



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE**

### **(ARTIFICIAL INTELLIGENCE) – SYLLABUS**

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

1

#### **ABOUT THE DEPARTMENT**

The Department of Computer Science was established during the year 1987–88 with B.Sc. Computer Science Programme. Since then, the Department has been functioning successfully producing young Computer Science graduates every year, with well trained and experienced faculty members and supporting staff. So far, the Department has produced more than 1000 (33 batches) Computer Science graduates and they are all well placed in India & Abroad. The Department has been producing excellent results over a period of 35 years. The Department has adequate infrastructure with a well–equipped Computer Laboratory with LCD Projector, a well stacked Department Library, well–furnished class rooms. From 2023 onwards we have got approval for Artificial Intelligence Programme.

#### **VISION**

- Apply a broad understanding of the fundamental theories, concepts, and applications of Computer Science in their career.
- Analyze a multifaceted computing problem and to apply principles of computing and other relevant disciplines to identify solutions and compare alternative solutions to computing problems.
- Apply Computer Science theory and software development fundamentals to produce computing–based solutions.
- To attain an ability to use current techniques, skills, and tools necessary for computing practice.
- To affiance in a wide range of careers and/or graduate studies in computer science or related fields with a zeal for lifelong learning.
- To communicate effectively, both orally and in writing and engaged in collaborative teamwork.
- Recognize the social and ethical errands of a professional working in the discipline.

#### **MISSION**

The Mission of the Department is to impart computer education to the students in the rural area of Madurai district, so that they become enlightened and intelligent, and to improve the standards of their life, as well as to produce graduates who excel in research and service. We also aim to inculcate the attitudes and values that will motivate them towards the continuous process of learning and leadership. We strive to educate ground–breaking skills and technology for the benefit of learners through incessant upgradation of curriculum.



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2

#### GRADUATE ATTRIBUTES

1. **(KB) A knowledge base for Computer Science:** Demonstrated competence in university level mathematics, natural sciences, Computer Science fundamentals, and specialized Computer Science knowledge appropriate to the program.
2. **(PA) Problem analysis:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex Computer Science problems in order to reach substantiated conclusions
3. **(Inv.) Investigation:** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
4. **(Des.) Design:** An ability to design solutions for complex, open-ended Computer Science problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. **(Tools) Use of Computer Science tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern Computer Science tools to a range of Computer Science activities, from simple to complex, with an understanding of the associated limitations.
6. **(Team) Individual and teamwork:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. **(Comm.) Communication skills:** An ability to communicate complex Computer Science concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. **(Prof.) Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. **(Impacts) Impact of Computer Science on society and the environment:** An ability to analyze social and environmental aspects of Computer Science activities. Such ability includes an understanding of the interactions that Computer Science has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
10. **(Ethics) Ethics and equity:** An ability to apply professional ethics, accountability, and equity.
11. **(Econ.) Economics and project management:** An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of Computer Science and to understand their limitations.
12. **(LL) Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge



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3

#### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The B.Sc. Computer Science (Artificial Intelligence) Graduates of the Sourashtra College will

PEO 1	attain a professional career by acquiring knowledge in scientific, mathematical, computing, and engineering principles.
PEO 2	apply, analyze, design, optimize, and implement skills to formulate and solve computer science, engineering, and multidisciplinary problems effectively.
PEO 3	utilize fundamental domain knowledge gained from core courses to develop innovative computing solutions, employing creativity and logical reasoning.
PEO 4	provide professional services using the latest technologies in the field of computer science.
PEO 5	cultivate leadership skills while adhering to ethical standards, promoting teamwork, and demonstrating effective communication and time management in the profession.
PEO 6	pursue higher studies, certifications, and research programs in alignment with market demands and emerging trends.

#### UNDERGRADUATE (UG) PROGRAMME OUTCOMES (POs)

Undergraduate (B.A., B.Sc., B.Com., B.C.A., B.B.A., etc.) is a 3 – year degree Programme with 6 semesters consisting the following Programme Outcomes (POs) under various criteria including critical thinking, problem solving, effective communication, societal/ citizenship/ ethical credibility, sustainable growth and employable abilities.

PO 1	<b>Critical Thinking:</b> Intellectual exploration of knowledge towards actions in clear and rational manner by understanding the logical connections between ideas and decisions.
PO 2	<b>Problem Solving:</b> Understanding the task/ problem followed by planning and narrow execution strategy that effectively provides the solution.
PO 3	<b>Effective Communication:</b> Knowledge dissemination by oral and verbal mechanisms to the various components of our society.
PO 4	<b>Societal/ Citizenship/ Ethical Credibility:</b> Realization of various value systems/ moral dimensions and demonstrate the empathetic social concern as well as equity in all the decisions, executions and actions.
PO 5	<b>Environmental Concern and Sustainable Growth:</b> Understanding the emerging environmental challenges and provide the possible contribution in sustainable development that integrates environment, economy and employment.
PO 6	<b>Skill Development and Employable Abilities:</b> Adequate training in relevant skill sector and creating employable abilities among the under graduates.



