

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI



THREE YEAR UNDERGRADUATE PROGRAMME

B.Sc. Computer Science (112)/Information Technology (123)/Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Designing and Development (138)

Semester - I and II

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2026-27) Under NEP 2020

SYLLABUS

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Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology (Science Group)
Board of Studies in Computer Science
(including Computer Application, Information Technology etc.)

Sr. No.	Name	Designation	Address
01	Dr. Swati Sherekar	Chairman	PGTD in Computer Science and Engineering, SGBAU, Amravati
02	Dr. Dineshkumar N. Satange	Member (Faculty Member)	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
03	Dr. Mohd. Atique Mohd. Junaid	Member	HoD, PGTD in Computer Science and Engineering, SGBAU, Amravati
04	Dr. Avinash Baburao Kadam	Member	Shri Shivaji Science and Arts College, Chikhali Dist. Buldana
05	Dr. Ajay Purushottam Chendke	Member	Degree College of Physical Education (HVPM), Amravati
06	Dr. Chandrashekhar H. Sawarkar	Member	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
07	Dr. Arvind A. Tayade	Member	G.S. Science Arts and Commerce College, Khamgaon Dist. Buldana
08	Prof. Sudeshkumar Chaudhari	Member	RDIK, Mahavidyalaya, Badnera Rly. Amravati.
09	Dr. Narendra M. Jathe	Member	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
10	Dr. Homraj Patelpaik	Member	Lokmanya Tilak Mahavidyalaya Wani, Dist. Yavatmal
11	Prof. Sureshkumar Mapari	Member	R. A. College, Washim.

Examination, Evaluation and Assessment

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.
- d. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
- e. **Value Education Courses** to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.
- f. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University
- g. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language
- h.

Examination and Assessment Process:

- The basic principle of the Credit framework is that Credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No Credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.
- Exit options are provided with Certificate, Diploma and Basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a Four Years Multidisciplinary Degree Programme. Students will receive a Bachelor's degree with Honors/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.
- For the smooth success of four-year degree programme with multiple entry and exit systems, the examination mode should be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative (evaluation of students learning at the end of an instructional unit) examination modes in line with the UGC Report on 'Evaluation Reforms in Higher Educational Institutions (2019).

Examination, Evaluation and Assessment Scheme

The total marks for each Course shall be based on Continuous Assessment and Semester End Examination.

Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC as mentioned in **Teaching Learning Scheme** prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the following table -

Examination, Evaluation and Assessment Scheme

Vertical No.	The Vertical	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal		Max. Marks	Min. Marks
			Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks				
a	Major	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	25	10	25	10	50	20
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	SEC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
e	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS (Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
f	FP/CEP	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	Internship/ Apprenticeship		Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum marks of 50 per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process is prescribed for Phase I and Phase II											
	CC													

Continuous Assessment Tests (CAT)

For internal assessment, the Continuous Assessment Tests (CAT) shall be conducted as under-

- i. Three CAT each of 8 / 10 Marks (Theory) as applicable and 10 Marks (Practical).
 - First on completion of 25% Syllabus of the course or on completion of 25 teaching days,
 - Second on completion of 50% Syllabus of the course or on completion of 50 teaching days,
 - Third on completion of 75% Syllabus of the course or on completion of 75 teaching days.
- ii. Each concurrent assessment (CAT-I, II & III) will be mapped to relevant Course Learning Outcome.
- iii. Total Performance in CAT (i.e. 40 %) shall be based on the best two out of three in CAT examinations
- iv. Internal assessment shall be carried out by the respective course teacher by choosing variety of assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method, which may be deemed to be appropriate for assessing the relevant course outcome.

Conduction of the Examination:

As per the scheme of teaching, learning, examination and evaluation, theory/practical examinations of Semester-I, II, III, IV, V, VI, VII and VIII shall be conducted by the University (except for Internal Examinations as applicable) at the end of each semester.

The theory/practical examinations of all the Semesters shall be held as per the following Schedule –

Sr. No.	Name of the Examination	End Sem Examination	Supplementary Examination*
1	Semester-I, III, V and VII	Winter	Summer
2	Semester-II, IV, VI and VIII	Summer	Winter

* The University may evolve mechanism for conducting repeat end semester examination. Such repeat examinations shall have to be conducted within one month of the regular even semester examination and on demand examination.

1. The practical examination of all semesters shall be conducted by the University at the end of each semester. The HEI shall conduct the Practical examination of odd semesters as per the schedule announced by the University. However, the appointment of the External and Internal Examiners shall be done by the Head or Principal of respective HEI to conduct external examination of the odd semester and the same should be communicated to the University before commencement of the practical examination. The University shall conduct the external practical examination of all even semester by appointing external and internal examiners.
2. The examinations specified above shall be held twice in a year at such places and on such dates as may be prescribed by the University.
3. An applicant to an examination specified above, shall pursue a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College/Institute/University department.
4. Provided that the student shall be eligible to appear for examination if -
 - a. He/she complies with the provisions of the Ordinance pertaining to the Examination in general from time to time.
 - b. He/she has prosecuted a regular course of study in a university department/college affiliated to the University.
 - c. He/she has in the opinion of the Principal shown satisfactory progress in his/her studies.
5. The provisions of Ordinance No. 6 and Ordinance No. 9 shall be mutatis-mutandis applicable to every collegiate/non-collegiate student.
6. The fees for each theory examination and practical examination conducted by the university shall be as prescribed by the University, from time to time.

SEMESTER – I

Computer Application (General) (109) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Pract	
					External		Internal		(Total)	
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	109201	Fundamentals of Computer	2	2	30	9	20	6	50	20
Major-P1	109202	Laboratory on Office Automation Tools	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T1	109271	Information Communication Technology	2	2	30	9	20	6	50	20
GOEC-T2	109272	Business Data Processing	2	2	30	9	20	6	50	20
SEC-P3	109281	Laboratory on Information Communication Technology Tools	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
IKS-Generic	--	--	2	2	30	9	20	6	50	20
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	30						

Computer Application (Vocational) (110) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	110201	Fundamentals of Computer	2	2	30	9	20	6	50	20
Major-P1	110202	Laboratory on Office Automation Tools	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T1	110271	Information Communication Technology	2	2	30	9	20	6	50	20
GOEC-T2	110272	Business Data Processing	2	2	30	9	20	6	50	20
SEC-P3	110281	Laboratory on Information Communication Technology Tools	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
IKS-Generic	--	--	2	2	30	9	20	6	50	20
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	30						

Computer Science (112) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	112201	Fundamentals of Computer	2	2	30	9	20	6	50	20
Major-P1	112202	Laboratory on Office Automation Tools	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T1	112271	Information Communication Technology	2	2	30	9	20	6	50	20
GOEC-T2	112272	Business Data Processing	2	2	30	9	20	6	50	20
SEC-P3	110281	Laboratory on Information Communication Technology Tools	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
IKS-Generic	--	--	2	2	30	9	20	6	50	20
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	30						

Information Technology (123) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	123201	Fundamentals of Computer	2	2	30	9	20	6	50	20
Major-P1	123202	Laboratory on Office Automation Tools	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T1	123271	Information Communication Technology	2	2	30	9	20	6	50	20
GOEC-T2	123272	Business Data Processing	2	2	30	9	20	6	50	20
SEC-P3	123281	Laboratory on Information Communication Technology Tools	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
IKS-Generic	--	--	2	2	30	9	20	6	50	20
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	30						

Data Analytics (134) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	134201	Fundamentals of Computer	2	2	30	9	20	6	50	20
Major-P1	134202	Laboratory on Office Automation Tools	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T1	134271	Information Communication Technology	2	2	30	9	20	6	50	20
GOEC-T2	134272	Business Data Processing	2	2	30	9	20	6	50	20
SEC-P3	134281	Laboratory on Information Communication Technology Tools	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
IKS-Generic	--	--	2	2	30	9	20	6	50	20
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	30						

Data Science and Analytics (135) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	135201	Fundamentals of Computer	2	2	30	9	20	6	50	20
Major-P1	135202	Laboratory on Office Automation Tools	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T1	135271	Information Communication Technology	2	2	30	9	20	6	50	20
GOEC-T2	135272	Business Data Processing	2	2	30	9	20	6	50	20
SEC-P3	135281	Laboratory on Information Communication Technology Tools	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
IKS-Generic	--	--	2	2	30	9	20	6	50	20
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	30						

Web Designing and Development (138) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	138201	Fundamentals of Computer	2	2	30	9	20	6	50	20
Major-P1	138202	Laboratory on Office Automation Tools	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T1	138271	Information Communication Technology	2	2	30	9	20	6	50	20
GOEC-T2	138272	Business Data Processing	2	2	30	9	20	6	50	20
SEC-P3	138281	Laboratory on Information Communication Technology Tools	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
IKS-Generic	--	--	2	2	30	9	20	6	50	20
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	30						

SEMESTER – II

Computer Application (General) (109) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal			
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T2	109203	Programming with C	2	2	30	9	20	6	50	20
Major-P4	109204	Laboratory on Programming with C	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T3	109273	E Business	2	2	30	9	20	6	50	20
GOEC-T4	109274	Website Design Principles	2	2	30	9	20	6	50	20
VSC-P6	109282	Laboratory on E-Commerce	2	4	-	-	50	20	50	20
SEC-P7	109283	Laboratory on Web Publishing	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	32						

Computer Application (Vocational) (110) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T2	110203	Programming with C	2	2	30	9	20	6	50	20
Major-P4	110204	Laboratory on Programming with C	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T3	110273	E Business	2	2	30	9	20	6	50	20
GOEC-T4	110274	Website Design Principles	2	2	30	9	20	6	50	20
VSC-P6	110282	Laboratory on E-Commerce	2	4	-	-	50	20	50	20
SEC-P7	110283	Laboratory on Web Publishing	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	32						

Computer Science (112) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T2	112203	Programming with C	2	2	30	9	20	6	50	20
Major-P4	112204	Laboratory on Programming with C	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T3	112273	E Business	2	2	30	9	20	6	50	20
GOEC-T4	112274	Website Design Principles	2	2	30	9	20	6	50	20
VSC-P6	112282	Laboratory on E-Commerce	2	4	-	-	50	20	50	20
SEC-P7	112283	Laboratory on Web Publishing	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	32						

Information Technology (123) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T2	123203	Programming with C	2	2	30	9	20	6	50	20
Major-P4	123204	Laboratory on Programming with C	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T3	123273	E Business	2	2	30	9	20	6	50	20
GOEC-T4	123274	Website Design Principles	2	2	30	9	20	6	50	20
VSC-P6	123282	Laboratory on E-Commerce	2	4	-	-	50	20	50	20
SEC-P7	123283	Laboratory on Web Publishing	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	32						

Data Analytics (134) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T2	134203	Programming with C	2	2	30	9	20	6	50	20
Major-P4	134204	Laboratory on Programming with C	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T3	134273	E Business	2	2	30	9	20	6	50	20
GOEC-T4	134274	Website Design Principles	2	2	30	9	20	6	50	20
VSC-P6	134282	Laboratory on E-Commerce	2	4	-	-	50	20	50	20
SEC-P7	134283	Laboratory on Web Publishing	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	32						

Data Science and Analytics (135) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T2	135203	Programming with C	2	2	30	9	20	6	50	20
Major-P4	135204	Laboratory on Programming with C	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T3	135273	E Business	2	2	30	9	20	6	50	20
GOEC-T4	135274	Website Design Principles	2	2	30	9	20	6	50	20
VSC-P6	135282	Laboratory on E-Commerce	2	4	-	-	50	20	50	20
SEC-P7	135283	Laboratory on Web Publishing	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	32						

Web Designing and Development (138) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T2	138203	Programming with C	2	2	30	9	20	6	50	20
Major-P4	138204	Laboratory on Programming with C	2	4	25	10	25	10	50	20
Minor-T	--	--	2	2	30	9	20	6	50	20
Minor-P	--	--	2	4	25	10	25	10	50	20
GOEC-T3	138273	E Business	2	2	30	9	20	6	50	20
GOEC-T4	138274	Website Design Principles	2	2	30	9	20	6	50	20
VSC-P6	138282	Laboratory on E-Commerce	2	4	-	-	50	20	50	20
SEC-P7	138283	Laboratory on Web Publishing	2	4	-	-	50	20	50	20
AEC-English	--	--	1	1	15	-	-	-	-	-
AEC-MIL	--	--	1	1	15	-	-	-	-	-
VEC	--	--	2	2	30	9	20	6	50	20
CC	--	Separate SOP will be released	2	4	-	-	50	20	50	20
Total:			22	32						

SYLLABUS

B.Sc.- I, SEMESTER – I

Computer Science (112)

Information Technology (123)

Computer Application (Regular) (109)

Computer Application (Vocational) (110)

Data Analytics (134)

Data Science and Analytics (135)

Web Designing and Development (138)

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major: Computer Science (112)/Information Technology (123)/Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Designing and Development (138)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research)

Major/Minor Course: Fundamentals of Computer

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	I	109201/ 110201/ 112201/123201/ 134201/135201/ 138201	Fundamentals of Computer	2	30	2 Hrs	30

Course Objectives:	1. To provide the knowledge of basic of Computer Science 2. To understand importance of memory devices of computer 3. To understand importance of memory devices input output devices of computer 4. To understand the Operating System concepts						
Course Outcomes:	Students will be able to - 1. Define Computer, History of Computer, Uses of Computer and Generations of Computers. 2. Define memories of computers, its types and examples of primary and secondary memories. 3. Introduce about all input-output devices of computer systems. 4. Define operating system, its function and types of operating systems.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

Unit I	Introduction to Computer, Uses of Computers, History of Computers, Characteristics, Generations of Computers, Block diagram of Computer.	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Memories: Primary Memories: RAM, ROM, and its types, Cache Memory, Secondary Storage Devices: Hard Disk, SSD, Pen drives.	7 Hrs	7 Marks	
Unit III	I/O Devices: Input Devices- Keyboard, Mouse, Scanner, Output Devices- Touch Screen, Monitors: VDU, LCD & LED. Printers: Types of Printers, Impact and non-impact printers, Modem.	8 Hrs	8 Marks	
Unit IV	Operating System: Definition, Functions of Operating System, Types: Batch Mode, Multiprogramming, Timesharing, Online Real Time, Distributed O.S. Booting Process.	7 Hrs	7 Marks	
References:	Course Material/Learning Resources Text books: 1) Computer Fundamentals & Networking - P.K.Sinha 2) Fundamentals of Computer - B.Ram 3) Internet Book - Clstenes 4) Information Technology - Alexies & Mathews - Vijay Nikole Reference Books: 1) Fundamentals of Computer - V.Rajaraman 2) Computer Network-Andrew Tennanbaum Weblink to Equivalent MOOC on SWAYAM if relevant: • https://onlinecourses.swayam2.ac.in/cec19_cs06/preview • https://onlinecourses.swayam2.ac.in/nou20_cs03/preview • https://www.classcentral.com/course/swayam-computer-fundamentals-13950 • https://onlinecourses.nptel.ac.in/noc19_cs42/preview • https://onlinecourses.swayam2.ac.in/aic20_sp06/preview • https://onlinecourses.swayam2.ac.in/cec20_cs02/preview			

Assessment Rubric: Major/Minor- Internal for Theory Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. I, SEMESTER – I (NEP)			
Theory	Course Code: 109201/ 110201/ 112201/123201/ 134201/135201/ 138201	Course Title: Fundamentals of Computer	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major/Minor Course: Laboratory on Office Automation Tools

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	I	109202/ 110202/ 112202/ 123202/ 134202/135202/ 138202	Laboratory on Office Automation Tools	2	60	4Hrs	50

Course Objectives:	1. Understand the concept of Office Automation Tools. 2. Know the importance of Office Automation. 3. Explain the functions of Office Suits. 4. Define the scope and benefits and limitations of MS-Office.			
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. To design documentation using MS-Word. 2. To design Spread Sheets using MS-Excel. 3. To create the presentation using MS-PowerPoint.			
Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Create a MS-Word document for your own Biodata. 2. Create MS-Word Document Using Cut, Copy, Paste, Find and Replace using Edit Option. 3. Create MS-Word Document for inserting Tables, Pictures, Cliparts, Shapes, Symbols and Word Arts using Insert Option. 4. Create MS-Word Document for Any Newspaper News using Column Option. 5. Create MS-Word Document for Bullets and Numbering Option. 6. Create MS-Word Document using all formatting options. 7. Create MS-Word Document using Change Case Option. 8. Create MS-Word Document for changing Fonts, Color, Size using Formatting Option. 9. Create MS-Word Document to Write and Send Letter using Mail-Merge Option. 10. Create MS-Word Document to prepare Marksheet using table Menu. 11. Create the Excel Spreadsheet for Preparing the Marksheet. 12. Create the Excel Spreadsheet for Preparing the Payment Sheet. 13. Create the Excel Spreadsheet for Preparing the Electric Bill.			Use any pedagogical technique suitable for the topic

	14. Create the Excel Spreadsheet for Preparing the Bar Chart on Marksheet. 15. Create the Excel Spreadsheet for Preparing the Column Chart on Payment Sheet. 16. Create the PowerPoint Presentation on your Seminar topic. 17. Create the PowerPoint Presentation using various designs. 18. Create the PowerPoint Presentation using various Layouts. 19. Create the PowerPoint Presentation using various Transition effects. 20. Create the PowerPoint Presentation using various Animation Effects. 21. Create the PowerPoint Presentation using various Audio and Video effects.			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. I, SEMESTER – I (NEP)				
Practical	Course Code: 109202/ 110202/ 112202/123202/ 134202/135202/ 138202	Laboratory on Office Automation Tools	Max Marks: 25	Time: 4 Hrs.
Sr. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. I, SEMESTER – I (NEP)			
Practical	Course Code: 109202/ 110202/ 112202/123202/ 134202/135202/ 138202	Laboratory on Office Automation Tools	Max Marks: 25
Sr. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

GOEC Theory1: Information Communication Technology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	I	109271/ 110271/ 112271/123271/ 134271/135271/ 138271	Information Communication Technology	2	30	2 Hrs	30

Course Outcomes:	Students will be able to - 1. Understand the literature of social networks and their properties. 2. Which network is suitable for whom. 3. Develop skills to use various social networking. 4. Learn some GOI digital initiatives in higher education. 5. Apply skills to use online forums, documents, spreadsheets, presentation for communication, collaboration and research. 6. Get acquainted with internet threats and security mechanisms.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction to Networking: Introduction, Need of computer communication network, Communication protocol, Types of networks: LAN, MAN, WAN Topology: Ring, Bus, Star, Hybrid, Hierarchical& Mesh.	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Internet: History, Applications of Internet, Types of Internet Connection: wired and wireless. Internet Protocols: TCP/IP, FTP, HTTP, URL, e-mail address, WWW, Web browsers, Search Engines, Introduction to Social Networking: Twitter, LinkedIn, Facebook, Flickr, Skype, YouTube, WhatsApp.	7 Hrs	7 Marks		
Unit III	E-mail: Definition of E-mail, Advantages and disadvantages, User Ids, Login, Passwords, Email Addresses, Domain Names, Mailers, Message Components, message Composition, Mail Managements. G-Suits: Google Drive, Google Documents, Google Spread Sheets, Google Slides and Google Forms.	8 Hrs	8 Marks		
Unit IV	Internet Securities: -mail threats and secure E-mails, Viruses and Antivirus Software, Firewalls, Cryptography, Digital Signatures, Copyright issues.	7 Hrs	7 Marks		

References:	Course Material/Learning Resources Text books: 1) Computer Networks (Fourth Edition) - Andrew S. Tanenbaum (PHI) 2) Information Technology - Alexies & Mathews - Vijay Nikole Reference Books: 1) Fundamentals of the Internet and World Wide Web, 2/e – Raymond Greenlaw and Ellen Hepp, TMH publication. 2) Internet Technology and Web Designs, ISRD group, TMH Publication. 3) Information Technology- The breaking wave, Dennis P. Curtin, Kim Foley, Kunai Sen and Cathleen Mortin, TMH Publication. 4) Computer Network & Internet - Douglas E. Comer (Pearson)			

Assessment Rubric: Internal for GOEC-1- Information Communication Technology

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. I, SEMESTER – I (NEP)			
Theory	Course Code: 109271/ 110271/ 112271/123271/ 134271/135271/ 138271	Information Communication Technology	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

GOEC Theory2: Business Data Processing

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	I	109272/ 110272/ 112272/123272/ 134272/135272/ 138272	Business Data Processing	2	30	2 Hrs	30

Course Objectives:	1. Student should understand the Data in Business. 2. Student should process the data in Business. 3. Student should present the data in Business in various forms. 4.			
Course Outcomes:	On competition of the following syllabus the students will be able to - 1. Understand the concepts of Data Processing. 2. Student should process the data in Business. 3. Understand type of files required for Data Processing. 4. Interpret data in Business. 5. Able to present data in graphical forms.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Online Processing, Batch Processing, Real-time Processing, Time-Sharing, Multiprogramming Systems, Multiprocessing Systems, Distributed Data Processing	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Master File, Transaction File, Intermediate files, Back up files, etc	7 Hrs	7 Marks	
Unit III	Word processing: application of word processing, menus and tool bars, word processor: creating, entering, saving and printing the document, editing and formatting text, mail merge and macros	8 Hrs	8 Marks	
Unit IV	Spreadsheet: application, menus and tool bar, preparing tables, charts, sorting, etc., running statistical applications in Excel and Libra Office Calc, creating formulae in spreadsheets.	7 Hrs	7 Marks	
References:	Text books: 1. V. K. Kapoor, Introduction to Computer Data Processing & System Analysis, Sultan Chand & Sons. 2. Joyce Cox & Joan Lambert, Microsoft Access 2010 Step by Step, Microsoft Press. Reference Books: 1. Foster Provost & Tom Fawcett, Data Science for Business; O'Reilly Media Publishing House			

	2. Bhadka Harsad and Sharma Priyanka, Business Data Processing, LAP Lambert Academic Publishers. 3. S.S. Shrivastava, MS Office, Laxmi Publications. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant:-Nil Any pertinent media (recorded lectures, YouTube, etc.) if relevant: • https://www.youtube.com/watch?v=uvVsyCR4-7c • https://www.youtube.com/watch?v=b3GjKrArLkw
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Assessment Rubric: Internal for GOEC-2- Information Communication Technology

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. I, SEMESTER – I (NEP)			
Theory	Course Code: 109272/ 110272/ 112272/123272/ 134272/135272/ 138272	Business Data Processing	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

SEC: Laboratory on Information Communication Technology Tools

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	I	109281/ 110281/ 112281/123281/ 134281/135281/ 138281	Laboratory on Information Communication Technology Tools	2	60	4 Hrs	50

Course Objectives:	1. Effectively use ICT tools, software applications and digital resources. 2. Acquire, organize and create his/her own digital resources. 3. Participate in the evaluation and selection of ICT resources. 4. Practice safe, ethical and legal ways of using ICT.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Understand importance and need of incorporating modern ICT tools in education. 2. Use applications of Google for academics, carry out Scholarly writing using ICT tools. 3. Integrate ICT into teaching-learning and its evaluation. 4. Use ICT for making classroom processes more inclusive and to address multiple learning abilities.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Create a Google form using short and long answers. 2. Create a Google form using Multiple Choice and Checkboxes answer. 3. Create a Google form using Drop-down menu answer. 4. Create a quiz using Google form with different kinds of questions. 5. Create a Survey using Google form to collect data about students learning experiences. 6. Create Google Forms to create permission slips for field trips and email them directly to parents.						Use any pedagogical technique suitable for the topic

	7. Create Google Forms to create polls to gather data about student opinions on a variety of topics. 8. Create Google Forms to gather feedback from students on specific lessons and topics, teaching styles, curriculum, and more. 9. Create and edit documents using Google Docs. 10. Create a bulleted list, Customize a bulleted list using Google Docs. 11. Create a numbered list, Change the line and paragraph spacing, Change the text alignment and change the indentation using Google Docs. 12. Create a document using Google docs to insert an image, insert a table, insert a chart, insert page numbers, insert headers and footers, insert a comment and customize your page layout. 13. Create home inventory sheet using Google Sheet. 14. Create health exercise chart using Google Sheet. 15. Create monthly budget using Google Sheet. 16. Create a salary sheet of employees of colleges using Google Sheet. 17. Create a document in Marathi language using Google Translate. 18. Convert the English document into Marathi, Hindi, and Tamil language using Google Translate. 19. Create presentation using Google Slides. 20. Create presentation on Google Forms using Google Slides. 21. Create Class on Google Classroom. 22. Upload the material, links and videos of subject in different topics. 23. Create own website using Google Site. 24. Create college website using Google Site. 25. Create account on YouTube. 26. Create your own channel on YouTube and upload your videos. 27. Create an account on Google Drive and upload your files on it. 28. Upload folder on Google Drive and share the links to your friends. 29. Create your account on Twitter 30. Tweets short post, videos, photos and links to followers. 31. Create account on Instagram. 32. Check out friends and families on Instagram 33. Upload photos, videos and share them with their followers. 34. Create account on LinkedIn. 35. Upload your profile on LinkedIn for business or service.			
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References:	Weblink to Equivalent MOOC on SWAYAM if relevant: https://www.google.com https://mail.google.com https://docs.google.com https://sites.google.com https://forms.google.com https://drive.google.com https://twitter.com/ https://www.youtube.com https://www.instagram.com/ https://in.linkedin.com/ https://en.wikipedia.org/wiki/Google_Docs https://www.youtube.com/user/youtube https://www.google.com/sheets/about/ https://support.google.com/docs/answer/6000292?hl=en&co=GENIE.Platform%3DAndroid https://support.google.com/a/users/answer/9303071?hl=en#create_form https://support.google.com/a/users/answer/9310491?hl=en#sites_create_name https://support.google.com/drive/answer/2424384?hl=en&co=GENIE.Platform%3DAndroid
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Assessment Rubric: Internal Examination Practical Course (SEC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. I, SEMESTER – I (NEP)			
Practical	Course Code: 109281/ 110281/ 112281/123281/ 134281/135281/ 138281	Laboratory on Information Communication Technology Tools	Max Marks: 50
Sr. No.	Assessment Criteria		Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout		20
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester		10
3.	Attendance in practical session / Students' overall performance		10
4.	Internal Viva Voce		10

SYLLABUS

B.Sc.- I, SEMESTER – II

Computer Science (112)

Information Technology (123)

Computer Application (Regular) (109)

Computer Application (Vocational) (110)

Data Analytics (134)

Data Science and Analytics (135)

Web Designing and Development (138)

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major: Computer Science (112)/Information Technology (123)/Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Designing and Development (138)

**(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research)**

Major/Minor Course: Programming with C

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	109203/ 110203/ 112203/123203/ 134203/135203/ 138203	Programming with C	2	30	2 Hrs.	30

Course Objectives:	1.To provide students with understanding of code organization and functional hierarchical decomposition with using data types. 2. Programming is about writing the instructions which a computer follows to enable it to store knowledge, process knowledge, and communicate knowledge with the outside world.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Understand the Programming concepts. 2. Understand development of C language. 3. Write Algorithms for the task/problem. 4. Able to design flowcharts of the problem. 5. Able to write Simple C Programs.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

