

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
Teaching, Learning and Examination Scheme
(Three Years- Six Semesters Bachelor in Computer Application (BCA)Stream: Data Science
(Four Years- Eight Semesters Bachelor in Computer Application (Honours) [(BCA)-Honours] &
(Four Years- Eight Semesters Bachelor in Computer Application (Honours with Research) [(BCA)-(Honours with Research)]

FIRST YEAR: SEMESTER – I

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Core Courses (CC)	Theory-1	102CC101	Mathematics Foundations to Computer Science	3	3	External & Internal	60	24	40	16	100	40		
	Theory-2	102CC102	Computer Architecture	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-1	102LabCC102	Computer Architecture	2	4	External & Internal	60	24	40	16	100	40		
Ability Enhancement Courses (AEC)	Theory-1	102AEC101	General English - I	1	1	External & Internal	30	12	20	8	50	20		
	Tutorial-1	102TuAEC101	General English - I	1	1	Internal	--	--	50	20	50	20		
	Theory-2	102AEC102	Additional Course - Indian or Foreign Language Other than Mother Tongue and English [optional course]*	0	1	Internal	--	--	50	20	50	20		
	Tutorial-2	102TuAEC102	Additional Course - Indian or Foreign Language Other than Mother Tongue and English (1-1- 0) [optional course]*	0	1	Internal	--	--	50	20	50	20		
Multi-Disciplinary Elective Course (MDE)	Theory-1	102MDE101	Indian Knowledge System#	2	2	External & Internal	60	24	40	16	100	40		
Value added	Theory-1	102VAC101	Environmental Science and sustainability	2	2	External & Internal	60	24	40	16	100	40		

Courses (VAC)												
Skill Enhancement courses(SEC)	Theory-1	102SEC101	Problem Solving using C	3	3	External & Internal	60	24	40	16	100	40
	Lab/ Practical-1	102LabSEC101	Problem Solving using C	2	4	External & Internal	60	24	40	16	100	40
Discipline Specific Elective (DSE)	--	--	--	--	--	--	--	--	--	--	--	--
Total:				19	25							

Note: #Indian Knowledge System: Indian Culture and Civilization, Indian Vision for Human Society, Indian Science, Indian Town Planning and Architecture, Indian Mathematics and Astronomy, Indian Aesthetics, Indian Health, Wellness and Psychology (including Ayurved)

*Indian Languages: Sanskrit/Hindi/All Regional languages

Foreign Languages: (not limited to) Spanish/German/French/Korean/Mandarin etc.

Special Note: External Examination (Theory and Practical) shall be conducted by University and Internal Examination (Theory and Tutorial) shall be conducted by college

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FIRST YEAR: SEMESTER – II

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Core Courses (CC)	Theory-3	102CC103	Object Oriented Programming using C++	3	3	External & Internal	60	24	40	16	100	40		
	Theory-4	102CC104	Data Structures	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-2	102LabCC104	Data Structures	2	4	External & Internal	60	24	40	16	100	40		
	Theory-5	102CC105	Operating Systems	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-3	102LabCC105	Operating Systems	1	2	External & Internal	30	12	20	8	50	20		
Ability Enhancement Courses (AEC)	Theory-3	102AEC103	Additional Course - Indian or Foreign Language Other than Mother Tongue and English [optional course]*	0	1	Internal	--	--	50	20	50	20		
	Tutorial-3	102TuAEC103	Additional Course - Indian or Foreign Language Other than Mother Tongue and English (1-1- 0) [optional course]*	0	1	Internal	--	--	50	20	50	20		
Value added Courses (VAC)	Theory-2	102VAC102	Indian Constitution	2	2	External & Internal	60	24	40	16	100	40		
Skill	Theory-2	102SEC102	Object Oriented	3	3	External	60	24	40	16	100	40		

Enhancement courses(SEC)			Programming using Java			&Internal						
	Lab/ Practical-2	102LabSEC102	Object Oriented Programming using Java	2	4	External & Internal	60	24	40	16	100	40
	Theory-3	102SEC103	Web Technologies	1	1	30	30	12	20	8	50	20
	Lab/ Practical-3	102LabSEC103	Web Technologies	1	2	30	30	12	20	8	50	20
Total:				21	29							

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SECOND YEAR: SEMESTER – III

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Core Courses (CC)	Theory-6	102CC201	Probability and Statistics	3	3	External & Internal	60	24	40	16	100	40		
	Theory-7	102CC202	Data Base Management System	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-4	102LabCC202	Data Base Management System	2	4	External & Internal	60	24	40	16	100	40		
	Theory-8	102CC203	Software Engineering	3	3	External & Internal	60	24	40	16	100	40		
Value added Courses (VAC)	Lab/ Practical-2	102LabVAC201	Yoga/Sports/NCC/NSS/ Disaster Management	2	4	External & Internal	60	24	40	16	100	40		
Skill Enhancement courses(SEC)	Theory-4	102SEC201	Python Programming	2	2	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-4	102LabSEC201	Python Programming	2	4	External & Internal	60	24	40	16	100	40		
Discipline Specific Elective (DSE)	Theory-1	102DSE201	Basics of Data Analytics using Spreadsheet	1	1	External & Internal	30	12	20	8	50	20		
	Lab/ Practical-1	102LabDSE201	Basics of Data Analytics using Spreadsheet	2	4	External & Internal	60	24	40	16	100	40		
Total:				20	28									