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4

#### PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of B.Sc. Computer Science (Artificial Intelligence) Programme, the students are expected will be able to

<b>PSO 1</b>	apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making.
<b>PSO 2</b>	be aware of various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.
<b>PSO 3</b>	be familiar with the concepts and theories related to Finance, Investments and Modern Marketing.
<b>PSO 4</b>	evaluate various social and economic problems in the society and develop answer to the problems as global citizens.
<b>PSO 5</b>	enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.
<b>PSO 6</b>	be ready and willing to embark on new ventures and initiatives, with a focus on critical thinking and a strong desire for continuous learning, particularly in the realm of life skills.

#### **DISTRIBUTION OF CREDITS (UG PROGRAMME)**

PAR T	SE M	COURSES	NO. OF COURSES	HOURS	CREDITS	TOTAL CREDITS
I	I-IV	LANGUAGE	4	6	3	12
II	I-IV	ENGLISH	4	6	3	12
III	I-VI	CORE	16	5-6	4	64
III	I-IV	ALLIED	4	4	4	16
III	V-VI	ELECTIVE	3	5	5	15
IV	I-IV	SKILL BASED SUBJECT	6	2	2	12
IV	I	VALUE EDUCATION	1	2	2	2
IV	I	ENVIRONMENTAL STUDIES	1	2	2	2
IV	III, IV	NON-MAJOR ELECTIVE	2	2	2	4
V	IV	EXTENSION ACTIVITY	1	0	1	1
	V	SELF – STUDY (SOFT SKILLS)	1	0	0	0
	VI	SELF –STUDY (GK (ONLINE))	1	0	0	0
<b>TOTAL</b>						<b>140</b>
Any online courses in SWAYAM PORTAL						



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5

#### B.Sc. COMPUTER SCIENCE (ARTIFICIAL INTELLIGENCE)

#### COURSE STRUCTURE – SEMESTER – I

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT11	<b>Part – I: Tamil –</b> பொதுத் தமிழ் – I	6	3	25	75	100	3
	24UACH11	<b>Hindi –</b> General Hindi – I						
	24UACS11	<b>Sanskrit –</b> Poetry, Grammar and History of Sanskrit Literature						
2	24UACE11	<b>Part – II: English –</b> General English – I	6	3	25	75	100	3
3	24UAIC11	<b>Part – III: Core – 1:</b> Programming in C	5	3	25	75	100	5
4	24UAICP1	<b>Part – III: Core – 2: Lab:</b> C Programming	5	3	40	60	100	3
5	24UAIA11	<b>Part – III: Allied – 1:</b> Discrete Mathematical Structures	4	3	25	75	100	4
6	24UAIS11	<b>Part – IV: SBS – 1:</b> Digital Principles and Computer Organization	2	3	25	75	100	2
7	24UACVE1	<b>Part – IV: Value Education</b>	2	3	25	75	100	2
<b>TOTAL</b>			<b>30</b>				<b>700</b>	<b>22</b>

#### SEMESTER – II

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT21	<b>Part – I: Tamil –</b> பொதுத் தமிழ் – II	6	3	25	75	100	3
	24UACH21	<b>Hindi –</b> General Hindi – II						
	24UACS21	<b>Sanskrit –</b> Prose, Grammar and History of Sanskrit Literature						
2	24UACE21	<b>Part – II: English –</b> General English – II	6	3	25	75	100	3
3	24UAIC21	<b>Part – III: Core – 3:</b> Data Structures and Algorithms	5	3	25	75	100	5
4	24UAICP2	<b>Part – III: Core – 4: Lab</b> : Data Structures and Algorithms Using C	5	3	40	60	100	3
5	24UAIA21	<b>Part – III: Allied – 2:</b> Probability and Statistics	4	3	25	75	100	4
6	24UAIS21	<b>Part – IV: SBS – 2:</b> Foundations of Artificial Intelligence	2	3	25	75	100	2
7	24UACES1	<b>Part– IV:</b> Environmental Studies	2	3	25	75	100	2
<b>TOTAL</b>			<b>30</b>				<b>700</b>	<b>22</b>



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6

#### SEMESTER – III

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1		<b>Part – I: Tamil –</b> காப்பியமும் நாடகமும்	6	3	25	75	100	3
		<b>Hindi – Hindi – III</b>						
		<b>Sanskrit – Sanskrit – III</b>						
2		<b>Part – II: English –</b> English For Enrichment – III	6	3	25	75	100	3
3		<b>Part – III: Core – 5:</b> Object Oriented Programming Using C++	5	3	25	75	100	5
4		<b>Part – III: Core – 6:</b> <b>Lab:</b> Object Oriented Programming Using C++	5	3	40	60	100	3
5		<b>Part – III: Allied – 3:</b> Resource Management Techniques	4	3	25	75	100	4
6		<b>Part – IV: SBS – 3:</b> <b>Lab:</b> Linux and Shell Programming	2	3	40	60	100	2
7		<b>Part – IV: NME – 1:</b> Office Automation	2	3	25	75	100	2
		<b>TOTAL</b>	<b>30</b>				<b>700</b>	<b>22</b>