Unit I	Algorithm, flowcharting, Types of programming languages. History of C language, Advantages, Structure of C program, Character set, Identifiers, Keywords, Constants and Variables, Symbolic constants, Qualifiers, Type conversion. Operators and Expressions	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Formatted I/O: scanf(), printf(), Unformatted I/O : getch(), getchar(), gets(), putchar(), puts(). Control structures: Branching: if, if-else, Conditional operator(? :), nested if, switch. Looping: while, do-while, for statements, comma operator, goto, break, continue, nested loops	7 Hrs.	7 Marks	
Unit III	Arrays - Declaration and initialization of one and two dimensional array. Structure - Definition, declaration, initialization, array of structure, nested structure, union. Pointers - Declaration, initialization, pointers arithmetic	8 Hrs.	8 Marks	
Unit IV	Functions in C: Definition of function, function prototype, categories of function, actual argument, formal argument, function calling: call by value, call by reference, function parameters, local and global variable, functions with array, function recursion. String functions - String functions: strlen(), strcpy(), strcmp() &strcat()	7 Hrs.	7 Marks	
References:	Text books: 1. Programming in C: E Balagurusamy: TMH Publication. Reference Books: 1) ANSI C- Dennis Ritchie 2) Programming in C - V. Rajaraman 3) Programming with C: Venugopal K.R. TMH, Publication. 4) Programming with C: Byson Gottfried , Schaum Series Publication. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/cec19_cs06/preview 2. https://onlinecourses.swayam2.ac.in/nou20_cs03/preview 3. https://www.classcentral.com/course/swayam-computer-fundamentals-13950 4. https://onlinecourses.nptel.ac.in/noc19_cs42/preview 5. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview 6. https://onlinecourses.swayam2.ac.in/cec20_cs02/preview 7. https://www.classcentral.com/course/swayam-introduction-to-programming-in-c-2486 8. https://swayamprabha.gov.in/asset/new_team/images/course_files/R12-Introduction%20to%20Programming%20in%20C%20.pdf Weblink to Equivalent Virtual Lab if relevant: 1. https://www.programiz.com/c-programming/online-compiler/			

	2. https://www.onlinegdb.com/online_c_compiler 3. https://www.tutorialspoint.com/compile_c_online.php Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=eEo_aacpwCw 2. https://www.youtube.com/watch?v=OGM2BJ29Syg 3. https://www.youtube.com/playlist?list=PLWPirh4EWFpF_2T13UeEgZWZHc8nHBuXp
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Assessment Rubric: Major/Minor- Internal for Theory Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. I, SEMESTER – II (NEP)			
Theory	Course Code: 109203/ 110203/ 112203/123203/ 134203/135203/ 138203	Course Title: Programming with C	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity(weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

Major/Minor Course: Laboratory on Programming with C

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	109204/ 110204/ 112203/123204/ 134204/135204/ 138204	Laboratory on Programming with C	2	60	4Hrs.	50

Course Objectives:	1. Understand the concept of C programming 2. Know the importance of Looping Statement. 3. To implement decision making structure 4. To develop proficiency in Functions						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. To design simple C Program. 2. To design program for implementing looping structure. 3. Ability to use function. 4. Skill in structuring code with function.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1. Write a program in 'C' to demonstrate Arithmetic Operations. 2. Write a program in 'C' to demonstrate If -Else Statement. 3. Write a program in 'C' to demonstrate Nested If Statement. 4. Write a program in C to demonstrate Switch-case Statement. 5. Write a program in 'C' to demonstrate For Loop Statement. 6. Write a program in 'C' to demonstrate While Loop Statement. 7. Write a program in 'C' demonstrate Do-While Loop Statement. 8. Write a program in 'C' demonstrate Nested Loop. 9. Write a program in 'C' demonstrate One-Dimensional Array. 10. Write a program in 'C' demonstrate Two-Dimensional Array. 11. Write a program in 'C' demonstrate String Functions. 12. Write a program in 'C' demonstrate Structure. 13. Write a program in 'C' demonstrate Pointers. 14. Write a program in 'C' demonstrate Function. 15. Write a program in 'C' demonstrate Function Recursion.							Use any pedagogical technique suitable for the topic

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. I, SEMESTER – II (NEP)				
Practical	Course Code: 109204/ 110204/ 112203/123204/ 134204/135204/ 138204	Laboratory on Programming with C	Max Marks: 25	Time: 4 Hrs.
Sr. No.	Exercise			MaxMarks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. I, SEMESTER – II (NEP)			
Practical	Course Code: 109204/ 110204/ 112203/123204/ 134204/135204/ 138204	Laboratory on Programming with C	Max Marks: 25
Sr. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

GOEC Theory3: E-Business

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	109273/ 110273/ 112273/123273/ 134273/135273/ 138273	E-Business	2	30	2 Hrs.	30

Course Objectives:	1. To understand how C++ improves C with object-oriented features 2. Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects. 3. To learn the syntax and semantics of the C++ programming language. 4. To learn how to design C++ classes for code reuse. 5. Perform programming on functions, inline functions, constructor and destructor. 6. Perform programming on the concept of function overloading, operator overloading, virtual functions and polymorphism.					
Course Outcomes:	On competition of the following syllabus the students will be able to- 1. Define and identify the fundamental knowledge about object-oriented programming. 2. Declare and describe the concepts of abstraction, encapsulation, inheritance and polymorphism. 3. Implement Object Oriented Programming Concepts in C++. 4. To be able to develop applications in C++. 5. Demonstrate employability skills through the development of programming projects.					
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	In corporation of Pedagogies		
Unit I	Introduction to E-Commerce: Introduction, E-Commerce – Definition, History of Ecommerce, Online Extension of a BAM Model, Transition to E-Commerce in India, E-Commerce v/s Traditional Commerce, E - Commerce v/s E - Business. Electronic Commerce – Cutting Edge Technologies, Strengths, Weakness, Opportunities and Challenges of E-Commerce, Components of E-Business	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic		
Unit II	E-Commerce Business models – B2C, B2B, C2B, C2C, B2G, C2G., Brokerage, Advertising, Infomediary, Merchant, Manufacturer (Direct), Affiliate, Community, Subscription, Utility. Ecommerce Business Revenue Models & Types, Impact of E-Commerce on business, Successful Business Models in India.	7 Hrs.	7 Marks			
Unit III	EDI: Electronic Data Interchange (EDI): Meaning & Definition, History & Evolution, Uses, EDI Standards, EDI Working Concept, Implementation difficulties of EDI, Financial EDI, EDI and	8 Hrs.	8 Marks			

	Internet, EDI services			
Unit IV	Hardware and Software for E Business: Web Servers – Browsers – Server Software– Web Authoring Tools Database System - World Wide Web – Domain Name – Hardware requirements, Brief on Shopping Cart, Point of Sale, Wireless Payment Device,	7 Hrs.	7 Marks	

References:	▪ Kalakota Ravi and A. B. Whinston : Frontiers of Electronic Commerce, Addison Wesley ▪ Raydu – E Commerce, HPH ▪ Agarwala K. N. and DeekshaArarwala : Business on the Net – Bridge to the online store front, Macmillan, New Delhi. ▪ Agarwala K.N and Deeksha Ararwala: Business on the Net – Whats and Hows of E-Commerce.
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Assessment Rubric: GOEC Theory-3 - Internal for Theory Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. I, SEMESTER – II (NEP)			
Theory	Course Code: 109273/ 110273/ 112273/123273/ 134273/135273/ 138273	Course Title: E-Business	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

GOEC Theory4: Website Design Principles

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	109274/ 110274/ 112274/123274/ 134274/135274/ 138274	Website Design Principles	2	30	2 Hrs.	30

Course Objectives:	• To have an understanding of the introductory Internet and World Wide Web concepts. • To be able to configure text, color, and page layout with Cascading Style Sheets. • To have an understanding of configuring images & multimedia on web pages. • To have an understanding of some advanced technologies of web. • To develop the skill & knowledge of Web page design using HTML5.				
Course Outcomes:					
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	In corporation of Pedagogies	
Unit I	Internet: History, Application, World Wide Web, Web Standards, Basics in Web Design: Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, World Wide Web Consortium (W3C). History of HTML, Introduction to HTML Tags and Attributes	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	HTML5: Features, Editing, First HTML5 Example, Headings, Linking, Images, Lists, Tables, HTML-Iframe. HTML-Form: <input><textarea><button><select><label>	7 Hrs.	7 Marks		
Unit III	CSS: Benefits of CSS, CSS Versions History, CSS Syntax, CSS Properties. Selectors: universal, type, id, class. Inline Styles Embedded Style Sheets, External Style Sheets.	8 Hrs.	8 Marks		
Unit IV	Introduction to scripting: Java Script basics, operators, data types, popup boxes. Control structures: if, If-else, Switch. Looping structures: for, do-while, while.	7 Hrs.	7 Marks		
References:	1. Paul Deitel, Harvey Deitel and Abbey Deitel, “Internet & World Wide Web: How to program”, Fifth Edition Pearson ISBN 978-0-13-215100-9 2. Thomas A. Powell, “HTML & CSS: The Complete Reference”, Fifth Edition, McGraw-Hill, ISBN: 978-0-07-174170-5				

	3. Kogent Learning Solutions Inc, HTML5 Black Book: Covers CSS3, Javascript, XML, Dreamtech Press, New Delhi, 2011 4. Jeffery C. Jackson, “Web Technologies”, A Computer Science Perspective, Pearson Education
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Assessment Rubric: GOEC Theory-4 - Internal for Theory Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. I, SEMESTER – II (NEP)			
Theory	Course Code: 109274/ 110274/ 112274/123274/ 134274/135274/ 138274	Course Title: Website Design Principles	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

VSC: Laboratory on E-Commerce

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	109282/ 110282/ 112282/123282/ 134282/135282/ 138282	Laboratory on E-Commerce	2	60	4Hrs.	50

Course Objectives:	1. To provide students with understanding of E-Commerce. 2. Importance of E-Commerce in the current business. 3. How to process E-Commerce and communicate knowledge with the outside world.			
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Understand the complexity of e-Commerce and its many facts. 2. Explore how e-business and e-commerce fit together. 3. Apply the Knowledge to perform E-Commerce transactions. 4. Identify the impact of e-commerce. 5. Recognize the benefits and limitations of e-commerce			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Visit E-Commerce Website 2. B2B e commerce. Give an example for this. 3. Define B2C e commerce. Give an example for this. 4. Define C2B e commerce. Give an example for this. 5. Define C2C e commerce. Give an example for this. 6. Give any 2 applications of e commerce. 7. Perform digital marketing, Edit Basket of purchase. 8. Visit the e-Commerce site register yourself as client. 9. Visit the e-Commerce site register yourself as client and change the address of client. 10. Illustrate the B2B, B2C with example.			Use any pedagogical technique suitable for the topic

References:	Weblink to Equivalent MOOC on SWAYAM if relevant: • https://www.bigcommerce.com/articles/ecommerce/best-ecommerce-website-design/ • https://www.coursera.org/learn/ecommerce-academy • https://www.coursera.org/learn/foundations-of-digital-marketing-and-e-commerce.
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Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. I, SEMESTER – II (NEP)			
Practical	Course Code: 109282/ 110282/ 112282/123282/ 134282/135282/ 138282	Laboratory on E-Commerce	Max Marks: 50
Sr. No.	Assessment Criteria		Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout		20
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester		10
3.	Attendance in practical session / Students' overall performance		10
4.	Internal Viva Voce		10

SEC: Laboratory on Web Publishing

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	109283/ 110283/ 112283/123283/ 134283/135283/ 138283	Laboratory on Web Publishing	2	60	4Hrs.	50

Course Objectives:	1. Understand the concept of Webpage/site 2. Know the importance of web publishing. 3. Explain the functions of web publishing. 4. Define the scope and benefits and limitations of web publishing.			
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. To design simple web page. 2. To design web page with login id. 3. To create web page/site. 4. To publish the website.			
Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Create a web page of your name using various heading tags. 2. Design a web page according to the format given below using heading tag with your name displayed on the top. Creating a web-page using <p> tag 3. Design a web page describing yourself using single and multiline comments. Also use tag. 4. Create a html file for displaying a webpage with below mentioned tags. a. Bold b. Italics c. Underline d. Alignment e. Paragraph 5. Create a html file for displaying a webpage with below mentioned tags: a. Text color			Use any pedagogical technique suitable for the topic

	b. Headings c. HR d. Background color e. Line break 6. Design a web page of your CV with headings as objective, educational qualification, achievements, strengths, hobbies and personal details. a. Insert a horizontal line after every above-mentioned heading b. Set any light color as page background. c. Bold and underline every heading 4. Use heading tag to specify the heading d. Use pre tag for Educational Qualification. 7. Create a html page which shows the following list apply the following parts: a. Put horizontal line after newspaper and magazine. b. Apply heading tag for newspaper and magazine. c. Apply a background color 8. Create a webpage to show the use of lists with type. 9. Design a web page to display the names of Beverages, Dishes and Desserts using unordered lists: 10. Design a web page to display the different courses available in your institute. Show the use of different types of ordered lists.			
References:	Weblink to Equivalent MOOC on SWAYAM if relevant: • https://www.youtube.com/watch?v=8RT4n8KGjFE • http://tinyurl.com/mtjx8pnw • https://www.youtube.com/watch?v=qiR-7fL-I2A • http://tinyurl.com/y84uddwa			

Assessment Rubric: Internal Examination Practical Course |(SEC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. I, SEMESTER – II (NEP)			
Practical	Course Code: 109283/ 110283/ 112283/123283/ 134283/135283/ 138283	Laboratory on Web Publishing	Max Marks: 50

Sr. No.	Assessment Criteria	Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout	20
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester	10
3.	Attendance in practical session / Students' overall performance	10
4.	Internal Viva Voce	10

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI



THREE YEAR UNDERGRADUATE PROGRAMME

**B.Sc. Computer Science (112)/Information Technology (123)/Computer Application (Regular) (109)/
Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/Web
Designing and Development (138)**

Semester - III and IV

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2026-27) Under NEP 2020

SYLLABUS

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Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology (Science Group)
Board of Studies in Computer Science
(including Computer Application, Information Technology etc.)

Sr. No.	Name	Designation	Address
01	Dr. Swati Sherekar	Chairman	PGTD in Computer Science and Engineering, SGBAU, Amravati
02	Dr. Dineshkumar N. Satange	Member (Faculty Member)	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
03	Dr. Mohd. Atique Mohd. Junaid	Member	HoD, PGTD in Computer Science and Engineering, SGBAU, Amravati
04	Dr. Avinash Baburao Kadam	Member	Shri Shivaji Science and Arts College, Chikhali Dist. Buldana
05	Dr. Ajay Purushottam Chendke	Member	Degree College of Physical Education (HVPM), Amravati
06	Dr. Chandrashekhar H. Sawarkar	Member	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
07	Dr. Arvind A. Tayade	Member	G.S. Science Arts and Commerce College, Khamgaon Dist. Buldana
08	Prof. Sudeshkumar Chaudhari	Member	RDIK, Mahavidyalaya, Badnera Rly. Amravati.
09	Dr. Narendra M. Jathe	Member	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
10	Dr. Homraj Patelpaik	Member	Lokmanya Tilak Mahavidyalaya Wani, Dist. Yavatmal
11	Prof. Sureshkumar Mapari	Member	R. A. College, Washim.

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.
- d. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
- e. **Value Education Courses** to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.
- f. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University
- g. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training; Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Examination, Evaluation and Assessment

Examination and Assessment Process:

- i. The basic principle of the Credit framework is that Credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No Credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.
- ii. Exit options are provided with Certificate, Diploma and Basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a Four Years Multidisciplinary Degree Programme. Students will receive a Bachelor's degree with Honors/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.
- iii. For the smooth success of four-year degree programme with multiple entry and exit systems, the examination mode should be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative (evaluation of students learning at the end of an instructional unit) examination modes in line with the UGC Report on 'Evaluation Reforms in Higher Educational Institutions (2019).

Examination, Evaluation and Assessment Scheme

The total marks for each Course shall be based on Continuous Assessment and Semester End Examination.

Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC as mentioned in **Teaching Learning Scheme** prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the following table -

Examination, Evaluation and Assessment Scheme

Vertical No.	The Vertical	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal		Max. Marks	Min. Marks
			Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks				
a	Major	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	25	10	25	10	50	20
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	SEC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
e	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS (Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
f	FP/CEP	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	Internship/ Apprenticeship		Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum marks of 50 per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process is prescribed for Phase I and Phase II											
	CC													

Continuous Assessment Tests (CAT)

For internal assessment, the Continuous Assessment Tests (CAT) shall be conducted as under-

- i. Three CAT each of 8 / 10 Marks (Theory) as applicable and 10 Marks (Practical).
 - First on completion of 25% Syllabus of the course or on completion of 25 teaching days,
 - Second on completion of 50% Syllabus of the course or on completion of 50 teaching days,
 - Third on completion of 75% Syllabus of the course or on completion of 75 teaching days.
- ii. Each concurrent assessment (CAT-I, II & III) will be mapped to relevant Course Learning Outcome.
- iii. Total Performance in CAT (i.e. 40 %) shall be based on the best two out of three in CAT examinations
- iv. Internal assessment shall be carried out by the respective course teacher by choosing variety of assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method, which may be deemed to be appropriate for assessing the relevant course outcome.

conduction of the Examination:

As per the scheme of teaching, learning, examination and evaluation, theory/practical examinations of Semester-I, II, III, IV, V, VI, VII and VIII shall be conducted by the University (except for Internal Examinations as applicable) at the end of each semester.

The theory/practical examinations of all the Semesters shall be held as per the following Schedule –

Sr. No.	Name of the Examination	End Sem Examination	Supplementary Examination*
1	Semester-I, III, V and VII	Winter	Summer
2	Semester-II, IV, VI and VIII	Summer	Winter

* The University may evolve mechanism for conducting repeat end semester examination. Such repeat examinations shall have to be conducted within one month of the regular even semester examination and on demand examination.

1. The practical examination of all semesters shall be conducted by the University at the end of each semester. The HEI shall conduct the Practical examination of odd semesters as per the schedule announced by the University. However, the appointment of the External and Internal Examiners shall be done by the Head or Principal of respective HEI to conduct external examination of the odd semester and the same should be communicated to the University before commencement of the practical examination. The University shall conduct the external practical examination of all even semester by appointing external and internal examiners.
2. The examinations specified above shall be held twice in a year at such places and on such dates as may be prescribed by the University.
3. An applicant to an examination specified above, shall pursue a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College/Institute/University department.
4. Provided that the student shall be eligible to appear for examination if -
 - a. He/she complies with the provisions of the Ordinance pertaining to the Examination in general from time to time.
 - b. He/she has prosecuted a regular course of study in a university department/college affiliated to the University.
 - c. He/she has in the opinion of the Principal shown satisfactory progress in his/her studies.
5. The provisions of Ordinance No. 6 and Ordinance No. 9 shall be mutatis-mutandis applicable to every collegiate/non-collegiate student.
6. The fees for each theory examination and practical examination conducted by the university shall be as prescribed by the University, from time to time.

SEMESTER – III

Computer Application (General) (109) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practica	
					External		Internal		(Total)	
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	109205	Data Structure (DS)	2	2	30	9	20	6	50	20
Major-T2	109206	Relational Database Management System (RDBMS)	2	2	30	9	20	6	50	20
Major-P	109207	Laboratory on DS and RDBMS	2	4	25	10	25	10	50	20
IKS-T	109208	IKS in Computational Sciences	2	2	30	9	20	6	50	20
Minor-T	109261	Data Structure and RDBMS	2	2	30	9	20	6	50	20
Minor-P	109262	Laboratory on Data Structure and RDBMS	2	4	25	10	25	10	50	20
GOEC-T	109275	E Content Development	2	2	30	9	20	6	50	20
VSC-P	109284	Laboratory on MySQL	2	4	-	-	50	20	50	20
AEC-English	-	-	1	1	15	-	-	-	-	-
AEC-MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	109291	Field Project / Community Engagement Services in Computer Application (General): Phase-I	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Computer Application (Vocational) (110) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practica	
					External		Internal		(Total)	
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	110205	Data Structure (DS)	2	2	30	9	20	6	50	20
Major-T2	110206	Relational Database Management System (RDBMS)	2	2	30	9	20	6	50	20
Major-P	110207	Laboratory on DS and RDBMS	2	4	25	10	25	10	50	20
IKS-T	110208	IKS in Computational Sciences	2	2	30	9	20	6	50	20
Minor-T	110261	Data Structure and RDBMS	2	2	30	9	20	6	50	20
Minor-P	110262	Laboratory on Data Structure and RDBMS	2	4	25	10	25	10	50	20
GOEC-T	110275	E Content Development	2	2	30	9	20	6	50	20
VSC-P	110284	Laboratory on MySQL	2	4	-	-	50	20	50	20
AEC-English	-	-	1	1	15	-	-	-	-	-
AEC-MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	110291	Field Project / Community Engagement Services in Computer Application (General): Phase-I	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Computer Science (112) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	112205	Data Structure (DS)	2	2	30	9	20	6	50	20
Major-T2	112206	Relational Database Management System (RDBMS)	2	2	30	9	20	6	50	20
Major-P	112207	Laboratory on DS and RDBMS	2	4	25	10	25	10	50	20
IKS-T	112208	IKS in Computational Sciences	2	2	30	9	20	6	50	20
Minor-T	112261	Data Structure and RDBMS	2	2	30	9	20	6	50	20
Minor-P	112262	Laboratory on Data Structure and RDBMS	2	4	25	10	25	10	50	20
GOEC-T	112275	E Content Development	2	2	30	9	20	6	50	20
VSC-P	112284	Laboratory on MySQL	2	4	-	-	50	20	50	20
AEC-English	-	-	1	1	15	-	-	-	-	-
AEC-MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	112291	Field Project / Community Engagement Services in Computer Application (General): Phase-I	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Information Technology (123) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practica (Total)	
					External		Internal			
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	123205	Data Structure (DS)	2	2	30	9	20	6	50	20
Major-T2	123206	Relational Database Management System (RDBMS)	2	2	30	9	20	6	50	20
Major-P	123207	Laboratory on DS and RDBMS	2	4	25	10	25	10	50	20
IKS-T	123208	IKS in Computational Sciences	2	2	30	9	20	6	50	20
Minor-T	123261	Data Structure and RDBMS	2	2	30	9	20	6	50	20
Minor-P	123262	Laboratory on Data Structure and RDBMS	2	4	25	10	25	10	50	20
GOEC-T	123275	E Content Development	2	2	30	9	20	6	50	20
VSC-P	123284	Laboratory on MySQL	2	4	-	-	50	20	50	20
AEC-English	-	-	1	1	15	-	-	-	-	-
AEC-MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	123291	Field Project / Community Engagement Services in Computer Application (General): Phase-I	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Data Analytics (134) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	134205	Data Structure (DS)	2	2	30	9	20	6	50	20
Major-T2	134206	Relational Database Management System (RDBMS)	2	2	30	9	20	6	50	20
Major-P	134207	Laboratory on DS and RDBMS	2	4	25	10	25	10	50	20
IKS-T	134208	IKS in Computational Sciences	2	2	30	9	20	6	50	20
Minor-T	134261	Data Structure and RDBMS	2	2	30	9	20	6	50	20
Minor-P	134262	Laboratory on Data Structure and RDBMS	2	4	25	10	25	10	50	20
GOEC-T	134275	E Content Development	2	2	30	9	20	6	50	20
VSC-P	134284	Laboratory on MySQL	2	4	-	-	50	20	50	20
AEC-English	-	-	1	1	15	-	-	-	-	-
AEC-MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	134291	Field Project / Community Engagement Services in Computer Application (General): Phase-I	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Data Science and Analytics (135) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	135205	Data Structure (DS)	2	2	30	9	20	6	50	20
Major-T2	135206	Relational Database Management System (RDBMS)	2	2	30	9	20	6	50	20
Major-P	135207	Laboratory on DS and RDBMS	2	4	25	10	25	10	50	20
IKS-T	135208	IKS in Computational Sciences	2	2	30	9	20	6	50	20
Minor-T	135261	Data Structure and RDBMS	2	2	30	9	20	6	50	20
Minor-P	135262	Laboratory on Data Structure and RDBMS	2	4	25	10	25	10	50	20
GOEC-T	135275	E Content Development	2	2	30	9	20	6	50	20
VSC-P	135284	Laboratory on MySQL	2	4	-	-	50	20	50	20
AEC-English	-	-	1	1	15	-	-	-	-	-
AEC-MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	135291	Field Project / Community Engagement Services in Computer Application (General): Phase-I	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Web Designing and Development (138) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	138205	Data Structure (DS)	2	2	30	9	20	6	50	20
Major-T2	138206	Relational Database Management System (RDBMS)	2	2	30	9	20	6	50	20
Major-P	138207	Laboratory on DS and RDBMS	2	4	25	10	25	10	50	20
IKS-T	138208	IKS in Computational Sciences	2	2	30	9	20	6	50	20
Minor-T	138261	Data Structure and RDBMS	2	2	30	9	20	6	50	20
Minor-P	138262	Laboratory on Data Structure and RDBMS	2	4	25	10	25	10	50	20
GOEC-T	138275	E Content Development	2	2	30	9	20	6	50	20
VSC-P	138284	Laboratory on MySQL	2	4	-	-	50	20	50	20
AEC-English	-	-	1	1	15	-	-	-	-	-
AEC-MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	138291	Field Project / Community Engagement Services in Computer Application (General): Phase-I	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