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SECOND YEAR: SEMESTER – IV

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Core Courses (CC)	Theory-9	102CC204	Entrepreneurship and Startup Ecosystem	1	1	External & Internal	30	12	20	8	50	20		
	Tutorial-3	102CC204	Entrepreneurship and Startup Ecosystem	1	1	Internal	--	--	50	20	50	20		
	Theory-10	102CC205	Computer Networks	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-5	102LabCC205	Computer Networks	2	4	External & Internal	60	24	40	16	100	40		
	Theory-11	102CC206	Design and Analysis of Algorithm	3	3	External & Internal	60	24	40	16	100	40		
	Theory-12	102CC207	Artificial Intelligence	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-6	102LabCC207	Artificial Intelligence	2	4	External & Internal	60	24	40	16	100	40		
Skill Enhancement courses (SEC)	Theory-5	102SEC202	Design Thinking and Innovation	1	1	External & Internal	30	12	20	8	50	20		
	Tutorial-1	102TuSEC202	Design Thinking and Innovation	1	1	Internal	--	--	50	20	50	20		
Discipline Specific Elective (DSE)	Theory-2	102DSE202	Data Visualization	1	1	External & Internal	30	12	20	8	50	20		
	Lab/ Practical-2	102LabDSE202	Data Visualization	2	4	External & Internal	60	24	40	16	100	40		
Total:				20	26									

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THIRD YEAR: SEMESTER – V

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Skill Enhancement courses(SEC)	Tutorial-3	102SEC301	Quantitative Techniques	2	2	Internal	60	24	40	16	100	40		
	Lab/ Practical-5	102LabSEC302	Internship/capstone Project	4	8	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-6	102LabSEC303	Major Project[evaluation in sixth semester]	0	4	--	--	--	--	--	--	--		
Discipline Specific Elective (DSE)	Theory-3	102DSE301	Introduction to Data Science	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-3	102LabDSE301	Introduction to Data Science	2	4	External & Internal	60	24	40	16	100	40		
	Theory-4	102DSE302	Time Series Analysis	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-4	102LabDSE302	Time Series Analysis	2	4	External & Internal	60	24	40	16	100	40		
	Theory-5	102DSE303	Machine Learning	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-5	102LabDSE303	Machine Learning	2	4	External & Internal	60	24	40	16	100	40		
Total:				21	35									

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THIRD YEAR: SEMESTER –VI

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Core Courses (CC)	Theory-13	102CC301	Generative AI	2	2	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-7	102LabCC301	Generative AI	2	4	External & Internal	60	24	40	16	100	40		
Ability Enhancement Courses (AEC)	Tutorial-4	102TuAEC301	Soft Skills	1	1	Internal	--	--	50	20	50	20		
Skill Enhancement courses(SEC)	Lab/ Practical-7	102LabSEC304	Major Project [Initiated in 5th Semester]	4	4	External & Internal	60	24	40	16	100	40		
Discipline Specific Elective (DSE)	Theory-6	102DSE304	Big Data Analytics	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-6	102LabDSE304	Big Data Analytics	2	4	External & Internal	60	24	40	16	100	40		
	Theory-7	102DSE305	Exploratory Data Analysis	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-7	102LabDSE305	Exploratory Data Analysis	2	4	External & Internal	60	24	40	16	100	40		
Total:				19	25									

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FOURTH YEAR: SEMESTER –VII

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Core Courses (CC)	Theory-14	102CC401	OptimizationofML	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-8	102LabCC401	OptimizationofML	2	4	External & Internal	60	24	40	16	100	40		
Multi-Disciplinary Elective Course (MDE)	Theory-2	102MDE401	Social Network Analysis	3	2	External & Internal	60	24	40	16	100	40		
Skill Enhancement courses(SEC)	Theory-6	102SEC401	Dissertation work [evaluation in Eight semester]	--	8	--	--	--	--	--	--	--		
	Lab/ Practical-8	102LabSEC402	Summer Internship	4	8	Internal	--	--	100	40	100	40		
Discipline Specific Elective (DSE)	Theory-8	102DSE401	Business Intelligence & Analytics	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-8	102LabDSE401	Business Intelligence & Analytics	2	4	External & Internal	60	24	40	16	100	40		
	Theory-9	101DSE402	Data Mining & Warehousing	3	3	External & Internal	60	24	40	16	100	40		
Total:				20	35									