#### SEMESTER – IV

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1		<b>Part – I: Tamil –</b> சங்க இலக்கியமும் அற இலக்கியமும்	6	3	25	75	100	3
		<b>Hindi – Hindi – IV</b>						
		<b>Sanskrit – Sanskrit – IV</b>						
2		<b>Part – II: English –</b> English For Enrichment – IV	6	3	25	75	100	3
3		<b>Part – III: Core – 7:</b> Programming in Java	5	3	25	75	100	5
4		<b>Part – III: Core – 8:</b> <b>Lab:</b> Java Programming	5	3	40	60	100	3
5		<b>Part – III: Allied – 4:</b> Numerical Methods	4	3	25	75	100	4
6		<b>Part – IV: SBS – 4:</b> <b>Lab:</b> SQL Programming	2	3	40	60	100	2
7		<b>Part – IV: NME – 2:</b> Introduction to Internet	2	3	25	75	100	2
8		<b>Part–V:</b> Extension Activities	–	–	–	–	100	1
		<b>TOTAL</b>	<b>30</b>				<b>800</b>	<b>23</b>

Passed in the BoS Meeting held on 09/03/2024

Signature of the Chairman



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7

#### SEMESTER – V

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1		<b>Part – III: Core – 9:</b> Software Engineering	5	3	25	75	100	4
2		<b>Part – III: Core – 10:</b> Operating System Concepts	5	3	25	75	100	4
3		<b>Part – III: Core – 11:</b> Machine Learning	5	3	25	75	100	4
4		<b>Part – III: Core – 12:</b> <b>Lab : Machine Learning Lab – I</b>	6	3	40	60	100	4
5	<b>Part – III: Elective – 1*</b>		5	3	25	75	100	5
	Principles of Deep Learning							
	Computing Intelligence							
	Pattern Recognition							
	Soft Computing							
6		<b>Part – IV: SBS – 5:</b> Quantitative Aptitude	2	3	25	75	100	2
7		<b>Part – IV: SBS – 6:</b> <b>Lab : Web Design</b>	2	3	40	60	100	2
8		Soft Skills (Self-Study)	–	–	–	–	100	–
		<b>TOTAL</b>	<b>30</b>				<b>800</b>	<b>25</b>

\*One elective course to be chosen from FOUR courses

#### SEMESTER – VI

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1		<b>Part – III: Core – 13:</b> IoT and Cloud Technologies	5	3	25	75	100	5
2		<b>Part – III: Core – 14:</b> Artificial Intelligence	5	3	25	75	100	5
3		<b>Part – III: Core – 15:</b> <b>Lab : Machine Learning Lab II</b>	5	3	40	60	100	3
4		<b>Part – III: Core – 16:</b> <b>Lab: Natural Language Processing</b>	5	3	40	60	100	3
5	<b>Part – III: Elective – 2*</b>		5	3	25	75	100	5
	Natural Language Processing							
	Simulation and Modelling							
	Robotics and Applications							
	Neural Networks							
6		<b>Part – III: Elective – 3:</b> Project & Viva-Voce	5	3	40	60	100	5
7		General Knowledge (Self-Study)	–	–	–	–	100	–
		<b>TOTAL</b>	<b>30</b>				<b>700</b>	<b>26</b>

\*One elective course to be chosen from FOUR courses



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8

#### COURSE STRUCTURE – I SEMESTER

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT11	<b>Part – I: Tamil –</b> பொதுத் தமிழ் – I	6	3	25	75	100	3
	24UACH11	<b>Hindi –</b> General Hindi – I						
	24UACS11	<b>Sanskrit –</b> Poetry, Grammar and History of Sanskrit Literature						
2	24UACE11	<b>Part – II: English –</b> General English – I	6	3	25	75	100	3
3	24UAIC11	<b>Part – III: Core – 1:</b> Programming in C	5	3	25	75	100	5
4	24UAICP1	<b>Part – III: Core – 2:</b> <b>Lab:</b> C Programming	5	3	40	60	100	3
5	24UAIA11	<b>Part – III: Allied – 1:</b> Discrete Mathematical Structures	4	3	25	75	100	4
6	24UAIS11	<b>Part – IV: SBS – 1:</b> Digital Principles and Computer Organization	2	3	25	75	100	2
7	24UACVE1	<b>Part – IV:</b> Value Education	2	3	25	75	100	2
		<b>TOTAL</b>	<b>30</b>				<b>700</b>	<b>22</b>

CA – Class Assessment (Internal)

SE – Summative Examination

SBS – Skill Based Subject

NME – Non –Major Elective

T – Theory

P – Practical

Passed in the BoS Meeting held on 09/03/2024

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9

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAIC11	PROGRAMMING IN C	CORE – 1	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	I	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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#### COURSE DESCRIPTION:

This course helps to provide the fundamental knowledge of a programming language and its features which enhances the user to write general purpose application programs.

#### COURSE OBJECTIVES:

- To inculcate fundamental knowledge of programming
- To develop programming skills using the fundamentals and basics of C language
- To stress the importance of clarity, simplicity and the efficiency in writing programs

#### COURSE OUTCOMES (COs):

After the completion of the Course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	apply the basic concepts and develop program to find solutions for simple problems	Upto K3
CO 2	design programs to solve complex problems by using suitable control statements	Upto K3
CO 3	analyze the problem and design efficient program using functions	Upto K3
CO 4	use array and structure to handle volume of data	Upto K3
CO 5	use advanced data structures pointers and files for data processing	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



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10

#### PROGRAMMING IN C

##### UNIT – I:

C fundamentals: Character set – Identifier and keywords – data types – constants – Variables – Declarations – Expressions – Statements – Arithmetic, Unary, Relational and logical, Assignment and Conditional Operators – Library functions.