SEMESTER – IV

Computer Application (General) (109) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal			
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	109209	OOP with C++	2	2	30	9	20	6	50	20
Major-T2	109210	Computer Networks	2	2	30	9	20	6	50	20
Major-T3	109211	Python Programming								
Major-P	109212	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
Minor-T	109263	C++ and Python Programming	2	2	30	9	20	6	50	20
Minor-P	109264	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
GOEC-T	109276	Web Technologies	2	2	30	9	20	6	50	20
VSC-P	109285	Database using Access Laboratory	2	4	-	-	50	20	50	20
AEC English	-	-	1	1	15	-	-	-	-	-
AEC MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	109292	Field Project / Community Engagement Services in Computer Application (General): Phase-II	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Computer Application (Vocational) (110) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal			
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	110209	OOP with C++	2	2	30	9	20	6	50	20
Major-T2	110210	Computer Networks	2	2	30	9	20	6	50	20
Major-T3	110211	Python Programming								
Major-P	110212	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
Minor-T	110263	C++ and Python Programming	2	2	30	9	20	6	50	20
Minor-P	110264	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
GOEC-T	110276	Web Technologies	2	2	30	9	20	6	50	20
VSC-P	110285	Database using Access Laboratory	2	4	-	-	50	20	50	20
AEC English	-	-	1	1	15	-	-	-	-	-
AEC MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	110292	Field Project / Community Engagement Services in Computer Application (General): Phase-II	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Computer Science (112) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	112209	OOP with C++	2	2	30	9	20	6	50	20
Major-T2	112210	Computer Networks	2	2	30	9	20	6	50	20
Major-T3	112211	Python Programming								
Major-P	112212	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
Minor-T	112263	C++ and Python Programming	2	2	30	9	20	6	50	20
Minor-P	112264	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
GOEC-T	112276	Web Technologies	2	2	30	9	20	6	50	20
VSC-P	112285	Database using Access Laboratory	2	4	-	-	50	20	50	20
AEC English	-	-	1	1	15	-	-	-	-	-
AEC MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	112292	Field Project / Community Engagement Services in Computer Application (General): Phase-II	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Information Technology (123) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practica (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	123209	OOP with C++	2	2	30	9	20	6	50	20
Major-T2	123210	Computer Networks	2	2	30	9	20	6	50	20
Major-T3	123211	Python Programming								
Major-P	123212	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
Minor-T	123263	C++ and Python Programming	2	2	30	9	20	6	50	20
Minor-P	123264	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
GOEC-T	123276	Web Technologies	2	2	30	9	20	6	50	20
VSC-P	123285	Database using Access Laboratory	2	4	-	-	50	20	50	20
AEC English	-	-	1	1	15	-	-	-	-	-
AEC MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	123292	Field Project / Community Engagement Services in Computer Application (General): Phase-II	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Data Analytics (134) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical (Total)	
					External		Internal		Max. Marks	Min. Marks
					Max. Marks	Min. Marks	Max. Marks	Min. Marks		
Major-T1	134209	OOP with C++	2	2	30	9	20	6	50	20
Major-T2	134210	Computer Networks	2	2	30	9	20	6	50	20
Major-T3	134211	Python Programming								
Major-P	134212	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
Minor-T	134263	C++ and Python Programming	2	2	30	9	20	6	50	20
Minor-P	134264	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
GOEC-T	134276	Web Technologies	2	2	30	9	20	6	50	20
VSC-P	134285	Database using Access Laboratory	2	4	-	-	50	20	50	20
AEC English	-	-	1	1	15	-	-	-	-	-
AEC MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	134292	Field Project / Community Engagement Services in Computer Application (General): Phase-II	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Data Science and Analytics (135) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practica (Total)	
					External		Internal			
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	135209	OOP with C++	2	2	30	9	20	6	50	20
Major-T2	135210	Computer Networks	2	2	30	9	20	6	50	20
Major-T3	135211	Python Programming								
Major-P	135212	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
Minor-T	135263	C++ and Python Programming	2	2	30	9	20	6	50	20
Minor-P	135264	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
GOEC-T	135276	Web Technologies	2	2	30	9	20	6	50	20
VSC-P	135285	Database using Access Laboratory	2	4	-	-	50	20	50	20
AEC English	-	-	1	1	15	-	-	-	-	-
AEC MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	135292	Field Project / Community Engagement Services in Computer Application (General): Phase-II	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

Web Designing and Development (138) Credits, Workload, Examination, Evaluation and Assessment Scheme

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practica (Total)	
					External		Internal			
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T1	138209	OOP with C++	2	2	30	9	20	6	50	20
Major-T2	138210	Computer Networks	2	2	30	9	20	6	50	20
Major-T3	138211	Python Programming								
Major-P	138212	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
Minor-T	138263	C++ and Python Programming	2	2	30	9	20	6	50	20
Minor-P	138264	Laboratory on C++ and Python Programming	2	4	25	10	25	10	50	20
GOEC-T	138276	Web Technologies	2	2	30	9	20	6	50	20
VSC-P	138285	Database using Access Laboratory	2	4	-	-	50	20	50	20
AEC English	-	-	1	1	15	-	-	-	-	-
AEC MIL	-	-	1	1	15	-	-	-	-	-
FP/CES	138292	Field Project / Community Engagement Services in Computer Application (General): Phase-II	2	4	-	-	50	20	50	20
CC		Separate SOP will be released	2	4	-	-	50	20	50	20

SYLLABUS

B.Sc.- II, SEMESTER – III

B.Sc. Computer Science (112)

Information Technology (123)

Computer Application (Regular) (109)

Computer Application (Vocational) (110)

Data Analytics (134)

Data Science and Analytics (135)

Web Designing and Development (138)

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major: Computer Science (112)/Information Technology (123)/Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Designing and Development (138)

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Major Course: Data Structure

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109205/ 110205/ 112205/123205/ 134205/135205/138205	Data Structure (DS)	2	30	2.00Hrs.	30 (External) 20 (Internal)

Course Objectives:	1. To provide the knowledge of basic of Data Structure 2. To understand importance of Algorithms 3. To understand importance of different steps of algorithm in Computer Science 4. To understand the Data Structure concepts						
Course Outcomes:	Students will be able to - 1. Learn the basic types for data structure, implementation and application. 2. Know the strength and weakness of different data structures. 3. Use the appropriate data structure in context of solution of given problem. 4. Develop programming skills which require to solve given problem.						
Unit System	Contents				Workload Allotted	Weightage of Marks	Incorporation of Pedagogies

			Allotted	
Unit I	Data structure: Introduction to data structure, Types of data structure: Primitive and Non-primitive, Linear and Non-linear data structure, Data structure operations. Array: Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion.	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Stacks: Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion. Queue: Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion. Types of Queue.	7 Hrs.	7 Marks	
Unit III	Linked List: Definition and concepts, Memory Representations, Types of Linked List, and Operations: Traversing, Insertion, Deletion. Tree: Definition and Terminologies, Memory Representations of Trees, Types of Trees : Binary Trees, Complete Binary Trees, Binary Search Trees, Traversing: Preorder, Inorder, Postorder, Insertion, Deletion.	8 Hrs.	8 Marks	
Unit IV	Searching and Sorting: Definition and concept. Searching Techniques: Linear Search, Binary Search and Indexed Sequential Search. Sorting Techniques: Bubble Sort, Selection Sort, Insertion Sort	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Data Structures, Seymour Lipschutz, Schaum's Outlines Series, Tata McGraw-Hill. 2. Text Book of Computer Science (Data Structure and C++): S. D. Pachpande, R.B. Ghayalkar and Athar Iqbal, Dnyanpath Publication. Reference Books: 1. Fundamentals of Data Structures in C, Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed. W. H. Freeman and Company. 2. Data Structure and Algorithms: Aho, Hopcroft, Ulman 3. Introduction to Data Structure: Bhagat Singh, Thomas L Naps Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/cec22_cs19/ 2. https://onlinecourses.nptel.ac.in/noc22_cs92/ 3. https://onlinecourses.nptel.ac.in/noc22_cs70/			

	Any pertinent media (recorded lectures, YouTube, etc.)if relevant: 1. https://www.youtube.com/watch?v=RBSGKlAvoiM 2. https://www.youtube.com/watch?v=zg9ih6SVACc
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Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Theory	Course Code: 109205/ 110205/ 112205/123205/ 134205/135205/138205	Course Title: Data Structure (DS)	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

Major Course: Relational Database Management System (RDBMS)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109206/ 110206/ 112206/123206/ 134206/135206/138206	Relational Database Management System (RDBMS)	2	30	2 Hrs.	30

Course Objectives:	1. Discuss Database management systems, databases and its applications 2. Familiarize the students with a good formal foundation on the relational model. 3. Outline the various systematic database design approaches 4. Familiarize with SQL, a basic language of database and enhance the skill to perform the queries by using functions. 5. Explore the Cursor, procedure, function and trigger.				
Course Outcomes:	Students will be able to - 1. Understand the fundamental concepts of Database. 2. Knowledge and ability to implement Normalization. 3. Understand the role and responsibility of Database Administrator, 4. Familiar with SQL, a basic language of database and enhance the skill to perform the queries by using functions. 5. Creation and use of store procedure and functions with the help of PL/SQL. 6. Ability to understand, design and implementation of Cursor, procedure, function and trigger.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction to Database: Data, Information, Characteristics of Database, Need of database, and Relational Model. Architecture of DBMS, DBA and its Role, Structured Query Language (SQL): Introduction, features, characteristics, advantages, data types, operators, Components of SQL: DDL, DML, DCL and TCL commands, Select statement with Clauses (Order By, Group By, Having, Where)	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Constraint: Data constraints and its type. Operations on Table with constraints. Views: Need, advantage & types. Index: Need, types and advantages, Joins and	7 Hrs.	7 Marks		

	Union of Tables and its types. In-built Functions: Character Functions, Number Functions, Date Functions, Group Functions, and Conversion Functions, Use of alias, Null, NVL, sub queries.			
Unit III	PL/SQL: Introduction, data types, Block structure of PL/SQL, Exception handling Cursor: Types of Cursor, attributes of Cursor, Life cycle of Cursor	8 Hrs.	8 Marks	
Unit IV	Procedure, Functions, Triggers: Introduction, importance, types advantages & disadvantages. Creation of Procedure, Functions. Backup and Recovery: Introduction, Archive (Transaction) Logs, and Importance of Backups, Database Recovery, and Transaction Control.	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 1. SQL, PL/SQL Programming – Ivan Bayross (BPB) 2. SQL A Complete Reference, Alexis Leon, Mathews Leon (Tata McGraw Hill) Reference Books: 1. Database Management System 3rd Ed. by Raghu Ramakrishnan and <i>Johannes Gehrke</i> 2. Oracle PL/SQL Language Pocket Reference, 5E: A Guide to Oracle's PL/SQL Language Fundamentals. by Steven Feuerstein, Bill Pribyl and Chip Dawes (O'REILLY) Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/cec19_cs05/preview 2. https://onlinecourses.nptel.ac.in/noc19_cs46/preview 3. https://onlinecourses.nptel.ac.in/noc20_cs60/preview Weblink to Equivalent Virtual Lab if relevant: 1. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=3EJlovevfcA 2. https://www.youtube.com/watch?v=U2T_LCdO14Y 3. https://www.youtube.com/watch?v=7wj7UEdLI6U			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Theory	Course Code:109206/ 110206/ 112206/123206/ 134206/135206	Course Title: Relational Database Management System (RDBMS)	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Practical: Laboratory on DS and RDBMS

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109207/ 110207/ 112207/123207/ 134207/135207/138207	Laboratory on DS and RDBMS	2	60	4Hrs.	50

Course Objectives:	1. To develop coding and understanding of database management system 2. To understand how a real world problem can be solved using the concept of DBMS and DS 3. To solve different DS and RDBMS real world problems & to learn its applications.
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Be able to design and analyze the time and space efficiency of the data structure. 2. Be capable to identify the appropriate data structure for given problem. 3. Have practical knowledge on the applications of data structures 4. Ability to implement linear and non-linear data structure operations using C programs 5. Ability to solve problems implementing appropriate data structures 6. Ability to implement sorting and searching algorithms using relevant data structures

Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1. Design Program to find sum of N number 2. Design Program to find factorial of N 3. Design Program to find greatest amongst three given number 4. Implementation of traversing technique in array 5. Implementation of insertion technique in array 6. Implementation of deletion technique in array 7. Implementation of PUSH and POP operations on stack. 8. Implementation of insertion and deletion technique in queue 9. Implementation of List data structure using i) array ii) singly linked list. 10. Implementation of recursive technique for finding factorial of an integer. 11. Implement stack using i) array ii) singly linked list 12. Implement Queue using i) array ii) singly linked list 13. Implementation of data insertion in Binary Search trees			Use any pedagogical technique suitable for the topic

14. Implementation of data deletion in Binary Search trees 15. Implementation of search in Binary Search trees 16. Implementation of Linear search 17. Implementation of Binary Search using arrays. 18. Implementation of Bubble sort 19. Implementation of Selection sort 20. Implementation of Insertion sort 21. Illustrate use of DDL commands 22. Illustrate SELECT command by using of possible clauses 23. Illustrate use EXIST, LIKE, IS NULL, IN operators. 24. Illustrate Joins and its types 25. Illustrate queries by using possible inbuilt Character, Number, Date Functions 26. Illustrate queries by using possible Group Functions 27. Write PL/SQL code to create Cursor 28. Write PL/SQL to create Simple Function 29. Write PL/SQL code illustrating loop 30. Write PL/SQL code illustrating conditional controls. 31. Write PL/SQL code to create Triggers 32. Illustrate use of Row Level and Statement level Trigger			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)				
Practical	Course Code: 109207/ 110207/ 112207/123207/ 134207/135207/138207	Laboratory on DS and RDBMS	Max Marks: 25	Time: 4 Hrs.
Sr. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Practical	Course Code: 109207/ 110207/ 112207/123207/ 134207/135207/138207	Laboratory on DS and RDBMS	Max Marks: 25
Sr. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

IKS –Major Specific: IKS in Computational Sciences

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109208/ 110208/ 112208/123208/ 134208/135208/138208	IKS in Computational Sciences	2	30	2 Hrs.	30

Course Objectives:	1. To sensitize the students about context in which they are embedded i.e. Indian Culture and civilization including its Knowledge System and Tradition. 2. Familiarize with the key components of the IKS 3. Know the phonetical foundations in Sanskrit Language. 4. Understand how to measures for time, length and weight were in use in Ancient India. 5. Identify the root of Modern-day binary system.					
Course Outcomes:	Students will be able to - 1. Understanding of the key concepts and principles of the Indian knowledge system. 2. Appreciate the potential Sanskrit offers in Natural Language Processing. 3. Understand how measures, time, length and weight were in use in Ancient India. 4. Understand specific contribution in Arithmetic and Geometry. 5. Demonstrate the aspect of Indian Mathematics.					
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies		
Unit I	Importance of Ancient knowledge, Defining Indian Knowledge System, The IKS Corpus-A Classification Framework, Caturdasa –vidyasthana. History of IKS, Unique Aspects of IKS. Components of a Language, Sanskrit Grammar and Phonetics in Sanskrit.	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic		
Unit II	Computational Concept in Astaddhyayi, Role of Sanskrit in Natural Language Processing. IKS in science, engineering and technology - Introduction to ancient Indian mathematics, importance of mathematics in ancient time, great Indian mathematician and their contribution, number system and its significance, concept of algebra, arithmetic and geometry.	7 Hrs.	7 Marks			

Unit III	Number System in India – Historical Evidence, Salient Features of the Indian Numeral. Concept of Zero and its importance, Large Numbers and their Representation, Place value of Numerals, Decimal Number System, Approaches to represent Numbers,	8 Hrs.	8 Marks	
Unit IV	Measurements for Time, Distance and Weight Unique Aspect of Indian Mathematics, Great Mathematicians and their Contributions, Arithmetic- Square of Number, Square Root, Series and Progressions. Value of Pi (π). Algebra, Binary Mathematics. Magic Squares in India.	7 Hrs.	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Introduction to IKS Concept and Application by Prof B Mahadevan, V R Bhat and Nagendra Pavana R N, PHI Publication. References: 1. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008. 2. Banerjea, P. (1916), Public administration in ancient India, Macmillan, London. 3. Kautilya Arthasastra by Dr. R P Kangle, second edition, 1969, reprint in 2000 by Motilal Banarsi Dass Publishers Private Limited, Delhi. 4. L. N.Rangarajan- Kautilya Arthashastra (English), Penguin Books India (P) Ltd, 1992. Web link: 1. https://iksindia.org/ 2. https://iksindia.org/lectures-and-videos.php 3. https://mmc.ugc.ac.in/Home/Indian_Knowledge_System			

Assessment Rubric: Internal for IKS (Major Specific) Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Theory	Course Code: 109208/ 110208/ 112208/123208/ 134208/135208/138208	Course Title: IKS in Computational Sciences	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Minor Theory: Data Structure and RDBMS

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109261/ 110261/ 112261/123261/ 134261/135261/138261	Data Structure and RDBMS	2	30	2 Hrs.	30

Course Objectives:	1. To provide the knowledge of basic of Data Structure 2. To understand importance of Algorithms 3. To understand importance of different steps of algorithm in Computer Science 4. To understand the Data Structure concepts 5. Discuss Database management systems, databases and its applications 6. Familiarize the students with a good formal foundation on the relational model. 7. Outline the various systematic database design approaches 8. Familiarize with SQL, a basic language of database and enhance the skill to perform the queries by using functions.			
Course Outcomes:	Students will be able to - 1. Learn the basic types for data structure, implementation and application. 2. Know the strength and weakness of different data structures. 3. Use the appropriate data structure in context of solution of given problem. 4. Understand the fundamental concepts of Database. 5. Knowledge and ability to implement Normalization. 6. Understand the role and responsibility of Database Administrator, 7. Familiar with SQL, a basic language of database and enhance the skill to perform the queries by using functions.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Data structure: Introduction to data structure, Types of data structure: Primitive and Non-primitive, Linear and Non-linear data structure, Data structure operations. Array: Definition and concepts, Memory Representations, Operations: Traversing, Insertion,	8 Hrs.	8 Marks	Use any pedagogical

	Deletion.			technique suitable for the topic
Unit II	Stacks: Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion. Queue: Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion. Types of Queue.	7 Hrs.	7 Marks	
Unit III	Introduction to Database: Data, Information, Characteristics of Database, Need of database, and Relational Model. Architecture of DBMS, DBA and its Role, Structured Query Language (SQL): Introduction, features, characteristics, advantages, data types, operators, Components of SQL: DDL, DML, DCL and TCL commands, select statement with clauses (Order By, Group By, Having, Where)	8 Hrs.	8 Marks	
Unit IV	Constraint: Data constraints and its type. Operations on Table with constraints. Snapshot, Views: Need, advantage & types. Index: Need, types and advantages, Joins and Union of Tables and its types. In-built Functions: Character Functions, Number Functions, Date Functions, Group Functions, and Conversion Functions, Use of alias, Null, NVL, sub queries.	7 Hrs.	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Data Structures, Seymour Lipschutz, Schaum's Outlines Series, Tata McGraw-Hill. 2. Text Book of Computer Science (Data Structure and C++): S. D. Pachpande, R. B. Ghayalkar and Athar Iqbal, Dnyanpath Publication. 3. SQL, PL/SQL Programming – Ivan Bayross (BPB) 4. SQL A Complete Reference, Alexis Leon, Mathews Leon (Tata McGraw Hill) Reference Books: 1. Fundamentals of Data Structures in C, Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed. W.H. Freeman and Company. 2. Data Structure and Algorithms: Aho, Hopcroft, Ulman 3. Introduction to Data Structure: Bhagat Singh, Thomas L Naps 4. Database Management System 3rd Ed. by Raghu Ramakrishnan and <i>Johannes Gehrke</i> 5. Oracle PL/SQL Language Pocket Reference, 5E: A Guide to Oracle's Pl/SQL Language Fundamentals. by Steven Feurstein, Bill Pribyl and Chip Dawes (O'REILLY) Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/cec22_cs19/ 2. https://onlinecourses.nptel.ac.in/noc22_cs92/ 3. https://onlinecourses.nptel.ac.in/noc22_cs70/			

	4. https://onlinecourses.swayam2.ac.in/cec19_cs05/preview 5. https://onlinecourses.nptel.ac.in/noc19_cs46/preview 6. https://onlinecourses.nptel.ac.in/noc20_cs60/preview Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=RBSGKIAvoiM 2. https://www.youtube.com/watch?v=zg9ih6SVACc 3. https://www.youtube.com/watch?v=3EJlovevfcA 4. https://www.youtube.com/watch?v=U2T_LCdO14Y 5. https://www.youtube.com/watch?v=7wj7UEdLI6U
Model Questions:	

Assessment Rubric: Internal for Data Structure and RDBMS (Minor Specific) Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Theory	Course Code: 109261/ 110261/ 112261/123261/ 134261/135261/138261	Course Title: Data Structure and RDBMS	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

Minor Practical: Laboratory on Data Structure and RDBMS

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109262/ 110262/ 112262/123262/ 134262/135262/138262	Laboratory on Data Structure and RDBMS	2	60	4Hrs.	50

Course Objectives:	1. To develop coding and understanding of database management system 2. To understand how a real world problem can be solved using the concept of DBMS and DS 3. To solve different DS and RDBMS real world problems & to learn its applications.			
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Be able to design and analyze the time and space efficiency of the data structure. 2. Be capable to identify the appropriate data structure for given problem. 3. Have practical knowledge on the applications of data structures 4. Ability to implement linear and non-linear data structure operations using C programs 5. Ability to solve problems implementing appropriate data structures 6. Ability to implement sorting and searching algorithms using relevant data structures			
Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Design Program to find sum of N number 2. Design Program to find factorial of N 3. Design Program to find greatest amongst three given number 4. Implementation of traversing technique in array 5. Implementation of insertion technique in array 6. Implementation of deletion technique in array 7. Implementation of PUSH operations on stack. 8. Implementation of POP operations on stack. 9. Implementation of insertion technique in queue 10. Implementation of deletion technique in queue 11. Illustrate use of DDL commands 12. Illustrate SELECT command by using of possible clauses 13. Illustrate use EXIST, LIKE, IS NULL, IN operators.			Use any pedagogical technique suitable for the topic

	14. Illustrate Joins and its types 15. Illustrate queries by using possible inbuilt Character, Number, Date Functions 16. Illustrate queries by using possible Group Functions			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)				
Practical	Course Code: 109262/ 110262/ 112262/123262/ 134262/135262/138262	Laboratory on DS and RDBMS	Max Marks: 25	Time: 4 Hrs.
Sr. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Practical	Course Code: 109262/ 110262/ 112262/123262/ 134262/135262/138262	Laboratory on DS and RDBMS	Max Marks: 25
Sr. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

GOEC Theory 5: E Content Development

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109275/ 110275/ 112275/123275/ 134275/135275/138275	E Content Development	2	30	2 Hrs.	30

Course Objectives:	1. Understand the fundamentals of e-content development. 2. Learn about instructional design principles. 3. Explore various multimedia tools for e-content creation. 4. Develop interactive and engaging digital learning materials. 5. Assess the quality and effectiveness of e-content.			
Course Outcomes:	Students will be able to - 1. Developing e-content for specific learning management systems (LMS): Integrating e-content with the features of a particular LMS platform. 2. Understanding the role of technology in e-learning: Exploring emerging trends like gamification, artificial intelligence, and adaptive learning in e-content development. 3. Project management skills: Planning, organizing, and executing e-content development projects within timelines and budget constraints.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to E-Content Development: Definition, Importance, and Scope of E-Content, Types of E-Content: Text, Audio, Video, Animation, Interactive Modules, Benefits and Challenges in E-Content Development, Role of E-Content in Higher Education and Training. Instructional Design for E-Content: Learning Theories and Pedagogical Models, ADDIE (Analysis, Design, Development, Implementation, Evaluation) Model, Bloom's Taxonomy for Digital Learning, Principles of Effective Instructional Design.	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic

Unit II	Tools and Technologies for E-Content Development: Authoring Tools: Articulate Storyline, Adobe Captivate, iSpring, H5P, Video Editing Tools: Camtasia, Adobe Premiere Pro, OpenShot, Audio Editing Tools: Audacity, Adobe Audition, Animation and Infographics: Canva, Powtoon, Vyond, Learning Management Systems (LMS): Moodle, Google Classroom. Multimedia Integration in E-Content: Principles of Multimedia Learning, Creating Engaging Visual Content, Audio Narration and Voiceovers, Interactive Elements: Quizzes, Simulations, and Gamification, Accessibility Considerations in E-Content.	7 Hrs.	7 Marks	
Unit III	E-Content Development Process: Content Planning and Storyboarding, Scripting and Designing Interactive Modules, Content Development and Testing, Publishing and Hosting E-Content (SCORM, HTML5, MP4 Formats).	8 Hrs.	8 Marks	
Unit IV	Evaluation and Quality Assurance in E-Content: Usability Testing and User Feedback, Assessment Strategies for Digital Learning, Standards and Best Practices (SCORM, xAPI, WCAG), Improving Engagement and Retention through Analytics. Emerging Trends in E-Content Development: AI and Machine Learning in E-Learning, Augmented Reality (AR) and Virtual Reality (VR) in Digital Education, Microlearning and Mobile Learning, Cloud-Based Learning Platforms.	7 Hs.	7 Marks	
References :	Course Material/Learning Resources Reference Books: 1. E-Learning and the Science of Instruction – Ruth Colvin Clark & Richard E. Mayer 2. Designing Effective Instruction – Gary R. Morrison, Steven M. Ross, Jerrold E. Kemp, and Howard Kalman 3. E-Content: Technologies and Perspectives for the European Market – P. Belfiore & F. Tiscar 4. Multimedia Learning – Richard E. Mayer 5. The Principles of Beautiful Web Design" – Jason Beaird & James George 6. Digital Media Tools – Nigel Chapman & Jenny Chapman 7. Teaching in a Digital Age – A.W. (Tony) Bates (Available online for free) 8. Learning Management System Technologies and Software Solutions for Online Teaching– Terry Anderson 9. Moodle 4 Administration – Alex Büchner Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/cec20_ge31/preview 2. https://onlinecourses.swayam2.ac.in/ntr22_ed05/preview 3. https://onlinecourses.nptel.ac.in/noc19_ge27/preview			

	4. https://onlinecourses.swayam2.ac.in/ntr21_ed50/preview Weblink to Equivalent Virtual Lab if relevant: 1. https://www.vlab.co.in/ 2. https://concord.org/ Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/playlist?list=PLcsj1x9n9h4gk2xxMdNWluAoGj9EPoFAv 2. https://www.youtube.com/playlist?list=PLt_wlo40Ef554qp2xM-vS1e19DQUcStdP
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Assessment Rubric: Internal for E Content Development (GOEC) Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Theory	Course Code:109275/ 110275/ 112275/123275/ 134275/135275/138275	Course Title: E Content Development	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

VSC: Laboratory on MySQL

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109284/ 110284/ 112284/ 123284/ 134284/135284/138284	Laboratory on MySQL	2	60	4Hrs.	50

Course Objectives:	1. Get Familiar with Relational Database and MySQL. 2. Able to Create various Relational Database and Operations over it. 3. Prepare queries by using inbuilt functions.			
Course Outcomes:	On competition of the following syllabus the students will be able to - 1. To design and implement on Relational Database Management System. 2. To design and operate various commands of MySQL. 3. To prepared and execute PL/SQL programs on MySQL			
Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Demonstrate the DDL Commands. (Create, Alter, Drop, Rename) 2. Demonstrate the DML Commands. (Select, Insert, Delete, Update) 3. Demonstrate SELECT commands by using the clauses. (Having, Group By, Where, Order By). 4. Demonstrate the use of Operators. (EXIST, LIKE, IS NULL, IN) 5. Demonstrate the following Joins – (Self, Equi. Outer) 6. Demonstrate the following Character Function. (LOWER, UPPER, INITCAP, CONCAT, LENGTH, SUBSTR, TRIM, REPLACE, LPAD, RPAD) 7. Demonstrate the Numeric Function. (SQUARE ROOT, SINE, MODULUS, CEIL, FLOOR, POWER, ROUND, TRUNCATE, GREATEST, LEAST) 8. Demonstrate the DATE function, (Add month function, Last_day function, Months_between function, Next_function). 9. Demonstrate the Group Function. (COUNT, DISTINCT, MAX, MIN, AVG, SUM) 10. Write PL/SQL code to create Cursor. (IMPLICIT CURSOR, EXPLICIT CURSOR) 11. Write PL/SQL Code to create Simple Function. 12. Write PL/SQL code to demonstrate Loop- a. If Condition Then Statement b. If Condition Then Else Statement			Use any pedagogical technique suitable for the topic

	c. If Condition Elseif Condition Else Statement 13. Write PL/SQL code to demonstrate Conditional Controls 14. Write PL/SQL code to create Trigger. 15. Write PL/SQL code to demonstrate commands on Triggers. (Insert, Update)			
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Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Practical	Course Code: 109284/ 110284/ 112284/123284/ 134284/135284/138284	Laboratory on MySQL	Max Marks: 50
Sr. No.	Assessment Criteria	Marks	
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout	20	
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester	10	
3.	Attendance in practical session / Students' overall performance	10	
4.	Internal Viva Voce	10	

**Field Project / Community Engagement Services in Computer Science (112)/Information Technology (123)/
Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data
Science and Analytics (135)/ Web Designing and Development (138): Phase-I**

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	109291/ 110291/ 112291/123291/ 134291/135291/138291	Field Project / Community Engagement Services in Computer Science (112)/Information Technology (123)/ Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Designing and Development (138): Phase-I	2	60	--	50

Course Objectives:

- To develop a sense of social responsibility among students.
- To foster civic values and the spirit of community service.
- To provide practical experience in addressing societal issues.
- To encourage students to work collaboratively with community members and organizations.
- To enhance critical thinking, problem-solving, and leadership skills through real-world application.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To enable students to apply theoretical/practical Computer Science/Application/Engineering concepts in real-life challenges, enhancing the quality of experiential learning.
- To give exposure to the students about the development of relation between rural communities and Computer Technology
- To study the Computer Technology driven solutions for local problems

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Develop problem-solving and critical thinking abilities by social activities and services to real-world situation.
- Critically evaluate information and conclusions based on the analysis and interpretation of data collected during the project.

