<ul style="list-style-type: none"> To characterize the different operators for formulating the problem involving decision structures, loops and functions. 	<ul style="list-style-type: none"> L2(Understanding) L3 (Apply)
CO.04.	<ul style="list-style-type: none"> To implement the use of user 	<ul style="list-style-type: none"> L2 (Understanding)

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	defined data types including array, structure, union and enum.	<ul style="list-style-type: none"> • L4 (Analyzing) • L3 (Applying)
CO.05.	<ul style="list-style-type: none"> • To implement the power of pointer in terms of dynamic memory allocation and call by reference. 	<ul style="list-style-type: none"> • L2(Understanding) • L4 (Analyzing) • L3 (Applying)
CO.06.	<ul style="list-style-type: none"> • To perform the file handling to take inputs and generate outputs and perform operations like creates, modify, delete etc on files. 	<ul style="list-style-type: none"> • L2(Understanding) • L4 (Analyzing) • L3 (Applying)
CO.07.	<ul style="list-style-type: none"> • To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration. 	<ul style="list-style-type: none"> • L2(Understanding) • L3 (Applying)

CO-PO Co-relation Mapping: NBA 3.1.2, NAAC 2.6.1

CO vs PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.01.	M	-	M	-	-	-	-	-	-	-	-	L
CO.02.	-	H	M	H	-	-	-	-	-	-	-	L
CO.03.	M	M	M	H	-	-	-	-	-	-	-	L
CO.04.	-	M	H	H	-	-	-	-	-	-	-	L
CO.05.	L	M	H	H	-	-	-	-	-	-	-	M
CO.06.	L	-	H	H	-	-	-	-	-	-	-	M
CO.07.	H	H	-	H	-	-	-	-	-	-	-	M

Course-PO Co-relation Mapping: NBA 3.1.3

Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ES-CS 401	H	H	H	H	-	-	-	-	-	-	-	H

Module wise University Syllabus:

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Mod No.	Topics	Faculty
1.	<ul style="list-style-type: none"> • Introduction to Programming. • Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) • Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. • From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- 	Only in case of courses where different modules are taught by different faculty
2.	<ul style="list-style-type: none"> • Arithmetic expressions and precedence 	
3.	<ul style="list-style-type: none"> • Conditional Branching and Loops (6 lectures) • Writing and evaluation of conditionals and consequent branching (3 lectures) Iteration and loops 	
4.	<ul style="list-style-type: none"> • Arrays (1-D, 2-D) • Character arrays and Strings 	
5.	<ul style="list-style-type: none"> • Basic Algorithms - Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required) 	
6.	<ul style="list-style-type: none"> • Functions (including using built in libraries) • Parameter passing in functions, call by value • Passing Arrays to functions: idea of call by reference 	
7.	<ul style="list-style-type: none"> • Recursion, as a different way of solving problems. • Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort. 	

8.	<ul style="list-style-type: none"> Structures, Defining structures and Array of Structures 	
9.	<ul style="list-style-type: none"> Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linkedlist(no implementation) 	
10.	<ul style="list-style-type: none"> File handling (only if time is available, otherwise should be done as part of the lab) 	

Gaps identified in University Syllabus: **NBA 2.1.1, 2.1.2**

Serial No.	Gap description	Justification	Related CO No.	Action Taken
G1				
Gn				

Text Books:

Sl. No.	Description
T1	Yashavant Kanetkar, Let Us C, bpb
T2	Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
T3	E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
T4	W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference Books:

Sl. No.	Description
R1	R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
R2	Reema Thareja, Introduction to C Programming, Oxford

E-resources: NBA 9.4

Sl. No.	Description
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E1	https://archive.nptel.ac.in/courses/106/104/106104128/
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Teaching Methodologies: NBA 2.2.1 [B], Samples for NBA 5.5, Instructional materials for NBA 5.7.3, NAAC 2.3.1

Sl. No.	Description
TM1	Chalk and Talk
TM2	PowerPoint Presentation
TM3	Experiential Learning: Learning by doing, experimenting, problem solving – less teacher-centric. Activities include projects, labs, internships, demonstrations, interactive simulations of real-life problems.
TM4	Participative or Collaborative Learning: Activities may include think-pair-share, collaborative groups in class, case studies, group problem-solving, peer teaching, peer editing.
TM5	Flipped classroom: Students watch instructional videos at home and complete assignments in class
TM6	Project-based learning

