

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	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 completion 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	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/Practical (Total)	
					External		Internal		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/Practical (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>

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_c++_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-c++			
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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 followingfeatures: 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. Information Technology (123)

Semester - V and VI

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. Junaaid	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. Buldhana
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. HomrajPatelpaik	Member	Lokmanya Tilak Mahavidyalaya Wani, Dist. Yavatmal
11	Prof. Sureshkumar Mapari	Member	Rajasthan Aryan Arts, Shri Mithulal Kacholia Commerce and Shri SatyanarayanjiRamkrishnaji Rathi Science College, Washim

Subcommittee appointed for drafting syllabus of B. Sc. III Sem V and VI (NEP) in B.Sc. Information Technology (123)

Sr. No.	Name	Designation	Address
01	Dr. Ajay Chendake	Chairman	Degree College of Physical Education, HVPM, Amravati
02	Ram Ghayalkar	Member	Shri R.L.T. College of Science, Akola
03	Dr. Navin Jambhekar	Member	Gopikabai Sitaram Gawande Mahavidyalaya, Umarkhed, Distt. Yavatmal
04	Prof. Vinod Agarkar	Member	Shri Dnyaneshwar MaskujiBurungale Science and Arts College, Shegaon. Dist. Buldhana
05	Dr. Bhargavi Chinchamaltpure	Member	Bharatiya Mahavidyalaya, Amravati.
06	Prof. Punam Ingale	Member	Vidyan Mahavidyalaya, Malkhapur, Dist. Buldhana

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:

- 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		Max. Marks	Min. Marks	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 – V

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-T7	123213	Operating System	2	2	30	9	20	6	50	20
Major-T8	123214	PHP Programming	2	2	30	9	20	6	50	20
Major-T9	123215	XML and Web Services	2	2	30	9	20	6	50	20
Major-Lab/Practical-15	123216	Laboratory on PHP Programming	2	4	25	10	25	10	50	20
Major-Elective T1	123217	Mobile Application Development	2	2	30	9	20	6	50	20
Major-Elective T1	123218	Client Server Technology	2	2	30	9	20	6	50	20
Major-Elective Lab/Practical-17	123219	Laboratory on Mobile Application Development	2	4	25	10	25	10	50	20
Major-Elective Lab/Practical-17	123220	Laboratory on Client Server Technology	2	4	25	10	25	10	50	20
Minor-T5	123265	Advance Computer Network	2	2	30	9	20	6	50	20
Minor-P18	123266	Laboratory on Advance Computer Network	2	4	25	10	25	10	50	20
VSC-P19	123286	Laboratory on Multimedia Content Development	2	4	-	-	50	20	50	20
SEC-P	123287	Laboratory on XML and Web Services	2	4	-	-	50	20	50	20
FP/CES	123293	Project in Information Technology.	2	4	-	-	50	20	50	20
*Special Theory	--	Foundation of Artificial Intelligence	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

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-T10	123221	Programming with Prolog	2	2	30	9	20	6	50	20
Major-T11	123222	Internet of Things	2	2	30	9	20	6	50	20
Major-T	123223	Laboratory on Programming with Prolog	2	2	30	9	20	6	50	20
Major-Lab/Practical-20	123224	Laboratory on Internet of Things	2	4	25	10	25	10	50	20
Major-Elective T12	123225	Neural Network	2	2	30	9	20	6	50	20
Major-Elective T2	123226	Visual Programming	2	2	30	9	20	6	50	20
Major-Elective Lab/Practical-22	12327	Laboratory on Neural Network	2	4	25	10	25	10	50	20
Major-Elective Lab/Practical-22	123228	Laboratory on Visual Programming	2	4	25	10	25	10	50	20
Minor-T6	123267	Machine Learning	2	2	30	9	20	6	50	20
Minor-P23	123268	Laboratory on Machine Learning	2	4	25	10	25	10	50	20
VSC-P24	123288	Laboratory on Programming with SCALA	2	4	-	-	50	20	50	20
Internship / Apprenticeship	123294	Internship / Apprenticeship in Information Technology	4	8	-	-	50	20	50	20

SYLLABUS

B.Sc.- III, SEMESTER – V

Information Technology (123)

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major: Information Technology (123)

(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: Operating System

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123213	Operating System	2	30	2 Hrs.	30

Course Objective:	1. Understand the fundamental concepts of operating systems. 2. Learn process management and CPU scheduling techniques. 3. Study memory management and virtual memory concepts. 4. Understand file systems and storage management. 5. Explore synchronization, deadlocks, and security issues. 6. Gain hands-on experience with Linux operating systems and shell commands.
Course Outcomes:	students will be able to: CO1: Explain the structure and functions of operating systems. CO2: Analyse process scheduling and synchronization mechanisms. CO3: Apply memory management techniques and virtual memory concepts. CO4: Design solutions for deadlock handling and resource allocation. CO5: Understand file systems, I/O management, and storage systems. CO6: Use Linux commands and shell scripting for system administration tasks.