- Contribute the knowledge to the social cause by understanding the societal problems and deriving the solution for the same
- Gain valuable experience and skills in a relevant field.
- Gain efficiency in written and oral communication through activity reports, presentations and discussions.
- Work effectively as part of a team to achieve social responsibility.
- Understand the importance of Computer Technology in various rural area problems.
- Build connections with local communities and learn from traditional knowledge.
- Identify Computer Technology related challenges (Lack of Technological Knowledge, non-availability of infrastructure, ICT problem, etc.) and provide the solution/ corrective measure to the concerning authority.

Guidelines/ SoP for FP/CEP

For understanding key principles of CE, forms of CE, operational guidelines and implementation strategy please refer https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf

As per NEP 2020, students of B Sc. II of Semester III need to perform a Field Project (FP) for TWO (2) credits i.e. 50 Marks.

The guidelines regarding the field project are as follows:

1. Students must complete 60 hours of field engagement.
2. Work may be done individually or in groups of up to 4 students, each under a departmental faculty guide.
3. A survey or sample collection methodology must be chosen, with appropriate documentation tools: questionnaires, datasheets, plant specimen formats, etc.
4. Projects can be survey-based, experimental, observational, or intervention-based.
5. **Final report to include:** Title, Introduction, Materials & Methods, Results, Discussion, Conclusion, References.
6. Minimum 6 pages excluding cover page, certificate, acknowledgement, etc.
7. Poster/PPT presentation is mandatory and will be evaluated by an appointed examiner.
8. For a SURVEY based project related questionnaire (15 or more questions) shall be prepared.
9. The departmental coordinator/guide shall check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative.
10. If the project is related to work that does not involve survey work, then the questionnaire part can be replaced accordingly (e.g. Sample collection/Data collection/ Experimental base etc.).
11. The total project work including preparation of questionnaire to presentation should be evaluated for 2 credits (50 Marks).

**SUGGESTED FORMS OF COMMUNITY-ENGAGED PRACTICE IN COMPUTER SCIENCE (112)/INFORMATION TECHNOLOGY (123)/
COMPUTER APPLICATION (REGULAR) (109)/ COMPUTER APPLICATION (VOCATIONAL) (110)/DATA ANALYTICS (134)/DATA
SCIENCE AND ANALYTICS (135)/ WEB DESIGNING AND DEVELOPMENT (138)**

Community Engagement Services (CES) in Computer Science involve using technology and digital tools to connect, involve, and empower communities. This can encompass various activities, from developing online platforms for community interaction to using data analysis to understand community needs and informed decision-making. CES in Computer Science aims to bridge the digital divide, promote digital literacy, and foster collaboration between communities and organizations.

Here's a more detailed look at CES in Computer Science:

Students have to choose any one of the following as the Community Engagement Services. Programmes may be interdisciplinary, integrating knowledge from various fields such as social sciences, health, education, environmental studies, etc.

1) Teaching

- Basics of Computers, MS Office and internet
- Cyber security and cyber crime
- Applications of statistics in real life
- Introduction to Statistical Software (Excel)
- Online digital services

2) Services

- Digital Banking and Online Payments
- Basic software installation
- E-Governance and Digital Services
- Health Awareness Using Digital Tools
- Online digital services and literacy

3) Data Collection and Survey

- Utilization of government community empowerment schemes.
- IT infrastructure in India
- Cyber and forensic investigation in India, Etc.

Note: Students must have to perform activities from above heads to complete 60 hours of community engagement and services

Key Benefits of CES in Computer Science:

- **Increased Community Participation:**
CES can make it easier for community members to participate in decision-making processes and contribute to their community's development.
- **Improved Communication:**
Online platforms and digital tools can facilitate better communication and information sharing within communities.
- **Enhanced Collaboration:**
CES can foster collaboration between community members, organizations, and local governments.
- **Empowered Communities:**
By providing access to information, resources, and technology, CES can empower communities to address their own needs and shape their future.
- **Greater Social Impact:**
CES can contribute to positive social change by addressing critical community needs and promoting civic engagement.

Assessment Rubric for FP/CEP: Phase -I**SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
B.Sc. II, SEMESTER – III (NEP)**

FP/CEP	109291/ 110291/ 112291/123291/ 134291/135291/138291	Field Project / Community Engagement Services in Computer Science (112)/Information Technology (123)/ Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Designing and Development (138): Phase-I	Max Marks: 50
Q. No.	Exercise		Marks
1	Field Engagement & Participation (Attendance, hands-on involvement, and community interaction)		15
2	Project Report Quality (Clarity, structure, scientific accuracy, originality, and referencing)		15
3	Data Collection & Analysis (Depth, relevance, and quality of survey/sample collection and its analysis)		10
4	Presentation (Poster or PPT) (Communication of findings, visual clarity, and confidence)		05
5	Social Relevance & Innovation (Creative solutions, awareness campaigns, or community impact beyond data.)		05

SYLLABUS

B.Sc.- II, SEMESTER – IV

B.Sc. Computer Science (112)

Information Technology (123)

Computer Application (Regular) (109)

Computer Application (Vocational) (110)

Data Analytics (134)

Data Science and Analytics (135)

Web Designing and Development (138)

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major: Computer Science (112)/Information Technology (123)/Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Designing and Development (138)

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Major Course: OOP with C++

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109209/110209/ 112209/123209/ 134209/135209/ 138209	OOP with C++	2	30	2 Hrs	30

Course Objectives:	1. To understand the concepts of object-oriented paradigm 2. To understand the C++ language features for OOP 3. Apply object-oriented concepts in programming 4. Use object-oriented thinking in problem-solving 5. Able to differentiate structure oriented programming and object oriented programming. 6. Able to understand and apply various object oriented features. 7. Able to know concepts in operator overloading, function overloading & polymorphism.						
Course Outcomes:	1. Understanding of fundamental principles of OOP, including concepts like classes, objects, inheritance, polymorphism, encapsulation 2. Understanding of how to apply OOP concepts effectively within the C++ programming language 3. Design and develop structured, reusable, and modular code by creating well-defined classes and objects to solve complex problems.						
Unit System	Contents	Workload Allotted			Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	OOP Paradigm: Basic Concepts, Features, Advantages, Applications of OOP, Structured Vs OOP, Trending OOP Languages.	8 Hrs			8 Marks	Use any pedagogical	

	OOP Concepts- Data Abstraction and Encapsulation: Classes and Objects Introduction, Defining a Class,			technique suitable for the topic
Unit II	Functions: Function Prototype, Inline Function, Default Argument, Function Overloading, Constructors: Types of Constructors: Default, Parameterized and Copy Constructor	7 Hrs	7 Marks	
Unit III	Functions and Objects: Access Specifiers, Memory Allocation for Objects, Objects as Function Arguments, Returning Objects from Functions. Inheritance: Definition, Types of Inheritance: Single, Multiple, Hierarchical, Multilevel, Hybrid, Visibility Modes	8 Hrs	8 Marks	
Unit IV	Polymorphism: Compile Time, Run Time, Virtual Base Classes, Virtual Functions, Pure Virtual Functions, Early Binding and Late Binding. Function Overriding, Operator Overloading, Overloading Unary and Binary Operator, Rules for Overloading.	7 Hrs	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Object oriented programming with C++: E. Balagurusamy Reference Books: 1. The Object-Oriented Thought Process, 5th Edition by Matt Weisfeld 2. An Introduction to Object-Oriented Programming: Timothy Budd 3. The C++ programming language: Bjarne Stroustrup 4. Programming principles and Practice using C++: Bjarne Stroustrup Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/noc21_cs02/preview 2. https://www.classcentral.com/course/swayam-programming-in-c-6704 3. https://www.coursera.org/learn/cplusplus-crypto-i 4. https://www.mygreatlearning.com/academy/learn-for-free/courses/oops-concepts-in-c 5. https://www.coursera.org/courses?query=object%20oriented%20programming 6. https://www.classcentral.com/course/freecodecamp-object-oriented-programming-oop-in-c-course-104967 7. https://unacademy.com/goal/computer-science/VTQXS/free-platform/object-oriented-programming-in-c/TKNQJ 8. https://www.udemy.com/course/c-programming-oops-concepts/?srsltid=AfmBOOpd-ae-k0vN2Q5HR8HWNZKLKxN1jBPrld4RqxQ8vbpg91bFp6L5&couponCode=ST3MT200225A 9. https://www.edx.org/learn/object-oriented-programming/ibm-object-oriented-implementation-using-c			

	Weblink to Equivalent Virtual Lab if relevant: 1. https://www.programiz.com/cpp-programming/online-compiler/ 2. https://www.onlinegdb.com/online_cplusplus_compiler 3. https://onecompiler.com/cpp 4. https://www.codechef.com/cpp-online-compiler
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Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER-IV (NEP)			
Theory	Course Code: 109209/110209/ 112209/123209/ 134209/135209/138209	Course Title: OOP with C++	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course: Computer Networks

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109210/110210/ 112210/123210/ 134210/135210/138210	Computer Networks	2	30	2 Hrs	30

Course Objectives:	1. To provide the knowledge of basic of Computer Network. 2. To understand importance of OSI model in Computer Networking. 3. To understand importance of Network Devices and Network Topology. 4. To understand the concepts of Internet and Email Services.						
Course Outcomes:	Students will be able to - 1. Define Computer Networks, its types and Network Topologies. 2. Define Network Devices and OSI Model. 3. Introduce about data Transmission Media, Switching and Multiplexing. 4. Define Internet and E-mail System						
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies			
Unit I	Introduction to Networking: Introduction, Need of Computer Network, Communication Protocol, Types of Networks: LAN, MAN, WAN Network Topology: Ring, Bus, Star & Mesh.	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic			
Unit II	Network Devices: Repeater, Hub, Switch, Bridge, Router OSI Reference Model: Introduction, OSI Model, Functions of seven layers of OSI.	7 Hrs	7 Marks				
Unit III	Data Transmission Media: Guided Media (Twisted pair, Coaxial, Fiber Optics) and Wireless media (Radio Waves, Micro Waves, Infrared). Switching: Circuit, Message, Packet. Multiplexing: Frequency Division, Time Division	8 Hrs	8 Marks				
Unit IV	Internet: History, Applications of Internet, Types of Internet Connection: wired and wireless. Internet Protocols: TCP/IP, FTP, HTTP, URL, E-mail Address, WWW, Web Browsers, Search Engines.	7 Hrs	7 Marks				

References:	Course Material/Learning Resources Text books: 1. Computer Networks (Fourth Edition) - Andrew S. Tanenbaum (PHI) 2. Data Communications and Networking, 4th Edition, Behrouz A Forouzan. McGraw-Hill 3. Computer Networking; A Top Down Approach Featuring The Internet, 2nd Edition, Kurose James F., Ross W. Keith PEARSON EDUCATION ASIA Reference Books: 1. Business Data Communication & Networking (fifth edition) – Fitzerland & Dennis. 2. Data and Computer Communication – William Stallings (Pearson) 3. Data Communication and Networking – Behrouz A. Forouzan (McGraw Hill) 4. Computer Network & Internet - Douglas E. Comer (Pearson) Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/ntr25_ed44/ 2. https://onlinecourses.nptel.ac.in/noc25_cs02/ 3. https://onlinecourses.nptel.ac.in/noc25_cs15/
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Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER-IV (NEP)			
Theory	Course Code: 109210/110210/ 112210/123210/ 134210/135210/138210	Course Title: Computer Networks	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

Major Course: Python Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109211/110211/ 112211/123211/ 134211/135211/138211	Python Programming	2	30	2 Hrs	30

Course Objectives:	1. To understand the fundamentals of the Python programming language 2. To develop problem-solving skills using Python. 3. To learn modular programming through functions, parameter passing techniques, exception handling, and the use of built-in modules in Python. 4. To perform string manipulation and implement Python programs						
Course Outcomes:	Students will be able to - 1. Describe the core syntax and semantics of Python programming language. 2. Discover the need for working with the strings and functions. 3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets. 4. Indicate the use of regular expressions and built-in functions						
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies			
Unit I	Introduction: History of Python Programming Language, Thrust area of Python, Installing Anaconda Python Distribution, Installing PyCharm IDE to setup a Python Development Environment, Creating and running your first Python Project. Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity.	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic			
Unit II	Data Types, Indentation, Comments, Reading Input, Printing Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language. Control Flow Statements: The if, if-else, if-elif-else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements.	7 Hrs	7 Marks				
Unit III	Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments	8 Hrs	8 Marks				
Unit IV	Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in	7 Hrs	7 Marks				

	String by Index Number, String Slicing and Joining,			
References :	Course Material/Learning Resources Text books: 1. “Introduction to Python Programming”, 1st Edition, by Gowrishankar S, Veena A Reference Books: 1. “Python Data Science Handbook: Essential Tools for Working with Data”, by Jake VanderPlas, 2. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems”, by Aurelien Geron 3. “Core Python Applications Programming”, 3rd Edition, by Wesley J Chun education. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview 2. https://onlinecourses.nptel.ac.in/noc19_cs40/preview 3. https://www.classcentral.com/course/swayam-python-for-data-science-14266 Weblink to Equivalent Virtual Lab if relevant: 1. https://python-iitk.vlabs.ac.in/ 2. http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/index.html 3. https://www.vlab.co.in/broad-area-computer-science-and-engineering Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=daefaLgNkw0 2. https://www.youtube.com/watch?v=W8KRzmHUcc 3. https://www.youtube.com/watch?v=gfDE2a7MKjA			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER-IV (NEP)			
Theory	Course Code:109211/110211/ 112211/123211/ 134211/135211/138211	Course Title: Python Programming	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Practical: Laboratory on OOP with C++

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109212/110212/ 112212/ 123212/ 134212/135212/138212	Laboratory on C++ and Python Programming	2	60	4Hrs	50

Course Objectives:	1. To learn the syntax and semantics of the C++ programming language. 2. To understand the concept of data abstraction and encapsulation. 3. Perform programs on OOPs using C++ 4. Perform programs on functions, constructor and destructor. 5. To learn how to overload functions and operators in C++ 6. Understand and implement concept of Inheritance. 7. To learn how to design C++ classes for code reuse. 8. To implement Python programs with conditionals and loops. 9. Use functions for structuring Python programs. 10. Represent compound data using Python lists, tuples, and dictionaries.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Able to write, compile and debug programs in C++ language. 2. Design programs involving constructors, destructors. 3. Able to use C++ classes and class libraries, arrays and pointers 4. Able to use Python programs with conditionals and loops. 5. Able to use functions for structuring Python programs. 6. Able to compound data using Python lists, tuples, and dictionaries.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

	List of Practical: 1. Write a program in C++ to demonstrate Class and Object. 2. Write a program in C++ to demonstrate constructor and destructor. 3. Write a program in C++ to demonstrate Inline function. 4. Write a program in C++ to demonstrate the use of friend function. 5. Write a program in C++ for default argument. 6. Write a program in C++ for unary operator overloading. 7. Write a program in C++ for Binary operator overloading. 8. Write a program in C++ for function overloading. 9. Write a program in C++ for virtual base class. 10. Write a program in C++ to implement single Inheritance. 11. Write a program in C++ to implement multiple Inheritance. 12. Write a program in C++ to implement multilevel Inheritance. 13. Write a program in C++ to implement hybrid Inheritance. 14. Write a program in C++ to implement hierarchical Inheritance. 15. Write a program in C++ for constructor overloading. 16. Write a program in C++ to implement parameterized constructor 17. Write a program in C++ to implement copy constructor 18. Write a program to demonstrate different number data types in python. 19. Write a Python program to perform different arithmetic operations on numbers. 20. Write a Python Program for checking whether the given number is an even number or not. Using a for loop. 21. Write a Python program using a while loop that asks the user for a number, and prints a countdown from that number to zero. 22. Write a Python program to demonstrate if-elif-else statement 23. Write a Python program to demonstrate nested if- else statement 24. Write a program to create, concatenate and print a string and accessing substring from a given string. 25. Write a Python program to check if a substring is present in a given string.			Use any pedagogical technique suitable for the topic
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References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.programiz.com/cpp-programming/online-compiler/ 2. https://www.onlinegdb.com/online_cplusplus_compiler 3. https://onecompiler.com/cpp 4. https://www.codechef.com/cpp-online-compiler 5. https://www.w3schools.com/cpp/cpp_compiler.asp 6. https://www.tutorialspoint.com/compile_cpp_online.php 7. https://nextleap.app/online-compiler/cpp-programming 8. https://www.jdoodle.com/online-compiler-cplusplus			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)				
Practical	Course Code: 109212/ 110212/ 112212/123212/ 134212/135212/138212	Laboratory on C++ and Python Programming	Max Marks: 25	Time: 4 Hrs.
Sr. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Practical	Course Code: 109212/ 110212/ 112212/123212/ 134212/135212/138212	Laboratory on C++ and Python Programming	Max Marks: 25
Sr. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Minor Course: C++ and Python Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109263/110263/ 112263/123263/ 134263/135263/138263	C++ and Python Programming	2	30	2 Hrs	30

Course Objectives:	After completion of this course student will be able to: 1. To understand the concepts of object-oriented paradigm 2. To understand the C++ language features for OOP 3. Apply object-oriented concepts in programming 4. Use object-oriented thinking in problem-solving 5. Able to differentiate structure oriented programming and object oriented programming. 6. Able to understand and apply various object oriented features. 7. To understand the core syntax and semantics of Python programming language. 8. To understand the working with functions. 9. To understand the concepts of lists, dictionaries						
Course Outcomes:	1. Understanding of fundamental principles of OOP, including concepts like classes, objects, inheritance, polymorphism, encapsulation 2. Understanding of how to apply OOP concepts effectively within the C++ programming language 3. Design and develop structured, reusable, and modular code by creating well-defined classes and objects to solve complex problems. 4. Describe the core syntax and semantics of Python programming language. 5. Discover the need for working with functions. 6. Illustrate the process of structuring the data using lists, dictionaries						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	OOP Paradigm: Basic Concepts, Features, Advantages, Applications of OOP, Structured Vs OOP, Trending OOP Languages. OOP Concepts- Data Abstraction and Encapsulation: Classes and Objects, Defining a Class.				8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Functions: Function Prototype, Inline Function, Default Argument, Function Overloading,				7 Hrs	7 Marks	

	Constructors: Types of Constructors: Default, Parameterized and Copy Constructor Inheritance: Definition, Types of Inheritance: Single, Multiple, Hierarchical, Multilevel, Hybrid, Visibility Modes			
Unit III	Introduction: History of Python Programming Language, Thrust area of Python Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity. Data Types, Indentation, Comments, Reading Input, Printing Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language.	8 Hrs	8 Marks	
Unit IV	Control Flow Statements: The if, if-else, if-elif-else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements. Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters,	7 Hrs	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Object oriented programming with C++: E. Balagurusamy 2. "Introduction to Python Programming", 1st Edition, by Gowrishankar S, Veena A Reference Books: 1. The Object-Oriented Thought Process, 5th Edition by Matt Weisfeld 2. An Introduction to Object-Oriented Programming: Timothy Budd 3. The C++ programming language: Bjarne Stroustrup 4. Programming principles and Practice using C++: Bjarne Stroustrup 5. "Python Data Science Handbook: Essential Tools for Working with Data", by Jake VanderPlas, 6. "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", by Aurelien Geron 7. "Core Python Applications Programming", 3rd Edition, by Wesley J Chun 8. "Flask Web Development: Developing Web Applications with Python", 2nd Edition, by Miguel Grinberg, Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/noc21_cs02/preview 2. https://www.classcentral.com/course/swayam-programming-in-c-6704 3. https://www.coursera.org/learn/cplusplus-crypto-i 4. https://www.mygreatlearning.com/academy/learn-for-free/courses/oops-concepts-in-c 5. https://www.coursera.org/courses?query=object%20oriented%20programming 6. https://www.classcentral.com/course/freecodecamp-object-oriented-programming-oop-in-c-course-104967			

7. <https://unacademy.com/goal/computer-science/VTQXS/free-platform/object-oriented-programming-in-c/TKNQJ>
8. <https://www.udemy.com/course/c-programming-oops-concepts/?srsltid=AfmBOopd-ae-k0vN2Q5HR8HWNZKLKxN1jBPr1d4RqxQ8vbpg91bFp6L5&couponCode=ST3MT200225A>
9. <https://www.edx.org/learn/object-oriented-programming/ibm-object-oriented-implementation-using-c>
10. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview
11. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
12. <https://www.classcentral.com/course/swayam-python-for-data-science-14266>

Weblink to Equivalent Virtual Lab if relevant:

1. <https://www.programiz.com/cpp-programming/online-compiler/>
2. https://www.onlinegdb.com/online_c++_compiler
3. <https://onecompiler.com/cpp>
4. <https://www.codechef.com/cpp-online-compiler>
5. <https://python-iitk.vlabs.ac.in/>
6. <http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/index.html>
7. <https://www.vlab.co.in/broad-area-computer-science-and-engineering>

Assessment Rubric: Internal for Theory Course (Minor)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER-IV (NEP)			
Theory	Course Code:109263/110263/ 112263/123263/ 134263/135263/138263	Course Title: C++ and Python Programming	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Minor Practical: Laboratory on C++ and Python Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109264/110264/ 112264/123264/ 134264/135264/138264	Laboratory on C++ and Python Programming	2	60	4Hrs	50

Course Objectives:	1. To learn the syntax and semantics of the C++ programming language. 2. To understand the concept of data abstraction and encapsulation. 3. Perform programs on OOPs using C++ 4. Perform programs on functions, constructor and destructor. 5. To learn how to overload functions and operators in C++ 6. Understand and implement concept of Inheritance. 7. To learn how to design C++ classes for code reuse. 8. To implement Python programs with conditionals and loops. 9. Use functions for structuring Python programs. 10. Represent compound data using Python lists and dictionaries.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Able to write, compile and debug programs in C++ language. 2. Design programs involving constructors, destructors. 3. Able to use C++ classes and class libraries, arrays and pointers 4. Able to use Python programs with conditionals and loops. 5. Able to use functions for structuring Python programs. 6. Able to compound data using Python lists, tuples, and dictionaries.						
Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	

	List of Practical: 1. Write a program in C++ to demonstrate Class and Object. 2. Write a program in C++ to demonstrate the Constructor 3. Write a program in C++ to demonstrate Inline function. 4. Write a program in C++ for default argument. 5. Write a program in C++ for function overloading. 6. Write a program in C++ to implement single Inheritance. 7. Write a program in C++ to implement multiple Inheritance. 8. Write a program in C++ to implement multilevel Inheritance. 9. Write a program in C++ to implement hybrid Inheritance. 10. Write a program in C++ to implement hierarchical Inheritance. 11. Write a program to demonstrate different number data types in python. 12. Write a Python program to perform different arithmetic operations on numbers. 13. Write a Python program for checking whether the given number is an even number or not, using a for loop. 14. Write a Python program using a while loop that asks the user for a number, and prints a countdown from that number to zero. 15. Write a Python program to perform different arithmetic operations on numbers. 16. Write a Python Program for checking whether the given number is an even number or not. Using a for loop. 17. Write a Python program using a while loop that asks the user for a number, and prints a countdown from that number to zero. 18. Write a Python program to demonstrate if-elif-else statement 19. Write a Python program to demonstrate nested if- else statement			Use any pedagogical technique suitable for the topic
References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.programiz.com/cpp-programming/online-compiler/ 2. https://www.onlinegdb.com/online_cplusplus_compiler 3. https://onecompiler.com/cpp 4. https://www.codechef.com/cpp-online-compiler 5. https://www.w3schools.com/cpp/cpp_compiler.asp 6. https://www.tutorialspoint.com/compile_cpp_online.php 7. https://nextleap.app/online-compiler/cpp-programming 8. https://www.jdoodle.com/online-compiler-cplusplus			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – IV (NEP)				
Practical	Course Code: 109264/110264/ 112264/123264/ 134264/135264/138264	Laboratory on C++ and Python Programming	Max Marks: 25	Time: 4 Hrs.
Sr. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – IV (NEP)			
Practical	Course Code: 109264/110264/ 112264/123264/ 134264/135264/138264	Laboratory on C++ and Python Programming	Max Marks: 25
Sr. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

GOEC Theory 6: Web Technologies

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109276/110276/ 112276/123276/ 134276/135276/138276	Web Technologies	2	30	2 Hrs	30

Course Objectives:	1. To explain different components and technologies of World Wide Web as a platform. 2. To develop the static website using client-side programming like HTML and CSS. 3. To enable students to understand web page site planning, management and maintenance. 4. To explain the concepts of developing advanced HTML pages with the help of frames, scripting language.						
Course Outcomes:	Students will be able to - 1. Understand the fundamentals of Internet and how the web function. 2. Design a static webpage by applying HTML elements. 3. Apply CSS concepts for designing HTML web pages. 4. To acquire knowledge and skills for creation of web site considering client-side programming. 5. Understand need and purpose of Web Hosting						
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies			
Unit I	Basic Terminology of Web and Web Design Principles What is Internet, Brief History of Internet, What is World Wide Web, Client Server Architecture, Web Server Vs Web browser, Webpages, Website, How website works? Types of Websites, Domain Name Server and Uniform Resource locator, Basic principles involved in developing a web site, Five Golden rules of web designing, Web Standards and W3C recommendations	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic			
Unit II	What is HTML, Features of HTML, Basic structure of an HTML document, Basic Building blocks of HTML, Working with Lists, Tables and Frames, Working with Text and Image Hyperlinks, Images and Multimedia, Working with Forms and Controls.	7 Hrs	7 Marks				
Unit III	Concept of CSS, Need of CSS, Creating Style Sheet -Inline, External, Embedded CSS, CSS Selectors, Types of Selectors, CSS Properties -Position, Float, clear, visibility , CSS Flexbox Layout, CSS Grid Layout, CSS Styling Properties (Background, Text Format, Controlling Fonts), Working with Lists and Tables, Box Model (Border properties, Padding Properties, Margin properties, Display properties)	8 Hrs	8 Marks				