##### UNIT – II:

Data input output functions – Simple C programs – Flow of control – if, if-else, while, do-while, for loop, Nested control structures – Switch, break and continue, go to statements – Comma operator.

##### UNIT – III:

Functions: Definition – proto type – Passing arguments – Recursions. Storage Classes: Automatic, External, Static, Register Variables – Multi-file programs – Preprocessor directives – Macro substitution – File inclusion – Compiler Control Directives.

##### UNIT – IV:

Arrays: Defining and processing – Passing arrays to functions – Multi-dimension arrays – Arrays and String. Structures: User defined data types – Passing structures to functions – Self-referential structures – Union – Bit wise operations.

##### UNIT – V:

Pointers: Declarations – Passing pointers to Functions – Operation in Pointers– Pointer and Arrays – Arrays of Pointers – Structures and Pointers – Files: Sequential and random file Creation and Processing – Command line arguments.

##### TEXT BOOK:

E. Balagurusamy, *Programming in ANSI C*, 7<sup>th</sup> Edition, Tata McGraw Hill, 2017.

##### REFERENCE BOOKS:

1. B.W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd Edition, PHI, 1988.
2. H. Schildt, *C: The Complete Reference*, 4<sup>th</sup> Edition. TMH Edition, 2000.
3. Gottfried B.S, *Programming with C*, Second Edition, TMH Pub. Co. Ltd., New Delhi 1996.
4. Kanetkar Y., *Let us C*, BPB Pub., New Delhi, 1999.

##### DIGITAL TOOLS:

1. [http://www.kciti.edu/wp-content/uploads/2017/07/cprogramming\\_tutorial.pdf](http://www.kciti.edu/wp-content/uploads/2017/07/cprogramming_tutorial.pdf)
2. <https://www.skiet.org/downloads/cprogrammingquestion.pdf>
3. <https://phy.ntnu.edu.tw/~cchen/pdf/ctutor.pdf>

##### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	1	1	3
CO2	2	2	1	1	1	1
CO3	1	1	2	3	1	1
CO4	1	3	1	1	1	3
CO5	1	1	2	2	2	2

3. Advanced Application    2. Intermediate Development    1. Introductory Level  
COURSE DESIGNER: Dr. T. D.VENKATESWARAN



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11

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAICP1	LAB: C PROGRAMMING	CORE-2 LAB	-	5	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	I	40	60	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

#### COURSE DESCRIPTION:

This course helps to provide the fundamental knowledge of a programming language and its features which enhances the user to write general purpose application programs.

#### COURSE OBJECTIVES:

- To inculcate fundamental knowledge of programming.
- To develop programming skills using the fundamentals and basics of C language.
- To stress the importance of clarity, simplicity and the efficiency in writing programs.
- It aims to train the student to the basic concepts of the C-programming language.
- To improve the programming skills through C language.

#### COURSE OUTCOMES (COs):

After the completion of the Course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	demonstrate the understanding of syntax and semantics of c programs.	Upto K3
CO 2	identify the problem and solve using c programming techniques.	Upto K3
CO 3	identify suitable programming constructs for problem solving.	Upto K3
CO 4	analyze various concepts of c language to solve the problem in an efficient way.	Upto K3
CO 5	develop a C program for a given problem and test for its correctness.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



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12

#### **LAB: C PROGRAMMING**

#### **LIST OF EXPERIMENTS:**

##### **Expression Evaluation**

1. Finding Simple Interest and Compound Interest
2. Centigrade to Fahrenheit and Fahrenheit to Centigrade
3. Finding roots of a quadratic equation
4. Finding Standard Deviation and Variance

##### **Conditional Statements**

1. EB Bill Generation
2. Print Grade of a student
3. Checking Prime Number, Perfect Number, Armstrong Number, Adam Number
4. Sum of the digits of a number

##### **Summation of Series**

1. Sin(x), 2. Cos(x), 3. Exp(x) (Comparison with built in functions)

##### **String Manipulation**

1. Counting the number of vowels, consonants, words, white spaces in a line of text and array of lines.
2. Reverse a string and check for palindrome.
3. Sub string detection, count and removal.
4. Finding and replacing substrings.

##### **Functions**

1. Finding Factorial
2. Finding NCP value using recursion
3. Finding biggest element

##### **Recursion**

1.  ${}^n P_r, {}^n C_r$
2. GCD of two numbers
3. Fibonacci sequence
4. Maximum & Minimum

##### **Matrix Manipulation**

1. Addition and Subtraction
2. Multiplication
3. Transpose, and trace of a matrix
4. Determinant of a Matrix



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE**

### **(ARTIFICIAL INTELLIGENCE) – SYLLABUS**

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

13

#### **Structures**

1. Mark Sheet Preparation using structure
2. Paybill Preparation using structure

#### **Preprocessor Directives**

Simple programs using Preprocessor Directives

#### **Files**

1. Inventory Control
2. Library Management

**COURSE DESIGNER: Dr. T.D.VENKATESWARAN**



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### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

14

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAIA11	DISCRETE MATHEMATICAL STRUCTURES	ALLIED – 1	4	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	I	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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#### COURSE DESCRIPTION:

This course helps to provide the fundamental knowledge of Discrete structures like Set theory, Relations, Functions, Matrices, Logic, Graph Theory

#### COURSE OBJECTIVES:

- To teach the basic concepts of set theory.
- To impart knowledge on solving problems using logic.
- To understand the mathematical concepts of combinatory.
- To solve various problems in number theory.
- To study the basic concepts of relations and its applications.