Detailed Plan for Lectures:

Annexure 2 / ES-CS201 (L)

Teaching Plan for ES-CS201: Module 1

Syllabus: : Introduction to Programming:

- Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.).
- Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

- From algorithms to programs; source code, variables (with data types) variables and memorylocations, Syntax and Logical Errors in compilation, object and executable code-

No. of lectures required for the module: 4

1. Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia

2. Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

3. E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1	1	<ul style="list-style-type: none"> • Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) 	CO1	NA	T1,T2, T3,T4,R1,R 2 E1,E2, TM1
ES-CS 201/2	1	<ul style="list-style-type: none"> • Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. 	CO2	NA	T1,T2, T3,T4,R1,R 2 E1,E2, TM1
ES-CS 201/3 and ES-CS 201/4	1	<ul style="list-style-type: none"> • From algorithms to programs; source code, variables (with data types) variables and memorylocations, Syntax 	CO2	Assignme nt-1	T1,T2, T3,T4,R1,R 2 E1,E2, TM1

		and Logical Errors in compilation, object and executable code-			
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Teaching Plan for ES-CS201: Module 2

Syllabus: Arithmetic expressions and precedence

No. of lectures required for the module: 2

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1 and ES-CS 201/2	2	Arithmetic expressions and precedence	CO3	Assignment-3	T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

Teaching Plan for ES-CS201: Module 3

Syllabus: Conditional Branching and Loops:

- Writing and evaluation of conditionals and consequent branching
- Iteration and loops

No. of lectures required for the module: 6

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1, ES-CS 201/2 and ES-CS 201/3	3	Writing and evaluation of conditionals and consequent branching	CO3	Assignment-1 & Assignment 2	T1,T2, T3,T4,R1,R2 ,E1,E2, TM1
ES-CS 201/4, ES-CS 201/5 and ES-CS 201/6	3	Iteration and loops (3 lectures)	CO3	Assignment 4	T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

Teaching Plan for ES-CS201: Module 4

Syllabus: Array

Arrays (1-D, 2-D), Character arrays and Strings

No. of lectures required for the module: 6

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1, ES-CS 201/2 and ES-CS 201/3	4	Arrays (1-D, 2-D)	CO4	Assignment-5 & Assignment-6	T1,T2, T3,T4,R1,R2 ,E1,E2, TM1
ES-CS 201/4, ES-CS 201/5 and ES-CS 201/6	4	Character arrays and Strings	CO4	Assignment-7	T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

Teaching Plan for ES-CS201: Module 5

Syllabus: Basic Algorithms

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

No. of lectures required for the module: 6

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1, ES-CS 201/2, ES-CS 201/3 and ES-CS 201/4	5	Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection),	CO3 & CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1
ES-CS 201/5 and ES-CS 201/6	5	Finding roots of equations, notion of order of complexity through example programs (no formal definition required)	CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

Teaching Plan for ES-CS201: Module 6

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Syllabus: Functions

- Functions (including using built in libraries)
- Parameter passing in functions, call by value
- Passing Arrays to functions: idea of call by reference

No. of lectures required for the module: 5

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1, ES-CS 201/2 and ES-CS 201/3	6	<ul style="list-style-type: none">• Functions (including using built in libraries)	CO3 & CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1
ES-CS 201/4 and ES-CS 201/5	6	<ul style="list-style-type: none">• Parameter passing in functions, call by value• Passing Arrays to functions: idea of call by reference	CO3 & CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

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Teaching Plan for ES-CS201: Module 7

Syllabus: Recursion

- Recursion, as a different way of solving problems. Example programs, such as FindingFactorial, Fibonacci series, Ackerman function etc.
- Quick sort or Merge sort.

No. of lectures required for the module: 5

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1, ES-CS 201/2 and ES-CS 201/3	7	<ul style="list-style-type: none"> • Recursion, as a different way of solving problems. Example programs, such as FindingFactorial, Fibonacci series, Ackerman function etc. 	CO3 & CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

ES-CS 201/4 and ES-CS 201/5	7	<ul style="list-style-type: none"> Quick sort or Merge sort. 	CO3 & CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1
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Teaching Plan for ES-CS201: Module 8

Syllabus: Structures

- Structures, Defining structures
- Array of Structures

No. of lectures required for the module: 4

Text book:

- T1:** Yashavant Kanetkar, Let Us C, bpb
- T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
- T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1 and ES-CS 201/2	8	<ul style="list-style-type: none"> Structures, Defining structures 	CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

ES-CS 201/3 and ES-CS 201/4	8	<ul style="list-style-type: none"> • Array of Structures 	CO4		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1
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Teaching Plan for ES-CS201: Module 9

Syllabus: Structures

- Idea of pointers, Defining pointers
- Use of Pointers in self-referential structures
- notion of linkedlist

No. of lectures required for the module: 2

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- **E1.** <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1	9	<ul style="list-style-type: none"> • Idea of pointers, Defining pointers 	CO5		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

ES-CS 201/2	9	<ul style="list-style-type: none"> • Use of Pointers in self-referential structures • notion of linkedlist 	CO4 & CO5		T1,T2, T3,T4,R1,R2 ,E1,E2, TM1
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Teaching Plan for ES-CS201: Module 10

Syllabus: File handling

- File handling

No. of lectures required for the module: 2

Text book:

- **T1:** Yashavant Kanetkar, Let Us C, bpb
- **T2:** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- **T3:** E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 4. Brian
- **T4:** W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Reference book:

- **R1.** R. S. Salari, Computer Concepts and Programming in C, Khanna Publishers
- **R2.** Reema Thareja, Introduction to C Programming, Oxford

E-learning:

- E1. <https://archive.nptel.ac.in/courses/106/104/106104128/>

Lec No.	Mod No.	Lecture Details	Related CO No.	Related Lab Expt.	Learning Resource
ES-CS 201/1 and ES-CS 201/2	10	<ul style="list-style-type: none"> • File handling 	CO6	Assignm ent-8	T1,T2, T3,T4,R1,R2 ,E1,E2, TM1

Advanced Topics: NBA 2.2.1 [C], partially student support 9.1

Serial No.	Topic	Relevance	Action Plan
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AT1			
AT2			

Instructions for Faculty

1. Separate Teaching Plans need to be prepared for each department even if syllabus and other details are the same.
2. Course Type should be marked as Theory, Practical or Sessional as applicable.
3. If different faculty teach different Sections of the same department or if more than one faculty teaches one course, all the faculty names should be inserted together in the "Faculty Name(s)" field. Section should be mentioned in brackets beside faculty name if applicable.
4. Programme Outcomes (POs) are defined by NBA in Appendix I of SAR [NBA Manual, pg 105]
5. Course Outcomes (COs) are "relate to the skills, knowledge and behaviour that students acquire in their progress through the course" [NBA Manual, pg 21]. To prepare Course Outcomes [NBA 3.1.1, NAAC 2.6.1], please refer to the Bloom's Taxonomy for the cognitive level.
6. CO-PO mapping is to be included as in NBA 3.1.2, NAAC 2.6.1 and Course-PO Mapping as in NBA 3.1.3
7. In the Module-wise Syllabus, the Faculty column is to be included only in case of courses where different faculty teach different modules.
8. Gaps in the syllabus, if any, are to be noted keeping in mind NBA 2.1.1 and 2.1.2. Possible actions may include (but not be limited to) lecture, lab experiment, self-learning resources, video lectures, etc.
9. E-resources (websites, videos, etc.) are to be noted keeping in mind NBA 9.4
10. Several criteria in NBA have direct or indirect connection with teaching methodologies (NBA 2.2.1 [B], Samples for NBA 5.5, Instructional materials for NBA 5.7.3, NAAC 2.3.1). Some possible methodologies may include (but not be limited to):
 - a. Chalk and Talk
 - b. PowerPoint Presentation
 - c. Experiential Learning: Learning by doing, experimenting, problem solving – less teacher-centric. Activities include projects, labs, internships, demonstrations, interactive simulations of real-life problems.
 - d. Participative or Collaborative Learning: Activities may include think-pair-share, collaborative groups in class, case studies, group problem-solving, peer teaching, peer editing.
 - e. Flipped classroom: Students watch instructional videos at home and complete assignments in class
 - f. Project-based learning

11. In the Detailed Lecture Plan, under the Lecture Details column, if a certain lecture corresponds to an identified gap in the university syllabus, corresponding Gap number is to be mentioned.
12. The Advanced Topic section will apply to NBA 2.2.1 [C] and partially NBA 9.1, and the corresponding action plan may be special mentoring, mini projects, self-learning, collaborative learning, etc.