Unit IV	What is Web Hosting? Need of Web Hosting, Types of Hosting packages, Registering Domains, Defining Name Servers, Steps to host the website	7 Hrs	7 Marks	
References :	Course Material/Learning Resources Text books: 1. HTML5 and CSS3- WAN BAYROSS -BPB Publications Reference Books: 1. HTML and CSS, 5th Edition –Thomas A Powell 2. Head First HTML and CSS,2nd Edition-Elisabeth Robson and Eric Freeman –O'Reilly 3. An introduction to Web Design + Programming- Paul S Wang, Sanda S Katila Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/cec21_lb01/preview 2. https://onlinecourses.swayam2.ac.in/nou22_cs03/preview			

Assessment Rubric: Internal for Theory Course (GOEC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. II, SEMESTER-IV (NEP)			
Theory	Course Code: 109276/110276/ 112276/123276/ 134276/135276/138276	Course Title: Web Technologies	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, CaseStudy, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

VSC: Database using Access Laboratory

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109285/110285/ 112285/123285/ 134285/135285/138285	Database using Access Laboratory	2	60	4 Hrs	50

Course Objectives:	1. To understand the Working on existing database systems 2. To familiarize students with hands-on experience in designing relational databases 3. To familiarize students with hands-on experience in implementing relational databases 4. To familiarize students with hands-on experience in managing relational databases						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Understand the fundamentals of relational databases 2. Demonstrate knowledge of designing relational databases 3. Demonstrate knowledge of implementing relational databases 4. Demonstrate knowledge of managing relational databases						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Create a table (person) in access with name, phno, email-id and address. insert 10 records. Create a query to display email id, phno and address when user gives name. 2. Field Name Data type Description Class Number Section 3. Prepare a query to display all records and Name should be in ascending order. 4. Create a database named “library.mdb” and perform the following tasks: Create a table named “Book” having following structure: Field name, Field datatype, Description, Book _id Text Primary key. Book identification number Bname Text Book name Wname Text Writer’s name 5. Prepare a query named “senior” to display records including fields name, class, sec, rollno, status, photo and value of “status” field must be senior.						Use any pedagogical technique suitable for the topic

	Prepare a form of above query “senior”. 6. Prepare a query to display only records including book name, writer name and publication name. Save the query as “q_book”. 7. Prepare a query to display all records on the basis of price which is more than Rs. 500. 8. Prepare a form on the basis of table. 9. Prepare a query named “senior” to display records including fields name, class, sec, rollno, status, photo and value of “status” field must be senior. Prepare a report of all the fields of above table.2. 10. Create a table named “student info” having following table structure. Field Name Data type, Description, ClassNumber, Section, Text, Roll no Number, Name Text 40 11. Create a database named “library.mdb” and perform the following tasks: Create a table named “Book” having following structure: Field name Field datatype Description 12. Create a table named “Book” having following structure: Field name Field datatype Description Prepare a form on the basis of table. 13. Create a database named “Nepal Bank” to store information about its staffs and do the following tasks: Create a table named “staffinfo” having following table structure: Field Name, Data Type, Discription 14. Create a form on the basis of “staffinfo” table and save as “entryform”. 15. Create a Student Table in MS-Access with the following features: a. Roll Number b. Student Name c. Class d. Marks in Subject 1, Subject 2, Subject 3 e. Total f. Average g. Result 16. Create “Employee” database and table “Emp”. With following features: Empno, Ename, Designation, Deptno, DOJ, Basic Salary. Calculate DA as 40% of Basic Salary. 17. Create “Employee1” database and table “Emp1” Empno, Ename, Designation, Deptno, DOJ, Basic Salary. List all the Employees who get less than 20000 Salary. 18. Create “Course” database and “Coursedtl” table having following records:- SRollno, Sname, Course Section, Medium, College, Total Fees. Prepare the Report to display all students who are pursuing B.Sc.(Computer)			
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	19. Create a “Stock” database having “Inventory” table:- Display all the Items which has closing stock < 100. 20. Create Business table by using Design Wizard with year own data (at least 6 fields and 10 records)			
References:	Weblink to Equivalent MOOC on SWAYAM if relevant:			

Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – IV (NEP)			
Practical	Course Code: 109285/110285/ 112285/123285/ 134285/135285/138285	Database using Access Laboratory	Max Marks: 50
Sr. No.	Assessment Criteria		Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout		20
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester		10
3.	Attendance in practical session / Students’ overall performance		10
4.	Internal Viva Voce		10

Field Project / Community Engagement Services in Computer Science (112)/Information Technology (123)/ Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135)/ Web Design and Development (138): Phase-II

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	109292/ 110292/ 112292/123292/ 134292/135292/138292	Field Project / Community Engagement Services in Computer Science (112)/Information Technology (123)/ Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135) /Web Design and Development (138): Phase-II	2	60	--	50

Course Objectives:

- To develop a sense of social responsibility among students.
- To foster civic values and the spirit of community service.
- To provide practical experience in addressing societal issues.
- To encourage students to work collaboratively with community members and organizations.
- To enhance critical thinking, problem-solving, and leadership skills through real-world application.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To enable students to apply theoretical/practical Computer Science/Application/Engineering concepts in real-life challenges, enhancing the quality of experiential learning.
- To give exposure to the students about the development of relation between rural communities and Computer Technology
- To study the Computer Technology driven solutions for local problems

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Develop problem-solving and critical thinking abilities by social activities and services to real-world situation.

- Critically evaluate information and conclusions based on the analysis and interpretation of data collected during the project.
- Contribute the knowledge to the social cause by understanding the societal problems and deriving the solution for the same
- Gain valuable experience and skills in a relevant field.
- Gain efficiency in written and oral communication through activity reports, presentations and discussions.
- Work effectively as part of a team to achieve social responsibility.
- Understand the importance of Computer Technology in various rural area problems.
- Build connections with local communities and learn from traditional knowledge.
- Identify Computer Technology related challenges (Lack of Technological Knowledge, non-availability of infrastructure, ICT problem, etc.) and provide the solution/ corrective measure to the concerning authority.

Guidelines/ SoP for FP/CEP

For understanding key principles of CE, forms of CE, operational guidelines and implementation strategy please refer https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf

As per NEP 2020, students of B Sc. II of Semester IV need to perform a Field Project (FP) for TWO (2) credits i.e. 50 Marks.

The guidelines regarding the field project are as follows:

1. Students must complete 60 hours of field engagement.
2. Work may be done individually or in groups of up to 4 students, each under a departmental faculty guide.
3. A survey or sample collection methodology must be chosen, with appropriate documentation tools: questionnaires, datasheets, plant specimen formats, etc.
4. Projects can be survey-based, experimental, observational, or intervention-based.
5. **Final report to include:** Title, Introduction, Materials & Methods, Results, Discussion, Conclusion, References.
6. Minimum 6 pages excluding cover page, certificate, acknowledgement, etc.
7. Poster/PPT presentation is mandatory and will be evaluated by an appointed examiner.
8. For a SURVEY based project related questionnaire (15 or more questions) shall be prepared.
9. The departmental coordinator/guide shall check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative.
10. If the project is related to work that does not involve survey work, then the questionnaire part can be replaced accordingly (e.g. Sample collection/Data collection/ Experimental base etc.).

11. The total project work including preparation of questionnaire to presentation should be evaluated for 2 credits (50 Marks).

**SUGGESTED FORMS OF COMMUNITY-ENGAGED PRACTICE IN COMPUTER SCIENCE (112)/ INFORMATION TECHNOLOGY (123)/
COMPUTER APPLICATION (REGULAR) (109)/ COMPUTER APPLICATION (VOCATIONAL) (110)/DATA ANALYTICS (134)/DATA
SCIENCE AND ANALYTICS (135)**

Community Engagement Services (CES) in Computer Science involve using technology and digital tools to connect, involve, and empower communities. This can encompass various activities, from developing online platforms for community interaction to using data analysis to understand community needs and informed decision-making. CES in Computer Science aims to bridge the digital divide, promote digital literacy, and foster collaboration between communities and organizations.

Here's a more detailed look at CES in Computer Science:

Students have to choose any one of the following as the Community Engagement Services. Programmes may be interdisciplinary, integrating knowledge from various fields such as social sciences, health, education, environmental studies, etc.

1) Teaching

- Basics of Computers, MS Office and internet
- Cyber security and cyber crime
- Applications of statistics in real life
- Introduction to Statistical Software (Excel)
- Online digital services

2) Services

- Digital Banking and Online Payments
- Basic software installation
- E-Governance and Digital Services
- Health Awareness Using Digital Tools
- Online digital services and literacy

3) Data Collection and Survey

- Utilization of government community empowerment schemes.
- IT infrastructure in India

- Cyber and forensic investigation in India, Etc.

Note: Students must have to perform activities from above heads to complete 60 hours of community engagement and services

Key Benefits of CES in Computer Science:

- **Increased Community Participation:**

CES can make it easier for community members to participate in decision-making processes and contribute to their community's development.

- **Improved Communication:**

Online platforms and digital tools can facilitate better communication and information sharing within communities.

- **Enhanced Collaboration:**

CES can foster collaboration between community members, organizations, and local governments.

- **Empowered Communities:**

By providing access to information, resources, and technology, CES can empower communities to address their own needs and shape their future.

- **Greater Social Impact:**

CES can contribute to positive social change by addressing critical community needs and promoting civic engagement.

Assessment Rubric for FP/CEP: Phase -II

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI B.Sc. II, SEMESTER – IV (NEP)			
FP/CEP	Course Code: 109292/ 110292/ 112292/123292/ 134292/135292/138292	Field Project / Community Engagement Services in Computer Science (112)/Information Technology (123)/ Computer Application (Regular) (109)/ Computer Application (Vocational) (110)/Data Analytics (134)/Data Science and Analytics (135) /Web Design and Development (138) : Phase-II	Max Marks: 50
Q. No.	Exercise		Marks
1	Field Engagement & Participation (Attendance, hands-on involvement, and community interaction)		15
2	Project Report Quality (Clarity, structure, scientific accuracy, originality, and referencing)		15
3	Data Collection & Analysis (Depth, relevance, and quality of survey/sample collection and its analysis)		10
4	Presentation (Poster or PPT) (Communication of findings, visual clarity, and confidence)		05
5	Social Relevance & Innovation (Creative solutions, awareness campaigns, or community impact beyond data.)		05

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI



THREE YEAR UNDERGRADUATE PROGRAMME

B.Sc. Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)

Semester - V and VI

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2026-27) Under NEP 2020

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Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology (Science Group)
Board of Studies in Computer Science
(including Computer Application, Information Technology etc.)

S. N.	Name	Designation	Address
01	Dr. Swati Sherekar	Chairman	PGTD in Computer Science and Engineering, SGBAU, Amravati
02	Dr. Dineshkumar N. Satange	Member (Faculty Member)	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
03	Dr. Mohd. Atique Mohd. Junaid	Member	HoD, PGTD in Computer Science and Engineering, SGBAU, Amravati
04	Dr. Avinash Baburao Kadam	Member	Shri Shivaji Science and Arts College, Chikhali Dist. Buldana
05	Dr. Ajay Purushottam Chendke	Member	Degree College of Physical Education (HVPM), Amravati
06	Dr. Chandrashekhar H. Sawarkar	Member	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
07	Dr. Arvind A. Tayade	Member	G.S. Science Arts and Commerce College, Khamgaon Dist. Buldana
08	Prof. Sudeshkumar Chaudhari	Member	RDIK, Mahavidyalaya, Badnera Rly. Amravati.
09	Dr. Narendra M. Jathe	Member	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
10	Dr. Homraj Patelpaik	Member	Lokmanya Tilak Mahavidyalaya Wani, Dist. Yavatmal
11	Prof. Sureshkumar Mapari	Member	R. A. College, Washim.

Subcommittee appointed for drafting syllabus of B. Sc. III Sem V and VI (NEP) in B.Sc. Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)

Sr. No.	Name	Designation	Address
01	Dr. Chandrashekhar H. Sawarkar	Chairman	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
02	Dr. Mukul M. Bhonde	Member	Shri Shivaji Science College, Amravati
03	Dr. Mukti Jadhao	Member	Shri Shivaji Science and Arts College, Chikhali Dist. Buldana
04	Dr. Dipti Pethkar	Member	Shankarlal Khandelwal Mahavidyalaya, Akola
05	Dr. Santosh Chavan	Member	Shri Shivaji Arts Commerce & Science College Akola
06	Dr. Pranali Landage	Member	Degree College of Physical Education, HVPM, Amravati

Scheme- Examination, Evaluation and Assessment

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.
- d. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
- e. **Value Education Courses** to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.
- f. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University
- g. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training; Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Examination and Assessment Process:

- i. The basic principle of the Credit framework is that Credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No Credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.
- ii. Exit options are provided with Certificate, Diploma and Basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a Four Years Multidisciplinary Degree Programme. Students will receive a Bachelor's degree with Honors/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.
- iii. For the smooth success of four-year degree programme with multiple entry and exit systems, the examination mode should be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative (evaluation

of students learning at the end of an instructional unit) examination modes in line with the UGC Report on ‘Evaluation Reforms in Higher Educational Institutions (2019).

Examination, Evaluation and Assessment Scheme

The total marks for each Course shall be based on Continuous Assessment and Semester End Examination.

Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC as mentioned in **Teaching Learning Scheme** prepared by the Board of Studies Shall be evaluated as per the scheme as mentioned in the following table -

Examination, Evaluation and Assessment Scheme

Vertical No.	The Vertical	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal			
			Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
a	Major	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	25	10	25	10	50	20
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	SEC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
e	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS (Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
F	FP/CEP	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	Internship/ Apprenticeship		Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum marks of 50 per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process is prescribed for Phase I and Phase II											
	CC													

Continuous Assessment Tests (CAT)

For internal assessment, the Continuous Assessment Tests (CAT) shall be conducted as under-

- i. Three CAT each of 8 / 10 Marks (Theory) as applicable and 10 Marks (Practical).
 - First on completion of 25% Syllabus of the course or on completion of 25 teaching days,
 - Second on completion of 50% Syllabus of the course or on completion of 50 teaching days,
 - Third on completion of 75% Syllabus of the course or on completion of 75 teaching days.
- ii. Each concurrent assessment (CAT-I, II & III) will be mapped to relevant Course Learning Outcome.
- iii. Total Performance in CAT (i.e. 40 %) shall be based on the best two out of three in CAT examinations
- iv. Internal assessment shall be carried out by the respective course teacher by choosing variety of assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method, which may be deemed to be appropriate for assessing the relevant course outcome.

Conduction of the Examination:

As per the scheme of teaching, learning, examination and evaluation, theory/practical examinations of Semester-I, II, III, IV, V, VI, VII and VIII shall be conducted by the University (except for Internal Examinations as applicable) at the end of each semester.

The theory/practical examinations of all the Semesters shall be held as per the following Schedule –

Sr. No.	Name of the Examination	End Sem Examination	Supplementary Examination*
1	Semester-I, III, V and VII	Winter	Summer
2	Semester-II, IV, VI and VIII	Summer	Winter

* The University may evolve mechanism for conducting repeat end semester examination. Such repeat examinations shall have to be conducted within one month of the regular even semester examination and on demand examination.

1. The practical examination of all semesters shall be conducted by the University at the end of each semester. The HEI shall conduct the Practical examination of odd semesters as per the schedule announced by the University. However, the appointment of the External and Internal Examiners shall be done by the Head or Principal of respective HEI to conduct external examination of the odd semester and the same should

be communicated to the University before commencement of the practical examination. The University shall conduct the external practical examination of all even semester by appointing external and internal examiners.

2. The examinations specified above shall be held twice in a year at such places and on such dates as may be prescribed by the University.
3. An applicant to an examination specified above, shall pursue a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College/Institute/University department.
4. Provided that the student shall be eligible to appear for examination if -
 - a. He/she complies with the provisions of the Ordinance pertaining to the Examination in general from time to time.
 - b. He/she has prosecuted a regular course of study in a university department/college affiliated to the University.
 - c. He/she has in the opinion of the Principal shown satisfactory progress in his/her studies.
5. The provisions of Ordinance No. 6 and Ordinance No. 9 shall be mutatis-mutandis applicable to every collegiate/non-collegiate student.
6. The fees for each theory examination and practical examination conducted by the university shall be as prescribed by the University, from time to time.

SEMESTER – V

Sant Gadge Baba Amravati University, Amravati

FACULTY: SCIENCE AND TECHNOLOGY

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:

Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

THIRD YEAR: SEMESTER – V

Credits, Workload, Examination, Evaluation and Assessment Scheme

Mode of Teaching	Ver tical No	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching/ Lab Work (Practical)/ Outdoor / Field	a.	Major: Data Analytics / Data Science and Analytics / Data Science	Theory7	134213 / 135213/ 136213	System Analysis and Design	2	2	16
			Theory8	134214 / 135214 / 136214	ASP.net	2	2	
			Theory9	134215 / 135215 / 136215	Perl Programming	2	2	
			Lab/Practical-15	134216 / 135216 / 136216	Laboratory on ASP.net	2	4	
		Major: Data Analytics / Data Science and Analytics / Data Science (Elective)	Theory1	134217 / 135217 / 136217	Database Management Technologies	2	2	
			Theory1	134218 /135218 / 136218	Database Security			
			Lab/Practical-17	134219 / 135219 / 136219	Laboratory on Database Management Technologies	2	4	
			Lab/Practical-17	134219 / 135219 / 136219	Laboratory on Database Security			
			b.	Minor: Data Analytics Data Science and Analytics / Data Science	Theory5	134265 / 135265 / 136265	Management Information System	
	Lab/Practical-18	134266 /135266 / 136266			Laboratory on Management Information System	2	4	
	c.	Generic/ Open Elective		-		-	-	-
	d.	VSC	Lab/Practical-19	134286 / 135286 / 136286	Laboratory on PHP Programming	2	4	8
		SEC	Lab/Practical	134287 / 135287 / 136287	Laboratory on Perl Programming	2	4	
	e.	VEC	-		-	-	-	0
	f.	FP/CES	Project	134293 / 135293 / 136293	Project in Data Analytics (134) / Data Science and Analytics (135) / Data Science (136).	2	4	4
		CC	-		-	-	-	-
			TOTAL				22	34
			*Theory		Foundation of Artificial Intelligence	2	2	2

* Implementation of the Course of “Foundation of Artificial Intelligence” for the U.G. Programmes Under all the faculties. As per Extra-Ordinary Notification No. 241/2025 of SGBAU, dated 24/12/2025. Students will earn grade from written examination marks conducted by the concerning college.

SEMESTER – VI

Sant Gadge Baba Amravati University, Amravati

FACULTY: SCIENCE AND TECHNOLOGY

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)
(Three Years- Six Semesters Bachelor's Degree Programme)

THIRD YEAR: SEMESTER – VI

Credits, Workload, Examination, Evaluation and Assessment Scheme

Mode of Teaching	Vertical No	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)		
Classroom Teaching/ Lab Work (Practical)/ Outdoor / Field	a.	Major: Data Analytics / Data Science and Analytics / Data Science	Theory10	134221 / 135221 / 136221	Applied Statistics	2	2	16		
			Theory11	134222 / 135222 / 136222	Data Science	2	2			
			Theory	134223 / 135223 / 136223	Data Visualization & Reporting	2	2			
			Lab/Practical-20	134224 /135224 / 136224	Laboratory on Applied Statistics	2	4			
		Major: Data Analytics / Data Science and Analytics / Data Science (Elective)	Theory2	134225 / 135225 / 136225	Data Mining	2	2			
			Theory2	134226 / 135226 / 136226	Map Reduce and Hadoop Technology					
			Lab/Practical-22	134227 / 135227 / 136227	Laboratory on Data Mining Tools	2	4			
			Lab/Practical-22	134228 / 135228 / 136228	Laboratory on Map Reduce and Hadoop Technology					
		b.	Minor: Data Analytics / Data Science and Analytics / Data Science	Theory6	134267 / 135267/ 136267	Artificial Intelligence	2		2	6
				Lab/Practical-23	134268 / 135268/ 136268	Laboratory on Artificial Intelligence	2		4	
	c.	Generic/ Open Elective	-		-	-	-	0		
	d.	VSC	Lab/Practical-24	134288 / 135288 / 136288	Laboratory on Mongo DB	2	4	4		
	e.	VEC	-		-	-	-	-		
	f.	Internship / Apprenticeship	OJT	134294 / 135294 / 136294	-	4	8	8		
			FP/CES	Project	-	-	-			
			-		-	-	-			
		TOTAL				22	34	34		

SYLLABUS

B.Sc.- III, SEMESTER – V

Data Analytics (134)

/ Data Science and Analytics (135)

/ Data Science (136)

Major Course: System Analysis and Design

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – V

**Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)**

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134213 / 135213 / 136213	System Analysis and Design	2	30	2 Hrs	30

Course Objectives:	1. To understand the concepts and importance of systems and information systems. 2. Able to explain the phases of the System Development Life Cycle (SDLC). 3. Able to identify the role and responsibilities of a System Analyst. 4. Apply fact-finding techniques for system study and requirement analysis. 5. Use structured analysis tools such as Data Flow Diagrams (DFD), Decision Trees, Decision Tables, ER Diagrams 6. Able to design input, output, and database systems effectively. 7. Understand system implementation, testing, documentation, and maintenance processes.						
Course Outcomes:	After completion of this course, Students will be able to – 1. Understanding of fundamentals of SAD, including concepts, types, SDLC and preliminary investigation 2. Understanding of how to apply structured tools, and design effective input, output, and database structures for information systems. 3. Understand methods of system implementation, testing, and maintenance.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to System Analysis and Design: Meaning and concepts of system,				7 Hrs	7 Marks	

	Characteristics, types of systems, System Analyst: role and responsibilities System Development Life Cycle (SDLC), Feasibility Study, Types: Technical feasibility, Economic feasibility, Operational feasibility			
Unit II	System Planning and Requirement Analysis: Preliminary investigation, Fact-finding techniques: Interview, Questionnaire, Observation, Document review Requirement gathering and analysis, Structured analysis tools: Data Flow Diagram (DFD), Decision Tree, Decision Table, ER-Diagrams	8 Hrs	8 Marks	
Unit III	System Design: Input design, Output design, File and database design User interface design, Form design principles, System controls and security	7 Hrs	7 Marks	
Unit IV	System Implementation and Maintenance: System testing, Unit testing, Integration testing, System testing Conversion methods: Direct conversion, Parallel conversion, Pilot conversion, Phased conversion, System documentation, Maintenance and evaluation	8 Hrs	8 Marks	
References:	Course Material/Learning Resources Text books: 1. System Analysis and Design: Elias M. Awad 2. Systems Analysis and Design: Kenneth E. Kendall, Julie E. Kendall 3. System Analysis and Design: V. Rajaraman Reference Books: 1. Modern Systems Analysis and Design: Jeffrey A. Hoffer, Joey F. George, Joseph S. Valacich 2. Analysis and Design of Information Systems: James A. Senn 3. System Analysis and Design Methods: Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://nptel.ac.in/courses/106108102 2. https://nptel.ac.in/courses/106108103?utm_source Any pertinent media(recorded lectures, YouTube, etc.)if relevant: 1. https://youtu.be/ktcVwtzPrYQ?si=oP_Sb2gGcOisKjV6 2. https://youtu.be/kuy3lj2zGfI?si=kIG6uIxZCbuwbL0r			

Model Questions:	Short Type (At least 8) 1. Define System Analysis and Design. 2. Name the types of systems. 3. What is SDLC? 4. What is preliminary investigation? 5. What is input design? 6. What are the characteristics of a system? 7. Who is a System Analyst? 8. What is feasibility study? 9. What is fact-finding? 10. What is system maintenance?
	Long Type 1. Explain the concept and characteristics of a system. 2. Discuss different types of systems with examples. 3. Explain the role and responsibilities of a System Analyst. 4. Explain the phases of the System Development Life Cycle (SDLC). 5. What is feasibility study? Explain its types in detail. 6. Describe the process of preliminary investigation in system development. 7. Explain various fact-finding techniques used in system analysis. 8. Explain Decision Tree and Decision Table with examples. 9. Discuss file and database design principles. 10. Explain system controls and security measures in information systems. 11. Discuss different types of system testing. 12. Explain conversion methods used in system implementation.

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 134213 / 135213/ 136213	Course Title: System Analysis and Design	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course: ASP.net

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134214/ 135214/ 136214	ASP.NET	2	30	2 Hrs.	30

Course Objectives:	1. To introduce students to ASP.NET and the .NET Framework for developing web applications. 2. To develop skills in creating and managing ASP.NET web applications using C#.NET. 3. To understand web controls, state management, validation, and event handling in ASP.NET. 4. To enable students to work with databases, data binding, security, and advanced ASP.NET features.			
Course Outcomes:	After completing this course, Students will be able to - 1. Explain the architecture and components of the .NET Framework and ASP.NET environment. 2. Develop and execute web-based applications using ASP.NET and C#.NET concepts. 3. Implement validation, state management, debugging, and error handling techniques in web applications. 4. Create database-driven ASP.NET applications using ADO.NET, data controls, caching, and security features.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to ASP.NET and .NET Framework: Introduction to ASP.NET, Overview of the .NET Framework, Features and Architecture of .NET Framework, .NET Languages and Language Interoperability Common Language Runtime (CLR) Types, Objects, and Namespaces Assemblies and Metadata, Internet Information Services (IIS)	8 Hrs.	8 Marks	

Unit II	Developing ASP.NET Applications: Introduction to ASP.NET Applications, Structure of ASP.NET Applications, Differences between Web-Based and Windows-Based Applications Web Form Fundamentals, ASP.NET Page Life Cycle, Server Controls and HTML Controls, Web Controls and their Properties, Event Handling in ASP.NET, Creating and Running Web Applications	7 Hrs.	7 Marks	
Unit III	C#.NET and ASP.NET Features: Introduction to C#.NET, Variables, Data Types, Operators, and Control Statements. Object-Oriented Programming Concepts in C#.NET: Functions, Classes, and Objects, Validation Controls in ASP.NET, Rich Controls and User Interface Design.	8 Hrs.	8 Marks	
Unit IV	Data Handling and Advanced ASP.NET: Introduction to ADO.NET, ADO.NET, Architecture and Data Access, Connection, Command, DataReader, and DataAdapter. Data Binding in ASP.NET, Working with DataGrid and Repeater Controls, File Handling and Streams, Sending E-mails in ASP.NET, Introduction to Caching and Security in ASP.NET.	7 Hrs.	7 Marks	
References :	Course Material/Learning Resources Text books: The Complete Reference ASP.NET by Matthew MacDonald., TATA McGRAW-HILL . C# and the .NET Platform by Andrew Troelsen, Apress. Professional ASP.NET, Bill Evjen and Scott Hanselman, Wrox. Reference Books: ASP.NET 4.0 Programming, Bill Evjen, Scott Hanselman, Devin Rader, Wiley India. Beginning ASP.NET with C#, Imar Spaanjaars, Wrox Publications. Programming ASP.NET, Dino Esposito, Microsoft Press. Weblink to Equivalent MOOC on SWAYAM if relevant: https://onlinecourses.swayam2.ac.in/cec22_cs19/ Any pertinent media(recorded lectures, YouTube, etc.)if relevant: https://youtu.be/AhAxLiGC7Pc?si=j23IcGgGnXXWo7wi https://youtu.be/xuFdrXqpPB0?si=h9DUT3PpQZvmbWyx			
Model Questions:	Short Type: Q.1. Define ASP.NET and explain the features of the .NET Framework. Q.2. What is CLR? Explain its functions in the .NET Framework. Q.3. Differentiate between Web-Based Applications and Windows-Based Applications. Q.4. Explain the ASP.NET Page Life Cycle with suitable examples.			