#### COURSE OUTCOMES (COs):

After the completion of the Course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	gain knowledge on set theory.	Upto K3
CO 2	understand different mathematical logics and functions.	Upto K3
CO 3	get an idea on permutations and combinations.	Upto K3
CO 4	understand the different form of number theory.	Upto K3
CO 5	understand relations and its applications.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLICATION



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## B.Sc. COMPUTER SCIENCE

### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

15

#### DISCRETE MATHEMATICAL STRUCTURES

##### UNIT– I: SET THEORY

Introduction– set and its Element – Set Description (Roster, Set Builder and cardinal number method) Types of Sets– Set Operations and Laws of set Theory. Partition of sets. Minsets–Countable and uncountable set. Algebra of sets and Duality.

##### UNIT– II: MATHEMATICAL LOGIC

Basic Logic and Proof, logical operations – Logic Propositional equivalence, Predicates and Quantities, Tautology–Contradiction–Methods of proofs(Direct and Indirect)– Function– Definition–Notation– Types of Function– Composition of Functions.

##### UNIT– III: NUMBER THEORY

The Integers and Division, Integers and Algorithms, (Multiplication, Addition and Division –Sequences and Summations, Recursive algorithms, Program correctness

##### UNIT– IV: COMBINATORICS

The basics of counting, the pigeonhole principle, Permutations and Combinations, Binomial coefficients, Generalized permutations and combinations

##### UNIT– V: RELATIONS

Relations – Relations and their properties, Representing Relations, Closures of relations, Equivalence relations, Partial orderings – Recurrence Relations Binary Relations.

##### TEXT BOOKS:

1. Rosen K.H. *Discrete Mathematics and its Applications*, 5th edition, Tata McGraw – Hills, 2003.
2. J.K Sharma, *Discrete Mathematics*, 3<sup>rd</sup> Edition, Macmillan Reprint 2011.

##### REFERENCE BOOK:

*Modern Algebra*, S. Arumugam & A. Thangapandi Issac, Scitech publications, 2005

##### DIGITAL TOOLS:

1. <https://www.coursera.org/specializations/discrete-mathematics>
2. <https://www.javatpoint.com/discrete-mathematics-tutorial>
3. <https://medium.com/basecs/a-gentle-introduction-to-graph-theory-7969829ead8>

##### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	1	1	3
CO2	2	2	1	1	1	1
CO3	1	1	2	3	1	1
CO4	1	3	1	1	1	3
CO5	1	1	2	2	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Prof. S. K. GANESHBABU



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## B.Sc. COMPUTER SCIENCE

### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

16

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAIS11	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	SBS – 1	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	I	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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#### COURSE DESCRIPTION:

The course enables the students to design digital circuits using basic logic gates and to understand concepts of sequential combinational circuits. The students gain the knowledge and understand hardware components of a computer and impart knowledge about internal architecture of a computer system.

#### COURSE OBJECTIVES:

- To give knowledge about basic number systems like Binary, Octal, Decimal, Hexadecimal number system.
- To give knowledge on the physical internal components of computers like Multiplexers, Decoders, Encoders, Flipflops, Registers and Counters.
- To make them understand the basic structure and operation of a digital computer.
- To teach the design of data path unit, control unit for processor and to familiarize with the hazards.
- To make them understand the concept of various memories and I/O interfacing.

#### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	explore number system and logic gates.	Upto K3
CO 2	design various combinational and sequential digital circuits using logic gates.	Upto K3
CO 3	state the fundamentals of computer systems and analyze the execution of an instruction.	Upto K3
CO 4	analyze different types of control design and identify hazards.	Upto K3
CO 5	identify the characteristics of various memory systems and I/O communication.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

Passed in the BoS Meeting held on 09/03/2024

Signature of the Chairman





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## B.Sc. COMPUTER SCIENCE

### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

17

#### DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

##### UNIT – I:

Binary number system – Binary to Decimal conversions–Decimal to Binary–Octal–Hexadecimal numbers – ASCII code –Excess–3 code – The basic gates – Inverter– OR Gates–AND Gates– Universal logic gates – NOR Gates – NAND Gates.

##### UNIT – II:

Combinational Circuits – Karnaugh Map – Analysis and Design Procedures – Binary Adder – Subtractor – Decoder – Encoder – Multiplexers –Demultiplexers.

Introduction to Sequential Circuits – Flip–Flops and its types – operation and excitation tables – Registers and types – Counters and its types.

##### UNIT – III:

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

##### UNIT – IV:

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

##### UNIT – V:

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O.

##### TEXT BOOK:

*Digital Principles and Application*, Albert Paul Malvino and Donald P. Leach, Sixth Edition, Tata McGraw–Hill–Education, 2006.

*Computer System Architecture*, M. Morris Mano, 3<sup>rd</sup> Edition, 2007, Pearson, New Delhi.

