



University of Madras

Chepauk, Chennai 600 005

[Est. 1857, State University, NAAC 'A⁺⁺' Grade, CGPA 3.59, NIRF 2019 Rank: 20]

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Undergraduate Programme in Computer Science with Data Science

Syllabus for
B.Sc. Computer Science with Data Science
(With effect from the Academic Year 2023 -24)

Learning Outcome Based Curriculum Framework

Note: The Committee is designed Learning Outcome Based Curriculum Framework of Undergraduate Computer Science Programmes prescribed by UGC

I Preamble

Bachelor of Computer Science with Artificial Intelligence is a 3 – Year Undergraduate Programme spread over six semesters. The course is designed to achieve a high degree of technical skills in Problem solving and Modern application development. The course develops requisite professional skills and problem solving along with developing the analytical abilities for pursuing a successful career in software industry and forms the required basics for further higher studies in Computer Science specifically in the area of Artificial Intelligence.

II Eligibility

A pass in the Higher secondary Examination (Academic Stream) conducted by the Government of Tamil Nadu with Mathematics as one of the subjects.

III Programme Objectives

PO1	Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study
PO2	Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.
PO3	Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
PO4	Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
PO5	Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO6	Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
PO7	Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team
PO8	Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO9	Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.
PO10	Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

IV Programme Specific Objectives

PSO1	To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making.
PSO2	To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.
PSO3	To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing.
PSO4	Evaluate various social and economic problems in the society and develop answer to the problems as global citizens.
PSO5	Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

B.Sc. COMPUTER SCIENCE WITH DATA SCIENCE

COURSE STRUCTURE

YEAR – I SEMESTER – I

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-I	3	6	25	75	100
Part-II	100L1Z	English Paper-I	3	6	25	75	100
Part-III	127C1A	CC- I: Python Programming @#%&	5	4	25	75	100
	127C11	CC- II: Python Programming Practical @#%&	5	5	40	60	100
	127E1A 127E1B 127E1C	EC-I Generic / Discipline Specific Mathematics-I @#%& / Statistics-I @#%& / Financial Accounting-I @#& /	3	5	25	75	100
Part-IV	127S1A	SEC- I: Office Automation @#%&*	2	2	25	75	100
	100S1A	Basic Tamil-I (Other Language Students) *					
	100S1B	Advanced Tamil-I *					
	127B1A	FC: Fundamentals of Computers @#%&	2	2	25	75	100
			23	30			

*** PART-IV: SEC-1 / Basic Tamil / Advanced Tamil (Any one)**

1. Students who have studied Tamil upto XII STD and also have taken Tamil in Part I shall take SEC-I.
2. Students who have not studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take Basic Tamil comprising of Two Courses (level will be at 6th Std.).
3. Students who have studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take Advanced Tamil comprising of Two Courses.

YEAR – I SEMESTER – II

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-II	3	6	25	75	100
Part-II	100L2Z	English Paper-II	3	6	25	75	100
Part-III	127C2A	CC- III: Java Programming @#%&	5	4	25	75	100
	127C21	CC- IV: Java Programming Practical @#%&	5	5	40	60	100
	127E2A 127E2B 127E2C	EC - II Generic / Discipline Specific : Mathematics II @#%& / Statistics II @#%& / Financial Accounting-II @#&	3	5	25	75	100
Part-IV	127S21	SEC-II: Office Automation Practical @#%& *	2	2	40	60	100
	100S2A	Basic Tamil-II (Other Language Students) *			25	75	100
	100S2B	Advanced Tamil- II *			25	75	100
	127S2A	SEC- III: Quantitative Aptitude @#%&	2	2	25	75	100
			23	30			

YEAR – II SEMESTER – III

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-III	3	6	25	75	100
Part-II	200L3Z	English Paper-III	3	6	25	75	100
Part-III	227C3A	CC- V: Data Structures @%&	5	4	25	75	100
	227C31	CC- VI: Data Structures Practical @%&	5	5	40	60	100
	227E3A 227E3B 227E3C	EC - III Generic / Discipline Specific: Mathematics I @#\$%& / Statistics I @#\$%& / Resource Management Techniques-I	3	5	25	75	100
Part-IV	227S31	SEC- IV: (Entrepreneurial Based): Web Page Design Practical @#\$%&	1	1	40	60	100
	227S32	SEC- V: Desktop Publishing Practical @#\$%&	2	2	40	60	100
	----	Environmental Science	--	1	--	--	--
			22	30			

YEAR – II SEMESTER – IV

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-IV	3	6	25	75	100
Part-II	200L4Z	English Paper-IV	3	6	25	75	100
Part-III	227C4A	CC- VII: Data Science Essentials &	5	4	25	75	100
	227C41	CC-VIII: Data Science using Python Practical &	5	4	40	60	100
	227E4A 227E4B 227E4C	EC-IV Generic / Discipline Specific Mathematics II @#\$%& / Statistics II @#\$%& / Resource Management Techniques-II	3	5	25	75	100
Part-IV	227S4A	SEC-VI: Emotional Intelligence @#\$%&	2	2	25	75	100
	227S4B	SEC-VII: Technical Writing @#\$%&	2	2	25	75	100
	---	Environmental Science	2	1	25	75	100
			25	30			

YEAR – III SEMESTER – V

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	327C5A	CC- IX: Data Visualization &	4	5	25	75	100
	327C51	CC- X: Data Visualization Practical &	4	5	40	60	100
	327C5B	CC- XI: R Programming @#&	4	5	25	75	100
	327C52	CC- XII: R Programming Practical @#&	4	5	40	60	100
	327E5A 327E5B 327E5C	EC -V: Computer Networks #\$\$%& / Software Engineering @#\$\$%& / Computing System Fundamentals #%%&	3	4	25	75	100
	327E5D 327E5E 327E5F	EC -VI: Cloud Computing @#\$\$%&/ Big Data Analytics @#\$\$%&/ Data Mining and Warehousing @#\$\$%&	3	4	25	75	100
Part-IV	---	Value Education	2	2	25	75	100
	---	Internship / Industrial Training (During summer vacation at the end of IV semester)	2	--	--	--	--
			26	30			

YEAR – III SEMESTER – VI

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	327C6A	CC - XIII: Data Analytics &	4	6	25	75	100
	327C61	CC - XIV: Data Analytics Practical &	4	6	40	60	100
	327C6B	CC - XV: Natural Language Processing %&	4	6	25	75	100
	327E6A 327E6B 327E6C	EC -VII: Mobile Ad-hoc Network @#\$\$%&/ Artificial Neural Networks %& / Grid Computing @&	3	5	25	75	100
	327E6D 327E6E 327E6F	EC-VIII: Internet of Things and its Applications @#\$\$%& / Robotics and Its Applications @#%&/ Information Security %&	3	5	25	75	100
Part-IV	327S61	Professional Competency Skill Course: Mini Project @%&	2	2	40	60	100
	---	Extension Activity	1	--	--	--	--
			21	30			

@ - Common to B.C.A.

- Common to B.Sc. Software Applications

\$ - Common to B.Sc. Computer Science

% - Common to B.Sc. Computer Science with Artificial Intelligence

& - Common to B.Sc. Computer Science with Data Science

-X-X-X-