	Q.5. What are Server Controls and HTML Controls in ASP.NET? Q.6. Define namespaces and assemblies in C#.NET. Q.7. Explain different state management techniques used in ASP.NET. Q.8. What is ADO.NET? Explain the role of DataReader and DataAdapter. Q.9. Write short notes on validation controls in ASP.NET. Q.10. Explain caching and security features in ASP.NET applications. Long Type: Q.1. Explain the architecture of the .NET Framework with a neat diagram. Discuss CLR, CTS, and CLS. Q.2. Describe the process of installing and configuring ASP.NET and IIS environment for web application development. Q.3. Explain the structure of an ASP.NET application and discuss Web Form fundamentals in detail. Q.4. Discuss different ASP.NET Web Controls and explain event handling with examples. Q.5. Explain Object-Oriented Programming concepts in C#.NET with suitable examples. Q.6. Describe validation controls and rich controls in ASP.NET with practical applications. Q.7. Explain various state management techniques such as View State, Session State, Application State, and Cookies. Q.8. Discuss tracing, debugging, logging, and error handling techniques in ASP.NET applications. Q.9. Explain ADO.NET architecture and discuss database connectivity using Connection, Command, DataReader, and DataAdapter objects. Q.10. Describe data binding in ASP.NET and explain the use of DataGrid, Repeater controls, file handling, and sending E-mails in web applications.
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Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 134214 / 135214 / 136214	Course Title: ASP.NET	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

Major Course: Perl Programming

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – V

**Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)**

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134215 / 135215 / 136215	Perl Programming	2	30	2 Hrs.	30

Course Objectives:	1. Learn about environmental setup and basic syntax of Perl programming. 2. Understand, analyse and develop computer programs in Perl. 3. Explore the concepts of data structures using Perl. 4. Handling file structures with Perl programming language..						
Course Outcomes:	Students will be able to – 1. Install Perl programming set up on machines. 2. Apply the logics for basic problems using controls structures. 3. Write complex programs by applying data structures. 4. Design application using file structures.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Perl & Basics: Overview: What is Perl, advantages of scripting languages, and its role in automation. Environment Setup: Installing Perl on Windows (e.g., Strawberry Perl, ActivePerl) and Linux. Basic Syntax: Variables, literals, printing, escape sequences, use strict, and use warnings. Operators: Arithmetic, relational, logical, assignment, and bitwise operators.				8 Hrs.	8 Marks	

	Data Types			
Unit II	Data Types, Control Structures, Loops: Data Types: Introduction to Scalars, Arrays, and Hashes. Control Structures: if, unless, else, and elsif conditional blocks. Looping Constructs: while, until, for, foreach loops. Loop Control: Using last (break), next (continue), and redo	7 Hrs.	7 Marks	
Unit III	Data Structures (Arrays and Hashes): Arrays: Initialization, accessing elements, array slices, and context (scalar vs. list context). Array Functions: push, pop, shift, unshift, sort, reverse, and splice. Hashes (Associative Arrays): Key-value pairs, hash initialization, accessing elements, and extracting keys and values.	8 Hrs.	8 Marks	
Unit IV	File Handling & I/O: File I/O: Opening, reading, and writing to files. Filehandles: Standard filehandles (STDIN, STDOUT, STDERR) and custom filehandles. File Tests: Operators to test for file existence, read/write permissions, and file types (e.g., -e, -r, -w, -d). Directory Manipulation: Opening directories, reading directory contents, and closing directories.	7 Hrs.	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Programming Perl by <u>Tom Christiansen</u>, <u>Brian D Foy</u>, <u>Larry Wall</u>, <u>Jon Orwant</u> -Oreilly Publication. 2. Perl Programming by L. Lampard - Code academy publisher 3. Perl In Easy Steps by Mike McGrath 4. Perl Black Book by Steven Holzner, Dreamtech publishing. Reference Books: 1. Effective Perl Programming: Ways to Write Better, More Idiomatic Perl, 2e by Hall-Pearson 2. PERL: THE COMPLETE REFERENCE by Martin Brown, MGH Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp31 2. https://spoken-tutorial.org/tutorial-search/?search_foss=PERL&search_language=English Any pertinent media(recorded lectures, YouTube, etc.)if relevant: 1. https://www.youtube.com/watch?v=dKlh0QXq6nk 2. https://www.youtube.com/watch?v=u3DALye3M6E			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 134215 / 135215 / 136215	Course Title: Perl Programming	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course: Laboratory on ASP.net

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134216/ 135216/ 136216	Laboratory on ASP.NET	2	60	4Hrs.	50

Course Objectives:	1. To provide practical knowledge of ASP.NET and C#.NET for developing dynamic and database-driven web applications. 2. To enable students to design, develop, debug, and deploy web applications using ASP.NET controls, event handling, and state management techniques. 3. To develop skills in database connectivity, data handling, validation, security, and performance optimization using ADO.NET and ASP.NET technologies.
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Develop and execute ASP.NET web applications using C#.NET, web forms, controls, and event handling techniques. 2. Apply object-oriented programming concepts, validation controls, state management, debugging, and error handling in web applications. 3. Create database-driven applications using ADO.NET with data binding, CRUD operations, and data controls such as GridView and Repeater. 4. Implement practical ASP.NET features including file handling, e-mail services, caching, and basic web application security.

Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1. Study and installation of Visual Studio, ASP.NET Framework, and IIS configuration. 2. Create a simple ASP.NET web application and study the structure of an ASP.NET project. 3. Demonstrate the use of namespaces, classes, objects, and assemblies in C#.NET. 4. Write a C#.NET program using variables, data types, operators, and control statements. 5. Develop a web page using HTML controls and ASP.NET server controls. 6. Create an ASP.NET Web Form to demonstrate page life cycle events. 7. Design a web application using different Web Controls such as Label, TextBox, Button, CheckBox, and DropDownList. 8. Implement event handling in ASP.NET for button click and selection events. 9. Develop a student registration form using validation controls. 10. Create a user interface using rich controls such as Calendar, AdRotator, and Wizard controls. 11. Demonstrate Object-Oriented Programming concepts in C#.NET using classes, inheritance, and functions. 12. Implement state management techniques using View State and Session State. 13. Create an application demonstrating the use of Cookies and Application State. 14. Perform tracing, debugging, and exception handling in an ASP.NET application. 15. Create a database connectivity application using ADO.NET and SQL Server. 16. Implement CRUD (Create, Read, Update, Delete) operations using Connection, Command, and DataReader objects. 17. Develop a web application using DataAdapter and DataSet for data access. 18. Implement data binding using GridView/DataGrid and Repeater controls. 19. Create a file upload and file handling application using streams in ASP.NET.			

	20. Develop an ASP.NET application to send E-mails using SMTP services. 21. Demonstrate caching techniques to improve ASP.NET application performance. 22. Implement basic security features such as authentication and authorization in ASP.NET. 23. Mini Project: Develop a complete database-driven ASP.NET web application integrating forms, validation, database connectivity, and security features.			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)				
Practical	Course Code: 134216/ 135216/ 136216	Laboratory on Laboratory on ASP.NET	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 134216/ 135216/ 136216	Laboratory on Laboratory on ASP.NET	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Major Course (Elective-1): Database Management Technologies

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134217 / 135217 / 136217	Database Management Technologies	2	30	2 Hrs	30

Course Objectives:	1. To understand advanced database concepts and modern database architecture. 2. To learn relational and non-relational database technologies. 3. To develop advanced SQL querying and transaction management skills. 4. To understand database security, recovery, optimization, and emerging trends. 5. To introduce students to cloud databases, big data, and distributed databases.						
Course Outcomes:	After completion of this course, Students will be able to - 1. Explain advanced concepts of DBMS architecture and database technologies. 2. Design optimized relational databases using normalization and constraints. 3. Apply advanced SQL queries, transactions, and concurrency techniques. 4. Analyze database security, recovery, and performance optimization methods. 5. Understand emerging database technologies such as NoSQL, cloud databases, and big data systems						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Advanced Database Concepts and Architecture: Introduction to DBMS, Database Architecture, Data Independence DBMS Components, Database Users and DBA, Centralized and Distributed Databases, Client-Server Databases, Parallel Databases				8 Hrs	8 Marks	

Unit II	Relational Database Design and Modeling: Relational Model, Entity Relationship (ER) Model, Attributes and Constraints Keys (Primary, Foreign, Candidate, Composite), Functional Dependency, Integrity Constraints, Normalization (1NF, 2NF, 3NF, BCNF)	7 Hrs	7 Marks	
Unit III	Advanced SQL and Transaction Processing: SQL Data Types, DDL, DML, DCL, TCL Commands, Joins Subqueries, Nested Queries, Views, Indexes, Stored Procedures, Triggers, Transactions	8 Hrs	8 Marks	
Unit IV	Database Security and Emerging Technologies: Database Security Concepts, Authentication and Authorization, Backup and Recovery Techniques Database Optimization, Data Warehousing, Data Mining, NoSQL Databases (MongoDB, Cassandra), Cloud Databases	7 Hrs	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Database System Concepts – Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 2. Fundamentals of Database Systems – Ramez Elmasri & Shamkant B. Navathe 3. Database Management Systems – Raghu Ramakrishnan & Johannes Gehrke 4. Modern Database Management – Jeffrey A. Hoffer, V. Ramesh, Heikki Topi Reference Books: 1. 1 An Introduction to Database Systems – C.J. Date 2. SQL: The Complete Reference – James R. Groff & Paul N. Weinberg 3. Database Systems: Design, Implementation and Management – Carlos Coronel & Steven Morris 4. MongoDB: The Definitive Guide – Kristina Chodorow & Shannon Bradshaw 5. Data Mining: Concepts and Techniques – Jiawei Han, Micheline Kamber & Jian Pei 6. Database Management Systems – P.K. Yadav Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs39 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_cs29 3. https://onlinecourses.swayam2.ac.in/e-learning/preview/nou20_lb03 4. https://onlinecourses-archive.nptel.ac.in/noc19_cs33/preview			
Modal Questions	Short Type 1. Define DBMS. 2. What is data independence? 3. What is a distributed database? 4. Define normalization. 5. What is BCNF? 6. What is a transaction? 7. State ACID properties.			

	8. What is deadlock? 9. Define database security. 10. What is NoSQL database? Long Type 1. Explain DBMS architecture and data independence. 2. Describe distributed and parallel database systems. 3. Explain normalization up to BCNF with examples. 4. Discuss ER Model and Enhanced ER Model. 5. Explain SQL joins, subqueries, views, and indexes with examples. 6. Discuss transaction processing and ACID properties. 7. Explain concurrency control and deadlock handling techniques. 8. Describe database backup and recovery methods. 9. Explain NoSQL databases and compare them with relational databases. 10. Discuss data warehousing and data mining concepts. 11. Explain cloud databases and their advantages. 12. Discuss the role of AI and Big Data technologies in modern database systems.
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Assessment Rubric: Internal for Theory Course (Major Elective-1)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 134217 / 135217 / 136217	Course Title: Database Management Technologies	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course (Elective-1): Database Security

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134218 / 135218 / 136218	Database Security	2	30	2 Hrs.	30

Course Objectives:		Course Outcomes: 1. To understand database threats, vulnerabilities, and the CIA security requirements. 2. To learn authentication, authorization, and role-based access control (RBAC). 3. To apply encryption, data masking, and secure communication for data protection. 4. To detect SQL injection attacks and implement auditing mechanisms. 5. To understand compliance standards (GDPR, HIPAA, PCI-DSS) and design security plans.			
Course Outcomes:		On completion of the following syllabus the students will be able to – 1 Identify and classify database security threats and vulnerabilities. 2 Implement authentication, RBAC, and privilege management using SQL. 3 Configure encryption (TDE, column-level) and TLS/SSL for data protection. 4 Detect and prevent SQL injection attacks and configure database auditing. 5 Design a database security policy incorporating compliance requirements.			
Unit System	Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Foundations of Database Security: Need for database security: Assets, threats, vulnerabilities, CIA triad: Confidentiality, Integrity, Availability		8 Hrs.	8 Marks	

	Common attacks: Eavesdropping, tampering, DoS Security models overview: DAC, MAC, RBAC, Basic security mechanisms: Views, stored procedures			
Unit II	Authentication, Authorization & Access Control: Authentication methods: Passwords, MFA, LDAP basics, Database users and password policies Privileges: System vs. Object privileges, SQL commands: GRANT, REVOKE Role-Based Access Control (RBAC): Creating and assigning roles, Row-level security using views	7 Hrs.	7 Marks	
Unit III	Encryption, Data Protection & Secure Communication: Data at rest vs. Data in transit, Transparent Data Encryption (TDE) – concept and configuration Column-level encryption (AES), Basic key management concepts, Data masking: Static and dynamic TLS/SSL for database connections	8 Hrs.	8 Marks	
Unit IV	Injection Attacks, Auditing & Compliance: SQL Injection: Types (Union, Boolean, Time-based) – concepts only Prevention: Parameterized queries, prepared statements Database auditing: Purpose and audit logs, Compliance basics: GDPR, HIPAA, PCI-DSS, Brief case studies: Healthcare and e-commerce databases	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Database Security: Problems and Solutions, Alfred Basta, Melissa Zgola, Cengage, 2018 2. Database Security, 2nd Edition, Hassan A. Afyouni Jones & Bartlett, 2014 Reference Books: 1. SQL Injection Attacks and Defense (2nd Ed), Justin Clarke, Syngress 2. The Web Application Hacker's Handbook, Stuttard & Pinto, Wiley 3. Oracle Database Security Guide Oracle Corp, Online Weblink to Equivalent MOOC on SWAYAM if relevant: Online Course Material Links https://nptel.ac.in/courses/106105175 https://cheatsheetseries.owasp.org/cheatsheets/SQL_Injection_Prevention_Cheat_Sheet.html https://dev.mysql.com/doc/refman/8.0/en/security.html Any pertinent media(recorded lectures, YouTube, etc.)if relevant: https://www.postgresql.org/docs/current/security.html https://www.coursera.org/learn/database-security https://www.youtube.com/@TheSecurityBuddy			

Assessment Rubric: Internal for Theory Course (Major Elective-1)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 134218 / 135218 / 136218	Course Title: Database Security	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course (Elective-1 Laboratory): Laboratory on Database Management Technologies

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134219 / 135219 / 136219	Laboratory on Database Management Technologies	2	60	4Hrs	50

Course Objectives:	1. To provide practical knowledge of relational database systems. 2. To develop skills in SQL programming and database design. 3. To understand advanced database operations and transaction handling. 4. To gain hands-on experience with modern database technologies.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Create and manage relational databases. 2. Write SQL queries for data manipulation and retrieval. 3. Design normalized database schemas. 4. Implement advanced database concepts such as views, triggers, and transactions. 5. Perform backup, recovery, and security operations.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

List of Practical's 1 Create a database and tables using SQL commands. 2 Perform DDL operations using CREATE, ALTER, DROP, and TRUNCATE commands. 3 Perform DML operations using INSERT, UPDATE, DELETE, and SELECT commands. 4 Implement different constraints such as PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, and CHECK. 5 Write SQL queries using WHERE, ORDER BY, GROUP BY, and HAVING clauses. 6 Implement different types of Joins: INNER JOIN, LEFT JOIN, RIGHT JOIN, and FULL JOIN. 7 Write SQL queries using subqueries and nested queries. 8 Create and use SQL Views for data abstraction and security. 9 Implement indexes to improve query performance. 10 Design ER Diagrams for real-world applications such as Library Management System or Student Information System. 11 Normalize database tables up to 3NF and BCNF. 12 Create and execute Stored Procedures. 13 Create and implement database Triggers. 14 Demonstrate transaction processing using COMMIT, ROLLBACK, and SAVEPOINT. 15 Study ACID properties using transaction examples. 16 Implement concurrency control using locking techniques. 17 Perform backup and recovery operations in DBMS. 18 Create user accounts and assign database privileges for security management. 19 Install and configure MySQL/PostgreSQL database server. 20 Create a simple database-driven application using SQL and any front-end tool. 21 Demonstrate NoSQL database operations using MongoDB. 22 Perform CRUD operations in MongoDB collections.			
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References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.programiz.com/sql/online-compiler 2. https://onecompiler.com/mysql 3. https://www.db-fiddle.com/?utm_source=dbms 4. https://onecompiler.com/mongodb 5. https://www.w3schools.com/sql/trysql.asp?filename=trysql_select_all 6. https://www.hackerrank.com/domains/sql?utm_source 7. https://nextleap.app/online-compiler/sql-programming 8. https://www.tutorialspoint.com/compilers/online-sql-editor.htm			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)				
Practical	Course Code: 134219 / 135219 / 136219	Laboratory on Database Management Technologies	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 134219 / 135219 / 136219	Laboratory on Database Management Technologies	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Major Course (Elective-1 Laboratory): Laboratory on Database Security

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
V	134220 / 135220 / 136220	Laboratory on Database Security	2	60	4 Hrs.	50
Course Objectives:	1. To provide hands-on experience in identifying database vulnerabilities and performing secure installation and configuration of database systems. 2. To enable students to implement authentication mechanisms, role-based access control (RBAC), and privilege management using SQL commands. 3. To train students in configuring encryption techniques (TDE, column-level encryption, TLS/SSL) and data masking for protecting sensitive data. 4. To develop skills in detecting, demonstrating, and preventing SQL injection attacks, as well as setting up database auditing and logging. 5. To integrate all security concepts through a case study to design a comprehensive database security plan for a real-world application.					
Course Outcomes:	After performing all laboratory exercises, students will be able to: 1. Perform secure installation, user management, and vulnerability identification in MySQL/PostgreSQL. 2. Implement authentication, role-based access control (RBAC), and row-level security using SQL statements. 3. Configure Transparent Data Encryption (TDE), column-level encryption, TLS/SSL, and dynamic data masking. 4. Demonstrate Union-based, Boolean-based, and Time-based SQL injection attacks, and prevent them using parameterized queries, stored procedures, and enable audit logging.					

	5. Design and document an end-to-end database security plan incorporating authentication, authorization, encryption, injection prevention, auditing, and compliance requirements.
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Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1 Install MySQL/PostgreSQL and perform secure installation (set root password, remove anonymous users) 2 Identify default databases, users, and vulnerabilities 3 Create database users with different authentication methods 4 Implement GRANT and REVOKE for table-level privileges 5 Create roles and assign privileges using RBAC model 6 Implement row-level security using views 7 Implement row-level security using PostgreSQL RLS 8 Enable and configure Transparent Data Encryption (TDE) in MySQL 8.0 9 Implement column-level encryption using AES_ENCRYPT() and AES_DECRYPT() 10 Configure TLS/SSL for MySQL/PostgreSQL client-server connection 11 Implement dynamic data masking for sensitive columns (salary, SSN) 12 Create encrypted database backup and restore 13 Demonstrate Union-based SQL injection on a vulnerable login form 14 Demonstrate Boolean-based blind SQL injection 15 Demonstrate Time-based blind SQL injection using SLEEP() 16 Prevent SQL injection using parameterized queries (PDO/prepared statements) 17 Prevent SQL injection using stored procedures 18 Enable MySQL audit log and analyze logs 19 Create audit triggers to log INSERT/UPDATE/DELETE on sensitive tables 20 Case Study: Design a complete database security plan for a banking application			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)				
Practical	Course Code: 134220 / 135220 / 136220	Lab/Practical-17: Laboratory on Database Security	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 134220 / 135220 / 136220	Lab/Practical-17: Laboratory on Database Security	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Minor Course: Management Information System

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – V

**Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)**

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134265 / 135265 / 136265	Management Information System	2	30	2 Hrs.	30

Course Objectives:	1. To introduce the concepts and importance of Management Information Systems (MIS). 2. To understand information systems, database management, and business applications. 3. To study decision support systems and e-business technologies. 4. To develop understanding of project management, security, and ethical issues in MIS.						
Course Outcomes:	After completing this course, Students will be able to - 1. Understand the concepts, structure, and applications of MIS 2. Explain database systems and information management techniques. 3. Analyze business applications of MIS and decision support systems. 4. Evaluate project management, security, and ethical issues in information systems.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Fundamentals of Management Information Systems: Introduction to System and Information System. Definition and Characteristics of MIS. Types of Information Systems.				8 Hrs.	8 Marks	

	Components of MIS. Role and Importance of MIS in Organizations. Benefits and Limitations of MIS.			
Unit II	Database and Information Management: Introduction to Database Management Systems (DBMS), Data Processing Concepts, Components of DBMS Database Administration, Entity Relationship (ER) Model, Information Storage and Retrieval.	7 Hrs.	7 Marks	
Unit III	Applications of MIS: Decision Support Systems (DSS), Group Decision Support Systems (GDSS), Knowledge Management Systems Expert Systems, E-Business and E-Commerce, Business Process Reengineering (BPR)	8 Hrs.	8 Marks	
Unit IV	Project Management, Security and Ethics: Fundamentals of Project Management, Agile Methodology and SCRUM Basics, Project Risk Management Information Security Concepts, Ethical and Social Issues in Information Systems, Future Trends in MIS	7 Hrs.	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Management Information Systems, by Waman S. Jawadekar, Tata McGraw Hill Education 2. MIS: Management Information Systems in Business, Government and Society, by Rahul De', Wiley India Reference Books: 1. Management Information Systems – Pearson Education. 2. Management Information Systems – McGraw Hill Publication. 3. Management Information System – Macmillan India. 4. Information Systems for Modern Management – PHI Publication. 5. Management Information Systems – Tata McGraw Hill. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. Management Information System Course Preview 2. Technology for Business Management Course Preview Any pertinent media(recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=ACHfIfQ4gJw 2. https://www.youtube.com/watch?v=jPIIMLTKfWo 3. https://www.youtube.com/watch?v=1cS7poIptX8			

Model Questions:	Short Type: Q.1.What is MIS? Q.2. What are the Characteristics of MIS? Q.3.What is importance of MIS? Q.4. Define DBMS. Q.5. What is Data Processing? Q.6. What is Decision Support Systems? Q.7. List some applications of MIS. Q.8. What is Agile Methodology? Long Type: Q.1. Explain Management information system and its usage in the organization. Q.2. Explain the Benefits and Limitations of MIS. Q.3. Define Information. Explain the Types of Information Systems.? Q.4. Explain the purpose of the database system. Q.5. What are Components of DBMS? Q.6. Define decision support system. Discuss its role. Q.7. What is Knowledge Management Systems? Q.8. List the major components of EC framework. Q.9. What are the ethical and social issues in the information system? Q.10. What are the future trends in Management information systems?
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Assessment Rubric: Internal for Theory Course (Minor)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 134265 / 135265 / 136265	Course Title: Management Information System	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Minor Course: Laboratory on Management Information System

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134266/ 135266/ 136266	Laboratory on Management Information System	2	60	4 Hrs.	50

Course Objectives:	1. To provide practical exposure to Management Information Systems and business applications. 2. To understand database management and information processing techniques. 3. To develop skills in decision support systems and e-business applications. 4. To create awareness about project management, information security, and ethics.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Use information system tools and software for business applications. 2. Perform database operations and information management tasks. 3. Analyze decision support and e-business systems 4. Apply project management, security, and ethical practices in MIS.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
List of Practical: 1. Study of different types of Information Systems used in organizations 2. Preparation of organizational structure using MIS concepts 3. Case study on role and importance of MIS in business organizations 4. Installation and introduction to MS Access/MySQL database system 5. Creation of database and tables using DBMS							

6. Performing CRUD operations in database systems			
7. Designing Entity Relationship (ER) diagrams for simple systems			
8. Data sorting, filtering, and retrieval using SQL queries			
9. Creation of forms and reports in DBMS			
10. Study of Database Administration tools and functions			
11. Development of a simple Decision Support System (DSS)			
12. Case study on Group Decision Support Systems (GDSS)			
13. Demonstration of Knowledge Management System applications			
14. Study of Expert Systems in real-world applications			
15. E-Commerce website analysis and report preparation			
16. Study of Business Process Reengineering (BPR) models			
17. Preparation of project plan using project management tools			
18. Study of Agile Methodology and SCRUM framework			
19. Demonstration of information security techniques and password management			
20. Seminar presentation on Ethical and Social Issues in Information Systems			
21. Case study on cyber security threats in MIS			
22. Mini project based on MIS applications in Data Analytics			

Reference Books:

1. O'Brien, J. A., & Marakas, G. M. (2020). Management information systems (11th ed.). McGraw-Hill Education.
2. Goyal, D. P. (2010). Management information systems: Managerial perspectives (3rd ed.). Macmillan India.
3. Baltzan, P., & Phillips, A. (2021). Business driven information systems (7th ed.). McGraw-Hill Education.