##### REFERENCE BOOKS:

1. *Digital Computer Fundamentals*, by Thomas C.Bartee TMH 2007.
2. *Digital Circuits and Design*, by S.Salivahanan and S.Arivazhagan ,Vikas Publishers.2005.
3. *Computer Organization*, by V. Carl Hamacher, Zconko G. Vranesic, Safwat G. Zaky 4<sup>th</sup> Edition, McGraw–Hill International Editions.

##### DIGITAL TOOLS:

1. <https://www.mheducation.co.in/digital-principles-and-applications-sie-9789339203405-india>
2. [http://jnujprdistance.com/assets/lms/LMS%20JNU/B.Sc.\(IT\)/Sem%20I/Digital%20Computer%20Fundamentals/Version%201/Digital%20Computer%20Fundamentals.pdf](http://jnujprdistance.com/assets/lms/LMS%20JNU/B.Sc.(IT)/Sem%20I/Digital%20Computer%20Fundamentals/Version%201/Digital%20Computer%20Fundamentals.pdf)

##### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	1	1	2	–
CO2	2	2	1	2	2	–
CO3	2	1	–	1	1	–
CO4	2	1	2	2	2	1
CO5	2	2	1	1	1	–

3. Advanced Application    2. Intermediate Development    1. Introductory Level

COURSE DESIGNER: Dr. K. ANURATHA



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## B.Sc. COMPUTER SCIENCE

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(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

18

#### COURSE STRUCTURE – II SEMESTER

S. No	Course Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24UACT21	<b>Part – I: Tamil –</b> பொதுத் தமிழ் – II	6	3	25	75	100	3
	24UACH21	<b>Hindi –</b> General Hindi – II						
	24UACS21	<b>Sanskrit –</b> Prose, Grammar and History of Sanskrit Literature						
2	24UACE21	<b>Part – II: English –</b> General English – II	6	3	25	75	100	3
3	24UAIC21	<b>Part – III: Core – 3:</b> Data Structures and Algorithms	5	3	25	75	100	5
4	24UAICP2	<b>Part – III: Core – 4:</b> <b>Lab :</b> Data Structures and Algorithms Using C	5	3	40	60	100	3
5	24UAIA21	<b>Part – III: Allied – 2:</b> Probability and Statistics	4	3	25	75	100	4
6	24UAIS21	<b>Part – IV: SBS – 2:</b> Foundations of Artificial Intelligence	2	3	25	75	100	2
7	24UACES1	<b>Part– IV:</b> Environmental Studies	2	3	25	75	100	2
		<b>TOTAL</b>	<b>30</b>				<b>700</b>	<b>22</b>

CA – Class Assessment (Internal)

SE – Summative Examination

SBS – Skill Based Subject

NME – Non –Major Elective

T – Theory

P – Practical

Passed in the BoS Meeting held on 09/03/2024

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## B.Sc. COMPUTER SCIENCE

### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

19

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAIC21	DATA STRUCTURES AND ALGORITHMS	CORE – 3	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	II	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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#### COURSE DESCRIPTION:

This course aims to impart fundamental knowledge to organize and structure data to the design and implementation of efficient algorithms and program development. And also learn on application of data structures in problem solving using several predefined algorithms.

#### COURSE OBJECTIVES:

- To impart knowledge and skill on identifying apt data structures to solve problems efficiently.
- To impart skill to write time and space efficient algorithms.
- To give knowledge on the concepts and applications of (i) linear data structures viz., arrays, stacks, queues (ii) linked linear data structures viz., linked lists, linked stacks and linked queues and (iii) Non-linear data structures viz., trees, binary trees
- To give knowledge on various sorting and searching algorithms
- To impart knowledge on solving problems using algorithmic techniques viz., Divide and Conquer, Greedy Approach

#### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	identify data structures needed to solve specific problems	Upto K3
CO 2	analyze the data structures for effective use in problem solving	Upto K3
CO 3	design and develop efficient algorithms in terms of Space and Time	Upto K3
CO 4	troubleshoot algorithms	Upto K3
CO 5	analyze time complexity of algorithms	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

Passed in the BoS Meeting held on 09/03/2024

Signature of the Chairman



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20

#### DATA STRUCTURES AND ALGORITHMS

##### UNIT-I:

**Introduction** – Basic Terminology; Elementary data organization – Data structure operations – Complexity of algorithms – other asymptotic notations for complexity of algorithms

**Arrays** – Introduction – Linear Arrays – Representation of Linear Arrays in memory – Traversing Linear Arrays – Inserting and Deleting – Searching – Linear Search, binary Search – Multi dimensional arrays

##### UNIT-II:

**Linked List** – Introduction – Representation on Linked list in memory – Traversing a linked list – searching in a linked list – **Memory Allocation:** Garbage Collection – Inserting into a linked list – Deletion from a linked list

##### UNIT-III:

**Stack:** Introduction – Array representation of stacks – Linked list representation of stacks – **Arithmetic Expression** : Polish Notation – Evaluation of a Postfix expression – transforming infix expression to postfix expression – **Recursion** : Factorial , Fibonacci – Towers of Hanoi. **Queue** – Linked Representation of Queues – DeQueue