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FOURTH YEAR: SEMESTER – VIII

The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Mode of Examination, Evaluation & Assessment	Examination Theory/Practical				Examination Theory/ Practical/ Tutorial (Total)			
							External		Internal		Max. Marks	Min. Marks	Max. Marks	Min. Marks
							Max. Marks	Min. Marks	Max. Marks	Min. Marks				
Skill Enhancement courses(SEC)	Lab/ Practical-9	102LabSEC403	Dissertation work [Started in Seventh semester]	8	8	External & Internal	120	48	80	32	200	80		
Discipline Specific Elective (DSE)	Theory-10	102DSE403	Advanced Data Visualization	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-9	102LabDSE403	Advanced Data Visualization	2	4	External & Internal	60	24	40	16	100	40		
	Theory-11	102DSE404	Cloud Computing for Data Analytics	3	3	External & Internal	60	24	40	16	100	40		
	Lab/ Practical-10	102LabDSE404	Cloud Computing for Data Analytics	2	4	External & Internal	60	24	40	16	100	40		
	Theory-12	102DSE405	Data Security & Privacy	2	4	External & Internal	60	24	40	16	100	40		
Total:				20	26									

Notes:

- a. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.
- b. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).
- c. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.

For 3 Credit Theory:**Total Hours: 45 per semester****Theory Paper 60 marks + Internal 40 marks = 100 marks**

Course Objectives:				
Course Outcomes:	As per Blooms Taxonomy (4 to 6)			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Detailed pointwise contents with at least four points	12 Hrs	15 Marks	BoS shall recommend suitable pedagogical strategies, both classical and contemporary innovations, for integration into the Teaching, Learning, and Evaluation (T, L, & E) Processes. These strategies should be tailored to enhance the delivery and comprehension of the course content within each Unit, ensuring that they align with the educational objectives and learning outcomes.
Unit II	Detailed pointwise contents with at least four points	11 Hrs	15 Marks	
Unit III	Detailed pointwise contents with at least four points	11 Hrs	15 Marks	
Unit IV	Detailed pointwise contents with at least four points	11 Hrs	15 Marks	
References:	Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

For 2 Credit Theory:**Total Hours: 30 per semester****Theory Paper 60 marks + Internal 40 marks = 100 marks**

Course Objectives:				
Course Outcomes:	As per Blooms Taxonomy (4 to 6)			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Detailed pointwise contents with at least four points	7 Hrs	7 Marks	BoS shall recommend suitable pedagogical strategies, both classical and contemporary innovations, for integration into

Unit II	Detailed pointwise contents with at least four points	8 Hrs	8 Marks	the Teaching, Learning, and Evaluation (T, L, & E) Processes. These strategies should be tailored to enhance the delivery and comprehension of the course content within each Unit, ensuring that they align with the educational objectives and learning outcomes.
Unit III	Detailed pointwise contents with at least four points	7 Hrs	7 Marks	
Unit IV	Detailed pointwise contents with at least four points	8 Hrs	8 Marks	
References:	Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

For 1 Credit Theory: General English – I, Entrepreneurship and Startup Ecosystem, Design Thinking and Innovation

Total Hours: 15 per semester

Theory Paper 30 marks + Internal 20 marks = 50 marks

Course Objectives:				
Course Outcomes:	As per Blooms Taxonomy (4 to 6)			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Detailed point wise contents with at least four points	4 Hrs	7 Marks	BoS shall recommend suitable pedagogical strategies, both classical and contemporary innovations, for integration into the Teaching, Learning, and Evaluation (T, L, & E) Processes. These strategies should be tailored to enhance the delivery and comprehension of the course content within each Unit, ensuring that they align with the educational objectives and learning outcomes.
Unit II	Detailed point wise contents with at least four points	4 Hrs	8 Marks	
Unit III	Detailed point wise contents with at least four points	4 Hrs	8 Marks	
Unit IV	Detailed point wise contents with at least four points	3 Hrs	7 Marks	
References:	Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.			

Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.
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For 1 Credit Theory: Web Technologies, Basics of Data Analytics using Spreadsheet, Feature Engineering, Introduction to Machine Learning

Total Hours: 15 per semester

Theory Paper 30 marks + Internal 20 marks = 50 marks

Course Objectives:				
Course Outcomes:	As per Blooms Taxonomy (4 to 6)			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Detailed point wise contents with at least four points	7 Hrs	15 Marks	BoS shall recommend suitable pedagogical strategies, both classical and contemporary innovations, for integration into the Teaching, Learning, and Evaluation (T, L, & E) Processes. These strategies should be tailored to enhance the delivery and comprehension of the course content within each Unit, ensuring that they align with the educational objectives and learning outcomes.
Unit II	Detailed point wise contents with at least four points	8 Hrs	15 Marks	
References:	Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			