Suggested Software and Tools:

1. MySQL Database System
2. Oracle Database Express Edition
3. Microsoft Access
4. Draw.io ER Diagram Tool
5. Trello Project Management Tool
6. Jira Software

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)				
Practical	Course Code: 134266/ 135266/ 136266	Laboratory on Management Information System	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 134266/ 135266/ 136266	Laboratory on Management Information System	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

VSC: Laboratory on Laboratory on PHP Programming

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134286 / 135286 / 136286	Laboratory on PHP Programming	2	60	4 Hrs.	50

Course Objectives:	1. To help the students getting started with web programming using HTML5, PHP . 2. To learn how to build own website. 3. To create dynamic content and user interface. 4. Integrating the front end and backend perspective of the application.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Learn the environment of Server-Side Script. 2. Understand what PHP is and how to write PHP scripts. 3. Learn PHP syntax and how to use variables and data types. 4. Use conditional statements (if, else, switch) and loops (while, for). 5. Use functions to make code reusable. 6. Handle forms and user input with PHP. 7. Learn how to use Arrays management.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

List of Practical:	1. Write a PHP program to perform addition, subtraction, multiplication, and division of two numbers. 2. Write a PHP program to swap two numbers. 3. Write a PHP program to find the largest of three numbers. 4. Write a PHP program to calculate sum of digits. 5. Write a PHP program to check palindrome number/string. 6. Write a PHP program to check positive, negative, or zero. 7. Write a PHP program to count digits in a number. 8. Write a PHP program to find sum of first N natural numbers. 9. Write a PHP program to reverse a string. 10. Write a PHP program to count vowels in a string 11. Write a PHP program to replace a word in a string. 12. Write a PHP program to create and display an array. 13. Write a PHP program to calculate average using user-defined function. 14. Write a program to Create a student registration form using PHP. 15. Write a program Create a login form validation using PHP.			Use any pedagogical technique suitable for the topic
References:	Web link to Equivalent MOOC on SWAYAM if relevant: 1. https://www.geeksforgeeks.org/php/php-program-to-perform-arithmetic-operations/ 2. https://www.geeksforgeeks.org/php/php-program-to-swap-two-numbers/ 3. https://www.geeksforgeeks.org/php/sum-of-first-n-natural-number-in-php/ 4. https://www.geeksforgeeks.org/php/php-reverse-string/ 5. https://www.w3schools.com/php/php_arrays.asp 6. https://www.geeksforgeeks.org/php/creating-a-registration-and-login-system-with-php-and-mysql/			

Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Practical	Course Code: 134286 / 135286 / 136286	Laboratory on PHP Programming	Max Marks: 50
Q. No.	Assessment Criteria		Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout		20
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester		10
3.	Attendance in practical session / Students' overall performance		10
4.	Internal Viva Voce		10

SEC: Laboratory on Perl Programming

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – V

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134287 / 135287 / 136287	Laboratory on Perl Programming	2	60	4 Hrs.	50

Course Objectives:	1. To learn installation process. 2. To learn programming methodology through syntax, control structures in Perl. 3. To write programs in Perl to solve simple and complex problems using Arrays, Hashes, File Handling.						
Course Outcomes:	On completion of the laboratory tasks the students will be able to - 1. Write programs for several practical and cognitive outcomes, ranging from expert-level text manipulation skills to a unique approach to problem-solving. 2. Apply Perl Data Language (PDL) for vectorized data analysis and image processing prominently used for data science.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

1. Write a Perl program to print “Hello World”. 2. Write a Perl program to display student information. 3. Write a Perl program to accept user input and display it. 4. Write a Perl program demonstrating different data types. 5. Write a Perl program to read two numbers from the user and demonstrate arithmetic operations. 6. Write a Perl program to compare two numbers using relational operators. 7. Write a program to demonstrate logical operators in Perl. 8. Write a Perl program to find the largest among three numbers using conditional statements. 9. Write a Perl program to print the multiplication table of a number using a for loop. 10. Write a Perl program to perform string manipulation operations. 11. Write a program using split() and join() functions. 12. Write a Perl program to create and access an array element. 13. Write a program to find the maximum and minimum elements in an array. 14. Write a Perl program to create a hash and display its keys and values. 15. Write a Perl program to perform file handling operations such as creating, writing, reading, and appending data to a file.			
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Assessment Rubric: Internal Examination Practical Course |(SEC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II, SEMESTER – III (NEP)			
Practical	Course Code: 134287 / 135287 / 136287	Lab/Practical-20 - Laboratory on Perl Programming	Max Marks: 50
Q. No.	Assessment Criteria		Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout		20
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester		10
3.	Attendance in practical session / Students’ overall performance		10
4.	Internal Viva Voce		10

Project in Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	134293 / 135293 / 136293	Project in Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)	2	--	--	--
Course Objectives: 1. To understand the research project development process. 2. To motivate students to undertake research projects and pursue innovations. 3. To cultivate a research and innovation mindset in students. 4. To create awareness about Design Thinking and innovative research idea generation.							
Course Outcomes: Upon successful completion of the course, students will be able to: 1. Develop new research ideas and innovations. 2. Create innovative solutions for identified problems. 3. Use research tools effectively. 4. Develop feasible solutions aligned with Sustainable Development Goals (SDGs).							
Guidelines: 1. The Project must be research or Application based and focus on innovation and problem-solving. 2. The research work needs to be carried out collaboratively and the topic shall be in area of Computer Science or an interdisciplinary in nature. 3. Single or at the most group of Four student will engage in Research Project. 4. Student or group of students responsible for regularly reporting the progress of their research project to their guide (Project In-charge). 5. The synopsis must be submitted within the timeframe provided by the guide (Project In-charge)/Department. 6. Students must submit the Title and Synopsis (5-8 pages) in the prescribed format provided by guide (Project In-charge)/Department. 7. Plagiarism is strictly prohibited. Projects found to contain plagiarism will be rejected. 8. The single or at the most group of four students will conduct the project. 9. Students must submit One copy of their final project report for examination to the department. 10. All students must adhere to the given schedule for submissions and presentations. 11. Students should ensure that their research work is aligned with ethical research practices. 12. The project report and synopsis should strictly follow the provided format for consistency. 13. Students are encouraged to seek funding or support from relevant bodies and publish their research where applicable.							
Formats of the Proposal/Synopsis and Report Synopsis Format: 1. Title Page 2. Certificate 3. Acknowledgement 4. Index/Table of Contents							

5. Abstract
6. Introduction
7. Motivation
8. Aims and Objectives
9. Literature Review
10. Methodology
11. Proposed System/Model
12. Applications
13. References

Research Project Report Format:

1. Title Page
2. Certificate
3. Acknowledgement
4. Index/Table of Contents
5. Abstract
6. Introduction
7. Literature Review
8. Methodology
9. Proposed System/Model
10. Implementation
11. Results and Discussion
12. Conclusion and Future Scope
13. References

Assessment Rubric/Internal evaluation for the Project:

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI B.Sc. III, SEMESTER – V (NEP)			
Project	Course Code: 112293	Project in Computer Science	Max Marks: 50
Q. No.	Exercise		Marks
1	Innovativeness of Topic, Synopsis Preparation, Submission and Presentation etc.		10
2	Regular Attendance in Laboratory, Progress / objective achievements in proposed plan of research (Clarity, structure, scientific accuracy, originality, and referencing)		10
3	Project Report Quality Assessment/Submission/Evaluation (Clarity, structure, scientific accuracy, originality, and referencing Depth, relevance, etc.)		20
4	Viva-Voce /Presentation (PPT) (Visual clarity, and confidence, Findings etc.)		10



SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(Extra-Ordinary)

Wednesday, the 24th December, 2025

(NOTIFICATION)

No. 241/2025

Date : 24/12/2025

Subject : Implementation of the Course of “Foundation of Artificial Intelligence” for the U.G. Programmes Under all the faculties.

It is notified for general information of all the concerned that the authorities of the University have accepted to implement the syllabus of the course “Foundation of Artificial Intelligence” to be implemented from semester V of III Year of all the Under graduate programmes in all the Faculties of the University as per NEP-2020 guidelines from the Academic Session 2026-2027 onwards which is published herewith vide Annexure- “A”

Sd/-

(Dr. Avinash Asanare) Registrar,
Sant Gadge Baba Amravati University

Annexure-A

Name of Course – “Foundation of Artificial Intelligence”

Introduction:

The National Education Policy (NEP) 2020 emphasizes the integration of Artificial Intelligence (AI) across all undergraduate levels and disciplines to foster digital literacy and problem-solving skills. ‘It can enhance the employability of the youth and prepare professionals in cutting-edge areas.’(pg. 46, R.D Kulkarni Report)

The Foundations of Artificial Intelligence course offers an overview of the key concepts, structures, applications, and ethical aspects of AI. It helps learners understand how intelligent systems work and shape modern life. The course covers AI’s definition, evolution, types, and practical uses, along with its basic architectures like rule-based systems, machine learning, and neural networks. Learners will explore AI’s role in education, healthcare, and commerce while reflecting on ethical and social concerns such as privacy, bias, and automation. In line with NEP 2020, it fosters digital literacy and responsible AI awareness for all disciplines.

A) Objective

- i) Introduce all undergraduate students of all the faculties to the basic concepts, uses, and importance of AI.
- ii) Enable learners to understand AI's principles, applications, limitations, and effectively use AI tools.
- iii) Encourage students to recognize AI's role in enhancing life and engage with its social and ethical implications.

B) Outcomes

- i) Understand the fundamental concepts, types, and evolution of Artificial Intelligence.
- ii) Apply basic AI techniques and tools to real-world problems across different domains.
- iii) Evaluate the social, ethical, and professional implications of AI in everyday life.

C) Implementation of Syllabus, Scheme of Examination and Teaching.

- 1) Curriculum, Teaching and Examination Scheme Given in Appendix A
- 2) This course given in Appendix A shall be compulsory course in **fifth semester** of all undergraduate programs of all faculties in Sant Gadge Baba Amravati University, Amravati. Medium of instruction, paper setting and writing of Answer paper shall be in English, Marathi and Hindi.
- 3) Question paper shall be set and valued by the College/ Department.
- 4) Duration of external examination shall be of 2 hours and paper shall be of 30 marks.
- 5) Internal 20 marks shall be distributed, 5 to attendance, 15 marks to assignment/class test/viva voce/presentation.
- 6) Distribution of 30 external marks shall be based on 4 units, 15 marks to short and 15 marks to long answer type questions.
- 7) It shall be obligatory on part of the college/department to conduct examination on prescribed date by the university and submit the candidate wise information as follows on university portal on due date after valuation answer books.

Grade A -- mark secured 30 to 50

Grade B – 5 to 29

Grade C – 0 to 24

FAIL 19 and below

The final Grade shall be determined by the combined performance in internal and external assessments. A student must secure a minimum of 30% in the internal assessment, 30% in the external assessment, and at least 40% overall to pass. Failure to meet any of these criteria will result in a grade of "Fail."

In case of failure, student need to appeared in backlog examination by paying prescribed fees.

- 8) Valuated answer book shall be kept in college custody for one academic year and random verification may be done by the University if required.
- 9) Result of final year of respective degree shall not be declared of an examination unless secured any of the grades out of A to C in Foundation of Artificial intelligence.
- 10) Grade secured by an examinee in examination of said course shall be shown on fifth and last semester marksheet.
- 11) The candidates shall have to pay Rs 150 /- in 5th semester to the college to meet out the expenses by the college on teaching of course, question paper setting and printing, paper valuation, providing answer sheet, and filling grade on University portal. In case of failure student need to pay Rs 20 /- for conduction of examination. There shall not have any facility of revaluation of answer book.

- 12) For teaching of the subject person having PG degree in any faculty with second class shall be considered eligible, provided priority shall be given to Ph.D., NET, SET, regular teacher.

13) Format of question paper

Distribution of 30 external marks shall be based on 4 units, 15 marks to short and 15 marks to long answer type questions with internal choice.

1a) Long or short answer questions based on unit number 1 having 8 marks

Or

1b) Long or short answer questions based on unit number 1 having 8 marks 2a) Long or short answer questions based on unit number 2 having 7 marks

Or

2b) Long or short answer questions based on unit number 2 having 7 marks 3a) Long or short answer questions based on unit number 3 having 8 marks

Or

3b) Long or short answer questions based on unit number 3 having 7 marks 4a) Long or short answer questions based on unit number 4 having 8 marks

Or

4b) Long or short answer questions based on unit number 4 having 8 marks

Program:				Semester:	V	
Course:	Foundation of Artificial Intelligence			Code:		
Teaching Scheme				Evaluation Scheme		
Level	Lecture	Hours	Credit	Internal	External	Total
5.5	2	2	2	20	30	50
Methods of Internal Assessment: 15 Marks to Class Tests, /Assignments/ Viva voce/ Presentation & 5 Marks to Attendance						
Course Objectives: To introduce AI concepts in a simple, real-life way with focus on understanding applications, ethics, and future opportunities.						
Course Outcomes: After completion of the course, the students will be able to:						
CO	Course Outcomes			BT Level		
CO-1	Explain the basic concepts, history, and types of AI with real-life examples.			L1 – Knowledge, L2 – Understanding		
CO-2	Describe AI structures and architectures using simple real-world analogies.			L2 – Understanding, L3 – Application		

CO-3	Identify and analyze applications of AI in the area of arts, commerce, humanities, and daily life.	L3 – Application, L4 – Analysis
CO-4	Evaluate ethical, social issues and predict future opportunities of AI in their own fields.	L4 – Analysis, L5 – Evaluation

Unit 1: Introduction to Artificial Intelligence (8 Hours)

Definition of AI: What is Intelligence? Natural vs. Artificial, Simple definition of AI; History & Evolution of AI: From early computers to modern AI; Types of AI: Narrow AI vs. General AI vs. Super AI; AI in Everyday Life: Google Maps, E-commerce suggestions, Chatbots, Social Media feeds; Key Components: Data, Algorithms, Computing Power

Unit 2: AI Structures, Architectures & Techniques (7 Hours)

Basic Structure of an AI System; AI Architectures (Simplified): Rule Based System, Machine Learning, Neural Networks; Key Concepts: Knowledge Representation (using symbols, facts), Search & Problem Solving (maze example, finding shortest route), Natural Language Understanding (Google Translate, chatbots)

Unit 3: Applications of AI in Society (7 Hours)

AI in Different Fields: Education (Personalized learning apps, plagiarism checkers), Healthcare (Disease prediction, medical chatbots), Commerce (Fraud detection in banking, stock market predictions, customer support), Daily Life (Smart home devices, language translation, travel assistants); AI & Decision Making: Hiring, Loan Approval, Court Decisions; Advantages of AI, Limitations of AI

Unit 4: Ethical, Social & Future Aspects of AI (8 Hours)

Ethical Concerns in AI: Privacy issues (CCTV, online data), Bias & Fairness (AI preferring certain groups), Job Displacement (automation replacing humans); Responsible AI: Transparency, Accountability, Human oversight; Future Trends in AI: Self-driving cars, AI in governance, creative industries; AI and You (Career Perspective): Opportunities in Digital Marketing, Content Creation, Business Analytics, HR Tech, Creative Industries (non-programming roles)

Textbook:

1. Melanie Mitchell – *Artificial Intelligence: A Guide for Thinking Humans* Reference Books:
2. Boden, Margaret A., *Artificial Intelligence: A Very Short Introduction*
3. Elaine Rich – *Artificial Intelligence* (3rd Edition)
4. Godbole, Achyut, *Artificial Intelligence* Bookganga Publication.
5. Stuart Russell – *Human Compatible* (2019)

SYLLABUS

B.Sc.- III, SEMESTER – VI

Data Analytics (134)

/ Data Science and Analytics (135)

/ Data Science (136)

Major Course: Applied Statistics

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

**Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)
(Three Years- Six Semesters Bachelor's Degree Programme)**

**(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))**

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	134221 / 135221 / 136221	Applied Statistics	2	30	2 Hrs	30

Course Objectives:	Overall, the objectives of Applied Statistics are to simplify and summarize complex data, reveal patterns and relationships, and provide a foundation for further analysis and interpretation. Some of the main objectives of descriptive statistics include: 1. To provide a concise summary of data through various statistical measures. 2. To develop the ability to present data through graphs, charts, and tables visually. 3. To have the ability to organize data in a meaningful way. 4. To understand various characteristics within data viz. shape, spread, and central values, make comparisons, draw conclusions, and comments on findings. 5. To explore relationships between variables.
Course Outcomes:	After successful completion of the course, students will be able to: 1. Students will gain a comprehensive knowledge and understanding of different types of data, data collection methods, and data measurement scales. 2. Students will acquire skills in analyzing and interpreting data using various descriptive statistical techniques. 3. Students will learn how to present data visually through graphs, charts, and tables. 4. Students will acquire skills to interpret and draw meaningful conclusions from data. 5. Completing a course in applied statistics will enhance students' analytical reasoning with decision-making skills after analyzing and evaluating statistical data. 6. Completing a course in applied statistics, students will be equipped with the skills necessary to conduct data analysis for research projects, reports, and academic studies during practical hours.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Types and Presentation of Data: Concept of statistical population and data, Qualitative & Quantitative data, Discrete & Continuous data, Frequency & Non-Frequency data, Geographical & Chronological data, Primary data & Secondary data with suitable examples. Tabular presentation of data: Construction of tables, Types of tables, Frequency distribution: Discrete, grouped, continuous and cumulative. Graphical presentation of data- Histogram, frequency polygon, frequency curve, ogives, and Box-plot.	8 Hrs	8 Marks	
Unit II	Statistical Analysis of Quantitative Data: Different types of scales-nominal, ordinal, interval and ratio, Univariate Data- Measures of central tendency, dispersion, moments and its computation from data. Absolute and relative measures of skewness and kurtosis based on quantiles and moments.	7 Hrs	7 Marks	
Unit III	Curve fitting and Theory of Attributes: Principle of least squares, fitting of straight line, parabola and curves reducible to straight line(exponential and power curve) Class frequency, order of a class frequency, ultimate class frequency, consistency of data, independence and association of attributes. Various measures of association.	8 Hrs	8 Marks	
Unit IV	Statistical Analysis of Bivariate Data: Correlation analysis-scatter diagram, Karl-Pearson’s coefficient of correlation and its properties. Correlation of bivariate frequency distribution, Spearman’s rank correlation. Regression analysis- Fitting of regression lines, regression coefficients and their properties.	7 Hrs	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Bhatt B.R., Srivenkatrainanna T. and Rao Madhava K.S. (1997): Statistics- A Beginner’s Text, Vol-11, New Age Intl.(P) Ltd. 2. Croxton F.E., Cowden D.J. and Kelin S (1973) : Applied General Statistics ,PHI Reference Books: 1. Goon A.M.,Gupta M.K &.,Das Gupta B. (1991) : Fundamentals of Statistics , Vol-I, World Press, Kolkata. 2. Kapoor V.K. & Gupta S.C.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, N. Delhi 3. Gupta S.P. : Statistical Methods , Sultan Chand and Sons, New Delhi 4. Elliance D.N. : Fundamentals of Statistics			

	5.Introduction to Applied Statistics – David D. Hanagal Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://youtu.be/5npGie2o2iA 2. https://www.youtube.com/watch?t=14&v=XERpfxcHUFM
Model Questions:	Short Type (At least 8) 1. Differentiate between qualitative data and quantitative data with one example each. 2. What is the difference between discrete frequency distribution and continuous frequency distribution? 3. Define primary data and secondary data with suitable examples. 4. What is a box-plot? Name any two statistical features it displays. 5. State the principle of least squares in curve fitting. 6. Write the equations for exponential curve and power curve that can be reduced to linear form. 7. Define class frequency and ultimate class frequency in the theory of attributes. 8. What does consistency of data mean in the context of attributes? 9. State any two properties of Karl Pearson's coefficient of correlation. 10. Write the formula for Spearman's rank correlation coefficient when ranks are not repeated. Long Type 1. Describe the construction of a frequency distribution table for continuous data. Then explain how you would draw a histogram, frequency polygon, and ogive from it. 2. Discuss the four scales of measurement – nominal, ordinal, interval, and ratio – with appropriate statistical examples for each. 3. Explain absolute and relative measures of skewness based on quantiles and based on moments. Also define kurtosis and its types. 4. Fit a straight line $y=a+bx$ using the principle of least squares. Derive the normal equations. How would you test the goodness of fit? 5. Derive Karl Pearson's coefficient of correlation from bivariate data. Prove that it lies between -1 and $+1$. Also explain its interpretation. 6. Distinguish between correlation and regression. Fit the two regression lines from bivariate data and prove that the coefficient of correlation is the geometric mean of the two regression coefficients.

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 134221 / 135221 / 136221	Course Title: Applied Statistics	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course: Data Science

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	134222 / 135222 / 136222	Data Science	2	30	2 Hrs	30

Course Objectives:	1 To acquire skills in data preparatory and preprocessing steps 2 To learn the tools and packages in Python for data science 3 To acquire knowledge in data interpretation and visualization techniques					
Course Outcomes:	At the end of this course students are able to: 1. Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data science tools. 2. Apply principles of Data Science to the analysis of business problems. 3. Apply ethical practices in everyday business activities and make well -reasoned ethical business and data management decisions. 4. Demonstrate knowledge of statistical data analysis techniques utilized in business decision making. 5. Apply algorithms to build machine intelligence					
Unit System	Contents			Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Data Science: - Need for data science, Benefits and uses, Facets of data, Data science process, Setting the research goal, Retrieving data Cleansing, integrating and transforming data, Exploratory data analysis, Building the models, Presenting and building applications.			8 Hrs	8 Marks	

Unit II	Mathematical Foundations for Data Science: - Basics of Data Science: Introduction; Typology of problems; Importance of linear algebra, statistics and optimization from a data science perspective Structured thinking for solving data science problems. Linear Algebra: Matrices and their properties (determinants, traces, rank, nullity, etc.); Eigen values and Eigen vectors; Matrix factorizations	7 Hrs	7 Marks	
Unit III	Python for Data Handling: - Basics of Numpy, Arrays, Aggregations, Computations on arrays, Comparisons masks, Boolean logic, Structured arrays Data manipulation with Pandas, Data indexing and selection, Operating on data, Missing data, Hierarchical indexing, Combining datasets	8 Hrs	8 Marks	
Unit IV	Python For Data Visualization : - Visualization with Matplotlib, Line plots, Scatter plots, Visualizing errors, Density and contour plots, Histograms Three dimensional plotting, Geographic data, Data analysis using statsmodels and seaborn, Graph plotting using Plotly	7 Hrs	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Data Science from Scratch: Joel Grus, O'Reilly Media Inc., ISBN: 9781491901427 2. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. 3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016 4. Practical Data Science Andreas François Vermeulen APress			

Model Questions:	Short answer Type Questions: 1.What is Data Science and why is it needed? 2.What are the steps in Data Science process? 3.What is data cleansing and why is it important? 4.Define Exploratory Data Analysis (EDA)? 5.What is a matrix and list its properties? 6.What are eigenvalues and eigenvectors? 7.Define probability and random variable? 8.What is NumPy and why is it used? 9.What is Pandas and its use in data handling? 10.What is data visualization? Name any two libraries used in Python? Long answer Type Questions: 1. Explain Data Science, its need, benefits, and applications in real life? 2. Describe the complete Data Science process in detail with all steps? 3. Explain data retrieval, cleansing, integration, and transformation with examples? 4. Discuss Exploratory Data Analysis (EDA) and its importance in decision making? 5. Explain Linear Algebra concepts (matrices, rank, determinant, eigenvalues, eigenvectors)? 6. Explain probability theory, random variables, expectation, and correlation in detail? 7. Discuss optimization techniques including gradient descent and least squares method? 8. Explain NumPy arrays and operations like masking, indexing, and aggregation? 9. Explain Pandas data manipulation techniques including missing data, grouping, and pivot tables? 10.Explain data visualization using Matplotlib, Seaborn, Plotly, and Bokeh with examples and comparison?
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Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 134222 / 135222 / 136222	Course Title: Data Science	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

Major Course: Data Visualization & Reporting

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	VI	134223 / 135223 / 136223	Data Visualization and Reporting	2	30	2 Hrs.	30
Course Objectives:		1. Understand the fundamentals of data visualization and its importance. 2. Learn about visual perception and its impact on data interpretation. 3. Explore the ethical considerations and challenges in data visualization. 4. Study different types of visualizations and their appropriate uses.					
Course Outcomes:		Students will be able to – 1. Identify and recognize visual perception and representation of data. 2. Illustrate about projections of different views of objects. 3. Apply various interaction and visualization techniques. 4. Analyze various groups for visualization.					

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Data Visualization Definition and importance of data visualization, Role of data visualization in decision making, Types of data (numerical, categorical, temporal, geographical) Data visualization process (data collection, exploration, analysis, visualization, interpretation), Challenges and limitations of data visualization, Visualization tools: Overview of Visualization Tools (e.g., Excel, Tableau, PowerBI, Python)	8 Hrs.	8 Marks	

Unit II	Principles of Data Story telling: Narrative and Context-Best Practices for Dashboard Layout and Interactivity Designing Effective Visualizations: Principles of Good Visualization, Design - Understanding and Using Color in Visualizations, Importance of Data Modelling in Visualization.	7 Hrs.	7 Marks
Unit III	Visual Representation: Creating visual representations, Visualization reference model, Visual mapping, Visual analytics, Design of visualization applications, Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data.	8 Hrs.	8 Marks
Unit IV	Visualization of groups: Visualization of groups, Trees, Graphs, Clusters, Networks, Software, Metaphorical visualization, Visualization techniques, Data structures used in data visualization.	7 Hrs.	7 Marks
References:	Course Material/Learning Resources Text books: 1. "Story telling with Data : A Data Visualization Guide for Business Professionals " Cole Nussbaumer Knaflic, Wiley; 1st edition, 2015. 2. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition,A K Peters, Ltd 2015. 3. “The Visual Display of Quantitative Information ” by Edward Tufte, Graphics Press USA ; 2nd edition, 2001. Reference Books: 1. "Data Visualization: A Practical Introduction" Kieran Healy, Princeton University Press, 2018. 2. "Analyzing Data with Power BI and Power Pivot for Excel ", Alberto Ferrari and Marco Russo, Microsoft Press; 1st edition, 2017. 3. "Microsoft Power BI Complete Reference", Devin Knight, Brian Knight, Mitchell Pearson, and Manuel Quintana, Packt Publishing; 1st edition,2018. 4. Visualization Analysis & Design ,1st edition, AK Peters Visualization Series 2014 5. Interactive Data Visualization for the Web , Scott Murray, ,2nd Edition, 2017 Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://learn.microsoft.com/en-us/power-bi/ 2. https://www.storytellingwithdata.com/ 3. https://jpsm.umd.edu/sites/jpsm.umd.edu/files/syllabi/Syllabus_Introduction%20to%20Data%20Visualization_Spring%202024.pdf 4. https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mgl10 Any pertinent media(recorded lectures, YouTube, etc.)if relevant: 1. https://www.youtube.com/watch?v=u5wxUks4-FY&list=PL8yOrZ6_TOt4_eyulGOoKl-sfhfS8tCAA 2. https://www.youtube.com/watch?v=VcgiiEoT1Dg		

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 134223 / 135223 / 136223	Course Title: Data Visualization & Reporting	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course: Laboratory on Applied Statistics

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	134224 / 135224 / 136224	Laboratory on Applied Statistics	2	60	4 Hrs	50

Course Objectives:	1. To Classify and organize raw data into appropriate statistical types, tables, and frequency distributions. 2. To Construct and interpret various graphical representations of data including histogram, frequency polygon, ogives, frequency curve, and box-plot. 3. To Compute and interpret measures of central tendency, dispersion, moments, skewness, and kurtosis for univariate data. 4. To Apply the principle of least squares to fit linear and non-linear curves (straight line, parabola, exponential, power) to given data. 5. To Analyze categorical data using theory of attributes including consistency checks, independence tests, and measures of association.
Course Outcomes:	After successful completion of the laboratory course, the student will be able to: 1. Construct simple and complex statistical tables, discrete/grouped/continuous/cumulative frequency distributions from raw data. 2. Draw and interpret histogram, frequency polygon, frequency curve, ogives (less-than and more-than), and box-plot. 3. Compute mean, median, mode, variance, standard deviation, moments, skewness (Bowley's & Pearson's), and kurtosis from univariate data. 4. Determine class frequencies, check consistency of attribute data, test independence/association, and compute Yule's coefficient of association. 5. Interpret graphical and numerical results to draw valid statistical conclusions. 6. Demonstrate proficiency in using manual calculations or statistical software (Excel/R/Python) for data analysis tasks covered in the syllabus.

Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1. To classify given datasets into qualitative/quantitative, discrete/continuous, primary/secondary, and geographical/chronological data. 2. To construct simple and complex statistical tables from raw data. 3. To form discrete and continuous frequency distributions. 4. To compute cumulative frequencies and draw less-than and more-than ogives. 5. To draw histogram and frequency polygon for grouped data 6. To draw frequency curve and box-plot, and detect outliers. 7. To identify nominal, ordinal, interval, and ratio scales from given variables. 8. To compute mean, median, and mode for raw and grouped data 9. To compute range, variance, standard deviation, and coefficient of variation. 10. To compute first four raw moments and central moments. 11. To compute absolute and relative measures of skewness (Bowley's and Karl Pearson's methods). 12. To compute kurtosis (β_2) and classify distribution as mesokurtic, leptokurtic, or platykurtic. 13. To fit a straight line $y = a + bx$ by the principle of least squares. 14. To fit a parabola $y = a + bx + cx^2$. 15. To fit exponential curve $y = ae^{(bx)}$ by reducing to linear form. 16. To fit power curve $y = a x^b$ by reducing to linear form. 17. To compute class frequencies and check consistency of data in attributes. 18. To test independence/association between two attributes using Yule's coefficient Q. 19. To draw scatter diagram and compute Karl Pearson's coefficient of correlation. 20. To compute Spearman's rank correlation and fit both regression lines			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 134224 / 135224 / 136224	Laboratory on Applied Statistics	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Practical	Course Code: 134224 / 135224 / 136224	Laboratory on Applied Statistics	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Major Course (Elective-2): Data Mining

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:

Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	VI	134225/ 135225/ 136225	Data Mining	2	30	2 Hrs.	30

Course Objectives:	1. To provide students with fundamental knowledge of data mining, data preprocessing, and data warehousing techniques for effective data analysis and knowledge discovery. 2. To develop the ability to analyze and apply various data mining methods such as association rule mining, classification, prediction, clustering, and pattern discovery in real-world scenarios. 3. To enable students to evaluate, compare, and implement suitable data mining algorithms and methodologies for solving complex data-driven problems and supporting intelligent decision-making.			
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Understand and apply fundamental concepts, techniques, and tools of data mining, data preprocessing, and data warehousing for extracting meaningful knowledge from large datasets. 2. Analyze and implement various data mining methods including association rule mining, classification, prediction, clustering, and pattern discovery techniques for real-world applications. 3. Evaluate and compare different data mining algorithms and methodologies to solve data analysis problems and support intelligent decision-making.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction and Data Preprocessing: Introduction to Data Mining, Data Mining Functionalities, Data Preprocessing: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization Concept Hierarchy Generation. Data Warehouse and OLAP Technology: Overview, Multidimensional Data Model, Data Warehouse Architecture	8 Hrs.	8 Marks	

Unit II	Association Rule Mining and Pattern Discovery: Introduction to Association Rule Mining, Mining Frequent Patterns, Associations and Correlations, Association Rule Mining Methods Mining Various Kinds of Association Rules, Correlation Analysis, Constraint-Based Association Mining, Graph Pattern Mining, Sequential Pattern Mining (SPM).	7 Hrs.	7 Marks	
Unit III	Classification and Prediction: Introduction to Classification and Prediction, Basic Concepts of Classification, Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Lazy Learners and Instance-Based Learning.	8 Hrs.	8 Marks	
Unit IV	Clustering and Applications: Cluster Analysis, Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Clustering Methods, Density-Based Clustering Methods, Grid-Based Clustering Methods, Outlier Analysis.	7 Hrs.	7 Marks	
References :	Course Material/Learning Resources Text books: 1 Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, and Jian Pei, 3rd Edition, Morgan Kaufmann Publishers, Elsevier. 2 Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Pearson Education. 3 Data Mining Techniques, Arun K. Pujari, Universities Press. Reference Books: 1 Data Mining: Introductory and Advanced Topics, Margaret H. Dunham, Pearson Education. 2 Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, and Mark A. Hall, Morgan Kaufmann Publishers. 3 Principles of Data Mining, David J. Hand, Heikki Mannila, and Padhraic Smyth, 4 MIT Press. 5 Data Warehousing, Data Mining and OLAP, Alex Berson and Stephen J. Smith, 6 McGraw-Hill Education. 7 Data Mining: Introductory and Advanced Topics, M. H. Dunham and S. Sridhar, 8 Pearson Education. Weblink to Equivalent MOOC on SWAYAM if relevant: 1 https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_cs06 2 https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs14 3 https://onlinecourses.swayam2.ac.in/e-learning/preview/imb25_mg200 Any pertinent media(recorded lectures, YouTube, etc.)if relevant: 1. https://youtu.be/rzRJsNeS0KI?si=kPnhV-MrGQoeAmaT 2. https://youtu.be/rB382wSHuTg?si=F6O9lPJrICieUqve			

Model Questions:	Short Type: Q.1. Define Data Mining and explain its major functionalities. Q.2. What is Data Preprocessing? Explain Data Cleaning and Data Transformation. Q.3. Differentiate between OLTP and OLAP systems. Q.4. Define Association Rule Mining. What are support and confidence? Q.5. Explain Decision Tree Induction and Bayesian Classification. Q.6. What is Cluster Analysis? Explain different types of clustering methods. Q.7. Define Sequential Pattern Mining and Outlier Analysis. Long Type: Q.1. Explain the complete process of Data Preprocessing including Data Cleaning, Integration, Transformation, Reduction, Discretization, and Concept Hierarchy Generation. Q.2. Discuss Data Warehouse Architecture, Multidimensional Data Model, and OLAP operations in detail. Q.3. Explain Association Rule Mining techniques and methods for mining frequent patterns with suitable examples. Q.4. Describe various Association Rule Mining methods including Correlation Analysis, Constraint-Based Mining, Graph Pattern Mining, and Sequential Pattern Mining. Q.5. Explain Classification and Prediction techniques with Decision Tree Induction, Bayesian Classification, Rule-Based Classification, and Lazy Learners. Q.6. Discuss major Clustering Methods including Partitioning, Hierarchical, Density-Based, and Grid-Based Clustering techniques. Q.7. Explain Outlier Analysis and discuss real-world applications of Data Mining in business, healthcare, education, and e-commerce.
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Assessment Rubric: Internal for Theory Course (Major Elective-2)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 134225/ 135225/ 136225	Course Title: Data Mining	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course (Elective-2): Map Reduce and Hadoop Technology

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	V	134226 / 135226 / 136226	Map Reduce and Hadoop Technology	2	30	2 Hrs	30

Course Objectives:	1. To understand the fundamentals of Big Data and distributed systems. 2. To learn the architecture and working of Apache Hadoop. 3. To gain knowledge of HDFS storage and MapReduce programming model. 4. To develop skills in processing large datasets using Hadoop ecosystem tools. 5. To understand real-world applications of Big Data analytics.				
Course Outcomes:	After completion of this course, students will be able to: 1. Understand Big Data concepts and distributed computing systems. 2. Understand Hadoop architecture and HDFS file system. 3. Implement basic MapReduce programs. 4. Analyze Hadoop ecosystem tools like Hive, Pig, and HBase. 5. Apply Big Data techniques to real-world problems.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction to Big Data: Characteristics, Traditional databases vs Big Data systems, Distributed computing concepts	7 Hrs	7 Marks		

	Introduction to cloud computing and scalable systems, Need for Hadoop in modern data processing, Overview of Apache Hadoop ecosystem			
Unit II	Hadoop Architecture and HDFS: Hadoop architecture overview, Components of Hadoop: HDFS (Hadoop Distributed File System), MapReduce, YARN (Yet Another Resource Negotiator) HDFS architecture (NameNode, DataNode), Block storage and replication, Fault tolerance and data reliability, File operations in HDFS, Basic Hadoop commands	8 Hrs	8 Marks	
Unit III	MapReduce Programming Model: Introduction to MapReduce paradigm, Map and Reduce functions, Input/Output formats Data flow in MapReduce, Combiner and partitioner concepts, Word Count example Execution phases of MapReduce job, Advantages and limitations	7 Hrs	7 Marks	
Unit IV	Hadoop Ecosystem and Tools: Hadoop ecosystem overview: Hive (data warehousing), Pig (scripting language), HBase (NoSQL database), Introduction to data processing tools Sqoop and Flume (data ingestion tools), Basic idea of Spark vs Hadoop, Real-world applications of Hadoop	8 Hrs	8 Marks	
References :	Course Material/Learning Resources Text books: 1. Hadoop: The Definitive Guide, Latest Edition- Tom White. 2. Big Data and Hadoop- Seema Acharya & Subhashini Chellappan 3. Big Data Analytics with Hadoop- Vignesh Prajapati.			
	Reference Books: 1. Professional Hadoop Solutions- Boris Lublinsky 2. Hadoop Operations - Donald Miner 3. Programming Hive - E. Capriolo 4. Guide to Big Data Analytics - Michael Berthold Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses-archive.nptel.ac.in/noc19_cs33/preview 2. https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_cs13 Any pertinent media(recorded lectures, YouTube, etc.)if relevant: 1. https://www.youtube.com/watch?v=b-IvmXoO0bU. 2. https://www.youtube.com/watch?v=SqvAaB3vK8U.			
Model Questions:	Short Type (At least 8) 1 Define Big Data. 2 What is Hadoop?			

	3 What is HDFS? 4 Define Map and Reduce functions. 5 What is a DataNode? 6 What is NameNode? 7 What is replication factor? 8 What is YARN? 9 What is Combiner in MapReduce? 10 What is Hive? Long Type 1. Explain characteristics of Big Data with examples. 2. Describe Hadoop architecture with neat diagram. 3. Explain HDFS architecture and its working. 4. Explain MapReduce programming model with Word Count example. 5. Discuss Hadoop ecosystem components in detail. 6. Explain advantages and limitations of Hadoop. 7. Compare traditional database systems with Big Data systems. 8. Explain data processing flow in Hadoop.
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Assessment Rubric: Internal for Theory Course (Major Elective-2)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 134226 / 135226 / 136226	Course Title: Map Reduce and Hadoop Technology	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course (Elective-2 Laboratory): Laboratory on Data Mining Tools

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:

Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	134227/ 135227/ 136227	Laboratory on Data Mining Tools	2	60	4Hrs.	50

Course Objectives:	1. To understand the fundamentals of Data Mining concepts, preprocessing techniques, and Data Warehousing using modern data mining tools. 2. To develop practical skills in applying classification, clustering, association rule mining, and pattern discovery techniques on real-world datasets. 3. To gain hands-on experience in using Data Mining tools such as WEKA, RapidMiner, KNIME, and Orange for data analysis and knowledge discovery. 4. To analyze and interpret data mining results for decision-making, prediction, and business intelligence applications.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Demonstrate the use of data mining tools to perform data preprocessing, data analysis, and knowledge discovery tasks. 2. Implement classification, clustering, association rule mining, and prediction techniques on real-world datasets using suitable algorithms. 3. Analyze multidimensional data and perform OLAP operations for effective data warehousing and business intelligence applications. 4. Evaluate and interpret the performance of various data mining methods to solve practical problems in domains such as healthcare, finance, education, and e-commerce.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

1. Study and installation of Data Mining tools such as WEKA, RapidMiner, Orange, and KNIME. 2. Perform data import/export operations using WEKA. 3. Implement Data Cleaning techniques for handling missing and noisy data. 4. Perform Data Transformation and Normalization on a given dataset. 5. Implement Data Reduction techniques using feature selection. 6. Generate Concept Hierarchies and perform Data Discretization. 7. Create and analyze a Data Warehouse schema (Star Schema and Snowflake Schema). 8. Perform OLAP operations such as Roll-up, Drill-down, Slice, and Dice. 9. Implement Apriori Algorithm for Association Rule Mining. 10. Generate Frequent Item sets using FP-Growth Algorithm. 11. Perform Correlation Analysis on transactional datasets. 12. Implement Sequential Pattern Mining using suitable datasets. 13. Build a Decision Tree Classifier using WEKA/RapidMiner. 14. Implement Bayesian Classification using Naive Bayes algorithm. 15. Perform Rule-Based Classification on sample datasets. 16. Implement k-Nearest Neighbor (k-NN) classification technique. 17. Perform Clustering using k-Means Algorithm. 18. Implement Hierarchical Clustering techniques. 19. Perform Density-Based Clustering using DBSCAN algorithm. 20. Detect Outliers and analyze anomalous data patterns using Data Mining tools.			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 134227/ 135227/ 136227	Laboratory on Data Mining Tools	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Practical	Course Code: 134227/ 135227/ 136227	Laboratory on Data Mining Tools	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Major Course (Elective-2 Laboratory): Lab on Map Reduce and Hadoop Technology

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))
(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	134228 / 135228 / 36228	Laboratory on Map Reduce and Hadoop Technology	2	60	4Hrs	50

Course Objectives:	1. To understand Hadoop and Big Data concepts. 2. To perform file operations using HDFS. 3. To develop MapReduce programs. 4. To use Hadoop ecosystem tools like Hive and Pig. 5. To analyze large datasets using Hadoop.						
Course Outcomes:	After completion of the lab, students will be able to: 1. Install and configure Hadoop. 2. Execute HDFS operations. 3. Develop MapReduce applications. 4. Use Hadoop tools for data processing. 5. Analyze Big Data datasets.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1.	Study of Big Data and Hadoop ecosystem.						
2.	Installation and configuration of Apache Hadoop in pseudo distributed mode.						
3.	Study of Hadoop Distributed File System (HDFS).						

	4. Perform HDFS file operations using Hadoop commands. 5. Create directories and upload/download files in HDFS. 6. Write and execute a basic MapReduce program. 7. Implement Word Count program using MapReduce. 8. Implement character count using MapReduce. 9. Implement line count using MapReduce. 10. Implement sorting operation using MapReduce. 11. Implement maximum temperature analysis using MapReduce. 12. Study of Hadoop YARN architecture and resource management. 13. Installation and execution of Hive queries. 14. Create tables and perform operations using HiveQL. 15. Study and execution of Pig Latin scripts. 16. Perform data loading and transformation using Pig. 17. Study of HBase architecture and basic commands. 18. Import/export data using Sqoop. 19. Data collection using Flume. 20. Mini Project: Analyze a dataset using Hadoop ecosystem tools.			
References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://datapillar.ai/a-complete-guide-to-hadoop-architecture-and-its-core-components-for-big-data/ 2. https://medium.com/edureka/hive-commands-b70045a5693a 3. https://www.udemy.com/course/learn-bigdata-hadoop-with-practical/ 4. https://www.tutorialspoint.com/ 5. https://www.geeksforgeeks.org/big-data/how-to-execute-wordcount-program-in-mapreduce-using-cloudera-distribution-hadoop-cdh/ 6. https://learnomate.org/count-frequency-of-character-in-mapreduce-programme/			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 134228 / 135228 / 136228	Laboratory on Map Reduce and Hadoop Technology	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Practical	Course Code: 134228 / 135228 / 136228	Laboratory on Map Reduce and Hadoop Technology	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Minor Course: Artificial Intelligence

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	134267 / 135267 / 136267	Artificial Intelligence	2	30	2 Hrs	30

Course Objectives:	1. To introduce the fundamentals of Artificial Intelligence and intelligent systems. 2. To understand AI problem-solving and search techniques. 3. To learn basic machine learning concepts used in data analytics. 4. To study applications, ethical issues, and future trends in AI.						
Course Outcomes:	After completing this course, students will be able to: 1. Understand concepts, history, and applications of Artificial Intelligence. 2. Apply AI search and problem-solving techniques. 3. Understand fundamentals of machine learning and intelligent systems. 4. Analyze ethical and practical applications of AI in real-world scenarios						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Artificial Intelligence Definition and History of AI, Characteristics of Intelligent Systems, Types of Artificial Intelligence Intelligent Agents and Environment: Rational Agents, Mapping from Sequences to Actions, Properties of Environments, Structure of Intelligent Agent, Types of Agents: Simple, Reflex Agents - Goal Based Agents - Utility Based Agents. Applications of AI in Daily Life				8 Hrs	8 Marks	

Unit II	Problem Solving and Search Techniques AI Problem Solving Approach, State Space Representation, Uninformed Search Techniques Breadth First Search, Depth First Search, Informed Search Techniques, Heuristic Search, Best First Search, Greedy Search	7 Hrs	7 Marks	
Unit III	Machine Learning Basics: Introduction to Machine Learning, Types of Machine Learning: Supervised Learning, Unsupervised Learning, Classification and Clustering, AI in Data Science and Analytics, Applications of Machine Learning	8 Hrs	8 Marks	
Unit IV	AI – Knowledge Representation -Procedural versus Declarative Knowledge, Applications and Ethics of AI, Expert Systems Natural Language Processing Basics, Robotics and Computer Vision, Ethical Issues in AI, Future Trends in Artificial Intelligence.	7 Hrs	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Stuart Russel and Peter Norvig- “Artificial Intelligence: A Modern Approach,” Pearson Education, 3rd Edition, 2010. E. 2. Rich and K. Knight, “Artificial Intelligence,” TMH, 3rd Edition, 2017. Reference Books: 1. Artificial Intelligence – Patrick Henry Winston, Addison-Wesley. 2. Machine Learning – McGraw Hill Publication. 3. Deep Learning – MIT Press. 4. Introduction to Artificial Intelligence and Expert Systems – PHI Learning. 5. B. Yagna Narayana, “Artificial Neural Networks”, PHI, 2005. Dan W. Patterson, 6. “Artificial Intelligence and Expert Systems,” Pearson Education, 2018. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ge55 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs42 3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs10 4. https://swayam-plus.swayam2.ac.in/ai-for-all-courses Weblink to Equivalent Virtual Lab if relevant: 1. https://ai1-iiith.vlabs.ac.in/ 2. https://ai2-iiith.vlabs.ac.in/ 3. https://codelabs.developers.google.com/			
Model Questions:	Short Type (At least 8) 1. What is AI? 2. What are AI Agents?			

	3. What are problem-solving techniques in AI? 4. How Machines Learn from Data? 5. What is Need for Machine Learning? 6. What is Expert Systems 7. What is NLP in AI? 8. What is unsupervised learning? 9. What is clustering in AI? 10. What is classification in machine learning? Long Type 1. Define Artificial Intelligence. How does it differ from traditional programming? 2. What is an AI Agent? How does it perceive and act in an environment? 3. Explain the evolution and history of Artificial Intelligence. 4. What is the A* algorithm and how does it combine cost and heuristic? 5. Explain Breadth-First Search (BFS) and Depth-First Search (DFS) with examples. 6. What is Machine learning? What are the types of Machine Learning 7. Differentiate between Supervised Learning, Unsupervised Learning 8. What are the Applications of Machine Learning? 9. Explain Procedural versus Declarative Knowledge 10. What are the Ethical Issues in AI?
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Assessment Rubric: Minor Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 134267/135267/136267	Course Title: Artificial Intelligence	Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)	10	
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)	5	
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)	5	

Minor Course: Laboratory on Artificial Intelligence

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors))

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research))

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	IV	134268/135268/ 136268	Laboratory on Artificial Intelligence	2	60	4 Hrs	50

Course Objectives:	1. To provide hands-on experience with AI tools and intelligent systems. 2. To implement AI search and problem-solving techniques. 3. To demonstrate machine learning concepts using datasets. 4. To understand AI applications, ethics, and analytics-based solutions.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Use AI tools and Python libraries for AI applications. 2. Implement AI search and problem-solving techniques. 3. Perform machine learning operations using datasets. 4. Analyze AI applications, ethical issues, and future technologies						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1. Installation and configuration of Python, Anaconda, and Jupyter Notebook 2. Study of AI applications in healthcare, education, and business 3. Program to demonstrate Intelligent Agents and environments 4. Implementation of State Space Representation for simple problems 5. Implementation of Breadth First Search (BFS) algorithm 6. Implementation of Depth First Search (DFS) algorithm 7. Comparative analysis of BFS and DFS algorithms 8. Implementation of Heuristic Search technique 9. Program for Best First Search algorithm							

10. Water Jug Problem using AI search techniques 11. Tic-Tac-Toe game implementation using AI concepts 12. Introduction to NumPy and Pandas libraries 13. Data preprocessing using Python libraries 14. Introduction to Scikit-Learn library 15. Implementation of Supervised Learning using Linear Regression 16. Classification using K-Nearest Neighbor (KNN) 17. Implementation of Decision Tree Classifier 18. Implementation of Unsupervised Learning using K-Means Clustering 19. AI-based mini project using a simple dataset 20. Study and presentation on Ethical Issues in Artificial Intelligence 21. Seminar on Future Trends in Artificial Intelligence 22. Case study on AI applications in Data Science and Analytics.				
Suggested Software and Tools: 1. Python Programming Language 2. Anaconda Distribution 3. Jupyter Notebook 4. Google Colab 4. Scikit-Learn 5. NumPy Library 6. Pandas Library				
References:	Reference Books: 1. Artificial Intelligence: A Modern Approach – Stuart Russell & Peter Norvig 2. Artificial Intelligence using Python – Prateek Joshi 3. Python Machine Learning – Sebastian Raschka 4. Hands-On Machine Learning with Scikit-Learn – Aurélien Géron 5. Machine Learning using Python – Wiley Publication Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://grow.google/ai 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs10 3. https://learn.microsoft.com/en-us/ai/?tabs=business-technical-leader 4. https://www.deeplearning.ai/courses/ai-python-for-beginners 5. https://www.coursera.org/learn/python-project-for-ai-application-development 6. https://www.youtube.com/watch?v=t9gmyvf7JYo			

	7. https://www.youtube.com/watch?v=hhGPiDrUe1c 8. https://www.youtube.com/watch?v=yvlymFj0oFo&list=PLJnkyVAO-LM7D_9kbeI47P7hJ0SjHj1VQ			
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Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 134268/135268/ 136268	Laboratory on Artificial Intelligence	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Practical	Course Code: 134268/135268/ 136268	Laboratory on Artificial Intelligence	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

VSC: Laboratory on Data Visualization & Reporting

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

B. Sc. III - SEMESTER – VI

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major:
Data Analytics (134)/Data Science and Analytics (135)/Data Science (136)

(Three Years- Six Semesters Bachelor's Degree Programme)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors)

(Four Years- Eight Semesters Bachelor's Degree Programme (Honors with Research)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	134288 / 135288 / 136288	Laboratory on Data Visualization & Reporting	2	60	4 Hrs.	50
Course Objectives:		1. To facilitate the students with the ability to visualize, gather information. 2. To articulate, analyze, solve complex problems, and make decisions. 3. To address the challenges of complex and computation intensive problems increasing their productivity.					
Course Outcomes:		On completion of the laboratory tasks the students will be able to - 1. Demonstrate basic proficiency in data import, cleaning, and visualization tools. 2. Generate appropriate charts and plots for univariate, bivariate, and multivariate data. 3. Publish and share reports.					
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies

Lab Programs for Data Visualization Using MS-Excel/ Power BI / Tableau / Python / Google Charts Introduction to Power BI Interface and Basics 1. Installation and interface overview 2. Exploring the Power BI workspace : Ribbon, panes, and canvas. 3. Importing data from Excel and CSV files. 4. Introduction to multiple data sources 5. Basic report creation: Adding visuals and saving a report. Data Transformation and Preparation 1. Using Power Query Editor 2. Cleaning data: Removing duplicates, handling missing values. 3. Transforming data: Splitting columns, changing datatypes, renaming columns. 4. Merging and appending queries. 5. Creating custom columns and calculated columns Data Modeling 1. Creating relationships between tables 2. Identifying and resolving data inconsistencies 3. Creating calculated columns and measures Creating Basic Visualizations 1. Creating various chart types (bar, column, line, pie, area, etc.,) 2. Formatting and customizing visualizations Publishing and Sharing Reports 1. Publishing a report using any tool. 2. Sharing reports and dashboards with team members. 3. Setting up data refresh schedules and managing permissions.			
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Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Practical	134288 / 135288 / 136288	Lab/Practical-24 - Laboratory on Data Visualization	Max Marks: 50
Q. No.	Assessment Criteria		Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout		20
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester		10
3.	Attendance in practical session / Students' overall performance		10
4.	Internal Viva Voce		10

Internship/Apprenticeship:

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	134294 / 135294 / 136294	Internship/Apprenticeship in Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)	4	120	--	100

Course Objectives :	1. Gain practical exposure to industry, research organizations, startups, or professional work environments related to Computer Science. 2. Apply theoretical knowledge acquired during the academic program to real-world computing problems and industry practices. 3. Enhance professional skills such as communication, teamwork, leadership, project management, and workplace ethics. 4. Strengthen problem-solving, analytical thinking, innovation, and decision-making abilities through experiential learning. 5. Understand organizational structure, work culture, professional responsibilities, and industry standards.
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Demonstrate the ability to apply Computer Science concepts, tools, and technologies in real workplace or project environments. 2. Analyze industry-specific problems and develop appropriate technical solutions using modern computing techniques. 3. Communicate effectively with team members, supervisors, clients, and stakeholders through reports, presentations, and discussions. 4. Demonstrate teamwork, leadership qualities, project management skills, and collaborative learning abilities. 5. Prepare internship/apprenticeship reports documenting objectives, methodology, activities performed, outcomes achieved, and lessons learned. 6. Evaluate industry practices and identify opportunities for innovation, entrepreneurship, higher studies, research, and career development.
Contents Internship/Apprenticeship in Computer Science Related to Major (During vacations/break period of Semester V and Semester VI) for duration of 120 hours mandatory to all the students, to be completed during vacations of Semester V and/or VI. This will carry 4 Credits for learning of 120 hours. Its credits and grades will be reflected in Semester VI credit grade report. General Guidelines 1. The examinee shall be required to produce hard copy and soft copy of completion of internship/apprenticeship certificate duly signed by competent authority to Faculty Mentors. 2. Student can take internship work in the form of Online/Onsite mode. 3. Research internship under Faculty member (Internal and External), IISC, IIT's, NIT's, research project or innovative project and other Research	

organizations also be considered.

Guidelines for Internship/Research Internship for Under Graduate Students:

For understanding key principles of Guidelines for Internship/Research Internship for Under Graduate Students published by UGC on 2023. Please refer

https://www.ugc.gov.in/pdfnews/0063650_Draft-Guidelines-for-Internship-and-Research-Internship-for-Under-Graduate-Students.pdf

Internship Work Evaluation:

1. The parent HEI will examine/evaluate the student's performance following its evaluation method.
2. The interns will be evaluated by research internship supervisor based on their efforts and research output.
3. The interns will be evaluated through seminar presentation or viva-voce at the HEI, (marks will be given by a group of experts from HEI including the supervisor).
4. Students will be allotted to faculty mentors/supervisor
5. Student need to submit at least one/two progress report, attendance, and regular supporting documents to faculty mentors/supervisor

Assessment Rubric/Internal evaluation for the Internship/Apprenticeship in Data Analytics (134)/Data Science and Analytics (135)/Data Science (136):

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI B.Sc. III, SEMESTER – VI (NEP)			
Internship/Apprenticeship	Course Code: 134294 / 135294 / 136294	Internship/Apprenticeship in Data Analytics (134) / Data Science and Analytics (135) / Data Science (136)	Max Marks: 100
Q. No.	Exercise		Marks
1	Activity logbook and evaluation report of Internship Supervisor		10
2	Format of presentation and the quality of the intern’s report		10
3	Acquisition of skill sets by the intern		10
4	Originality and any innovative contribution		10
5	Significance of research outcomes		10
6	Regular Attendance		25
7	Seminar/Viva-Voce /Presentation (PPT) (Visual clarity, and confidence, Findings etc.)		25
Total:			100