##### UNIT-IV:

**Trees** – Binary Trees – Representing binary trees in memory – Traversing binary trees – Binary Search Trees – Searching and inserting in binary search trees – deleting a binary search tree

**Algorithms** – Introduction– What is an Algorithm – Algorithms Specification – Performance Analysis

**Divide and Conquer** – General Method – Binary Search – Finding the maximum and Minimum – Merge Sort – Quick Sort – Selection

##### UNIT-V:

**The Greedy Method** – General Method – Knapsack problem – Job sequencing with deadlines – **Minimum cost spanning tree:** Prim's Algorithm – Kruskal Algorithm – Optimal Storage on tapes – optimal merge patterns – single source shortest path

##### TEXT BOOKS:

1. *Data Structures* by Seymour Lipschutz, Schaum's outlines, Tata McGraw Hill Education Private Limited, New Delhi. 2006.
2. *Fundamentals of Computer Algorithms*, Ellis Horowitz, Sartaj Shani, Galgotia publications Pvt Ltd, 2010, New Delhi.



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21

#### REFERENCE BOOKS:

1. *Data structures Using C* Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, Kindersley (India) Pvt. Ltd., 2009.
2. *Data structures and Algorithms*, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education Pvt.Ltd., 2002.

#### DIGITAL TOOLS:

1. <https://www.computer-pdf.com/programming/781-tutorial-data-structure-and-algorithm-notes.html>
2. <https://www.cs.princeton.edu/courses/archive/spr11/cos247/lectures/08DsAlg.pdf>
3. [https://www.iare.ac.in/sites/default/files/lecture\\_notes/IARE\\_DS\\_LECTURE\\_NOTES\\_2.pdf](https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_DS_LECTURE_NOTES_2.pdf)

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	1	1	1	2
CO2	2	2	1	2	1	3
CO3	3	2	1	1	2	2
CO4	2	1	2	2	2	3
CO5	1	1	1	1	1	1

3. Advanced Application    2. Intermediate Development    1. Introductory Level

COURSE DESIGNER: Prof. D. V. JEYANTHI



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22

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAICP2	LAB: DATA STRUCTURES AND ALGORITHMS USING C	CORE – 4 LAB	5	–	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	II	40	60	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input checked="" type="checkbox"/>
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#### COURSE DESCRIPTION:

This course aims to impart fundamental knowledge to organize and structure data to the design and implementation of efficient algorithms and program development. And also learn on application of data structures in problem solving using several predefined algorithms.

#### COURSE OBJECTIVES:

- To understand the concepts of Linked List, Stack and Queue, Trees and Graphs.
- To Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.
- To apply searching and sorting techniques
- To determine the concepts of Greedy Method
- To apply searching techniques.
- To give knowledge on various sorting and searching algorithms

#### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand and implement data structures using C	Upto K3
CO 2	understand and implement various types of linked lists and their applications	Upto K3
CO 3	understand and implement Tree Traversals	Upto K3
CO 4	understand and implement various algorithms in C	Upto K3
CO 5	understand and implement different sorting and searching algorithms	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



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23

#### **LAB: DATA STRUCTURES AND ALGORITHMS USING C**

##### **LIST OF EXPERIMENTS**

1. Perform stack operations
2. Perform queue operations
3. Perform tree traversal operations
4. Search an element in an array using linear search.
5. Search an element in an array using binary search
6. Sort the given set of elements using Merge Sort.
7. Sort the given set of elements using Quick sort.
8. Search the Kth smallest element using Selection Sort
9. Find the Optimal solution for the given Knapsack Problem using Greedy Method.
10. Find all pairs shortest path for the given Graph using Dynamic Programming method
11. Find the Single source shortest path for the given Travelling Salesman problem using Dynamic Programming method
12. Find all possible solution for an N Queen problem using backtracking method
13. Find all possible Hamiltonian Cycle for the given graph using backtracking method

**COURSE DESIGNER: Dr. K. ANURATHA**



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## B.Sc. COMPUTER SCIENCE

### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

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24

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAIA21	PROBABILITY AND STATISTICS	ALLIED – 2	4	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	II	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### COURSE DESCRIPTION:

This course helps to provide the fundamental knowledge about Probability & Statistics

#### COURSE OBJECTIVES:

- To give knowledge about various types of statistical measures such as mean, median, mode, geometric mean, harmonic mean, standard deviation etc.,
- To give a foundation in statistical data analysis
- To solve real life problems using Correlation coefficient, regression, and theoretical probability distributions.

#### COURSE OUTCOMES (CO):

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

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	identify the basic concepts Central tendencies	Upto K3
CO 2	gain knowledge about Measures of Dispersion	Upto K3
CO 3	receive the idea of Curve Fitting, Correlation & Regression	Upto K3
CO 4	get knowledge about the basic concepts of Probability & Random variables	Upto K3
CO 5	acquire knowledge about theoretical Discrete & Continuous distributions	Upto K3

K1– KNOWLEDGE(REMEMBERING), K2–UNDERSTANDING, K3–APPLICATION





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### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

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25

#### PROBABILITY AND STATISTICS

##### UNIT – I:

Introduction to statistics – primary and secondary data – classification, tabulation and Diagrammatic Representation of statistical data – Bar–charts, Pie–diagrams – Graphical Representation of data – Histograms, Frequency polygon, Ogives.

##### UNIT – II:

Measures of dispersion – characteristics – coefficient of dispersion – Coefficient of variation–Moments – skewness and kurtosis – Pearson’s coefficient of skewness – Bowley’s coefficient of Skewness – Coefficient of skewness based upon moments.

##### UNIT – III:

Simple correlation – Karl Pearson’s coefficient of correlation – correlation coefficient for A bivariate frequency distribution – Rank correlation – Regression lines of regression – Properties of regression coefficient.

##### UNIT – IV:

Events and sets – sample space – concept of probability – addition and multiplications Theorem on probability – conditional probability and independence of evens – Baye’s Theorem – concept of random variable – Mathematical Expectation.

##### UNIT –V:

Concept of sampling distributions – standard error – Tests of significance based on t, Chi–square and F distributions with respect to mean, variance.

##### TEXT BOOK:

*Statistical Methods*, S.P. Gupta, Sultan Chand and sons Publications, 4th Edition 2011.

##### REFERENCE BOOKS:

1. *Fundamentals of Mathematical Statistics* by S.C. Gupta & V.K. Kapoor, Sultan Chand and Sons, 2004.
2. *Elements of Mathematical Statistics* By S.C. Gupta & V.K. Kapoor, Sultan Chand & Sons, Third Edition, 2000

##### DIGITAL TOOLS:

1. <http://math.iisc.ernet.in/~manju/UGstatprob16/statprob.pdf>
2. <http://wwwf.imperial.ac.uk/~ejm/ISE.2.6/NOTES.PDF>

##### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	1	1	3
CO2	2	2	1	1	1	1
CO3	1	1	2	3	1	1
CO4	1	3	1	1	1	3
CO5	1	1	2	2	2	2

3. Advanced Application    2. Intermediate Development    1. Introductory Level

COURSE DESIGNER: Prof. S. K. GANESHBABU



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## B.Sc. COMPUTER SCIENCE

### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

26

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24UAIS21	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	SBS – 2	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	II	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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#### COURSE DESCRIPTION:

This course aims to introduce the fundamental concepts of artificial intelligence (AI). Students will develop a broad understanding of AI technologies, their implications, and their potential applications in various fields. The course will emphasize practical examples and real-world case studies to facilitate comprehension and inspire innovative thinking.

#### COURSE OBJECTIVES:

##### To make the students

- Learn the basic representation and reasoning paradigms used in AI.
- Understand the subfields of AI.
- Explore real-world applications of AI across different industries.
- Gain insights into the ethical, social, and economic implications of AI.
- Provide an introduction to the underlying issues and future directions.

#### COURSE OUTCOMES (COs):

On the successful completion of the course, students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	define the fundamental concepts of AI.	Upto K3
CO 2	explain the subfields of AI.	Upto K3
CO 3	identify real-world applications of AI across various industries.	Upto K3
CO 4	analyze the ethical, social, and economic implications of AI.	Upto K3
CO 5	recognize the potential of AI to drive innovation and transformation in different domains.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

Passed in the BoS Meeting held on 09/03/2024

Signature of the Chairman



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## B.Sc. COMPUTER SCIENCE

### (ARTIFICIAL INTELLIGENCE) – SYLLABUS

(Under CBCS based on OBE) (For those admitted during 2024 – 2025 and after)

27

#### FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

##### UNIT I:

Introduction to Artificial Intelligence – Definition and scope of AI – Historical overview and key milestones – Differentiating AI from human intelligence.

##### UNIT II:

AI Subfields and Technologies: Machine learning: Supervised, unsupervised, and reinforcement learning – Deep learning and neural networks – Natural language processing (NLP) and computer vision

##### UNIT III:

Applications of AI: AI in healthcare: Diagnosis, treatment, and medical imaging – AI in finance: Fraud detection, algorithmic trading, and risk assessment – AI in transportation: Autonomous vehicles and traffic optimization – AI in customer service and chatbots – AI in education: Personalized learning and intelligent tutoring systems.

##### UNIT IV:

Ethical and Social Implications of AI: Bias and fairness in AI systems – Privacy and data protection concerns – Impact of AI on employment and the workforce – AI and social inequality.

##### UNIT V:

Other Important Issues: Ethical guidelines and responsible AI practices – AI and Innovation – Emerging trends and future directions in AI – AI and creativity: Generative models and artistic applications.

##### TEXT BOOK:

*Foundations of Artificial Intelligence*, Digital Lecture Notes provided by the department.

##### REFERENCE BOOK:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3<sup>rd</sup> Edition, Prentice Hall, 2010.
2. Nils J Nilsson, *Principles of Artificial Intelligence*, Illustrated Reprint Edition, Springer Heidelberg, 2014.
3. Patrick Henry Winston, *Artificial Intelligence*, Third Edition, Addison–Wesley Publishing Company, 2004.

##### DIGITAL TOOLS:

- <https://nptel.ac.in/courses/106102220>
- <https://www.udemy.com/course/learn-basics-of-artificial-intelligence/>
- <https://www.ibm.com/topics/artificial-intelligence>

##### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	1	1	2
CO2	2	2	1	1	1	1
CO3	1	1	2	2	1	1
CO4	1	2	1	1	1	2
CO5	1	1	2	2	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE DESIGNER: Dr. K. ANURATHA