Unit System	Content	Workload Allotted	Weightage of marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Operating Systems: Definition and objectives of Operating Systems, Evolution of Operating Systems, Types of Operating Systems, OS Services and Functions, System Calls, Operating System Structures, Operating System Security	7 Hrs.	7 Marks	
Unit II	Process Management: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Threads and Multithreading CPU Scheduling: Basic Concepts, Scheduling Criteria, CPU Scheduling Algorithms, Scheduling Criteria, Context Switching, Inter-Process Communication (IPC)	8 Hrs.	8 Marks	
Unit III	Process Synchronization: Critical Section Problem, Synchronization, Hardware, Mutex Locks, Semaphores, Monitors Deadlocks: Deadlock, Characterization, Prevention, Avoidance, Detection and Recovery Operating System Security Concept	7 Hrs.	7 Marks	
Unit IV	Memory Management: Memory Hierarchy, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory, Demand Paging, Page Replacement, Thrashing Storage Management: Disk Structure, Disk Management File-System Concept, Overview of I/O Systems	8 Hrs.	8 Marks	
References:	Ref Books: 1.Operating System Concepts–Seventh Edition: Abraham Silberschatz, Peter Galvin, Greg Gagne (John Wiley & Sons) 2. Operating Systems: William Stallings (Pearson) 3. Modern Operating System: Andrew S.Tanenbaum Text Books 1. Distributed Operating Systems, Prentice Hall M. Singhal & N. Shivaratri, 2. Advanced Concepts in Operating Systems, McGraw Hill 3. Understanding theLinuxKernel,2nd Edition By Daniel P. Bovet, Oreilly 4. The Design of Unix Operating System Maurice Bach,Pearson Important Portal Link (swayam and nptel): 1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_cs88 2. https://nptel.ac.in/courses/106102132 3. https://pdos.csail.mit.edu/6.828/2025			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 123213	Course Title: Operating 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

Major Course: PHP Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123214	PHP Programming	2	30	2 Hrs	30

Course Objectives:	1. To introduce the fundamentals and environment setup of PHP programming. 2. To develop understanding of PHP syntax, variables, operators, and control statements. 3. To provide knowledge of functions, strings, arrays, and regular expressions in PHP. 4. To develop problem-solving skills using PHP programming techniques.				
Course Outcomes:	After successful completion of this course, students will be able to: 1. Understand the basic concepts, syntax, and environment of PHP programming. 2. Apply PHP operators, conditional statements, and looping constructs in programs. 3. Implement user-defined functions and manage variable scope in PHP. 4. Perform string manipulation, create and manipulate indexed and associative arrays in PHP applications.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction to PHP and Basic Concepts: PHP introduction, Versions and versions of PHP, Important tools and software requirements: Web, Server, Database, Editors, Basic Syntax of PHP, PHP variables and constants, Types of data in PHP, Expressions Scope of variables, PHP Operators, Operator precedence and associativity	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Conditional Statements and Looping: PHP IF statement, IF-Else statement, Nested IF-Else statement, Switch case statement, while loop, Do While loop, For loop, Goto statement, Break statement, continue statement, Exit statement	7 Hrs.	7 Marks		
Unit III	PHP Functions and String Manipulation: Function and need of function, Declaration and calling of function, Function Arguments: Function with arguments, Default arguments in function, call by value, call by reference, String	8 Hrs.	8 Marks		

	Manipulation: Creating and accessing strings, Searching and replacing strings, Formatting strings, Joining and splitting strings, String related library functions			
Unit IV	Arrays in PHP: Anatomy of an array, creating index based arrays, Creating associative arrays, Accessing elements of arrays, Looping with index based arrays, Associative Array Traversal: Associative arrays using each(), Associative arrays using foreach()	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Reference Books: 1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007. 2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008. 3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback, O'reilly, 2014. 4. Luke Welling, Laura Thompson, "PHP and MySQL Web Development", 4th Edition, Addition Paperback, Addison-Wesley Professional, 2008. 5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.mygreatlearning.com/academy/learn-for-free/courses/php 2. https://www.udemy.com/topic/php/free/?srsltid=AfmBOopJ_dYxOusDbwRRVO3HA3H_01pYvN8P6wrI6DhflCfs1sb7Ubi8 3. https://www.w3schools.com/php/ Weblink to Equivalent Virtual Lab if relevant: 1. https://www.programiz.com/php/online-compiler/ 2. https://onecompiler.com/php 3. https://www.adaface.com/online-compiler/online-php-compiler 4. https://www.w3schools.com/pHP/phptryit.asp?filename=tryphp_compiler 5. https://www.onlinegdb.com/online_php_interpreter			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 123214	Course Title:PHP 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: XML and Web Services

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123215	XML and Web Services	2	30	2 Hrs.	30

Course Objectives:	1. To provide the knowledge of basic of XML 2. To understand importance of XML document structure 3. To understand importance of XML as native database for web applications 4. To understand the stylesheet						
Course Outcomes:	Students will be able to - 1. Learn the basic types for XML document, and its application. 2. Know the strength and weakness of XML. 3. Use the appropriate schema for web services. 4. Develop scripting skills which require to solve given problem.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Extensible Markup Language (XML): Introduction, Types of XML document: Valid and Well formed, Components of XML documents: The document prolog and document instance. XML Basics: Elements, attributes & entities, Creating simple XML Document, Difference between XML and HTML				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Document Type Definition (DTD): Introduction, DTD Syntax and Declarations, Types of DTD: Internal and External, Element Content Model, entities and their types				7 Hrs.	7 Marks	
Unit III	Stylesheet: Introduction, Introduction to CSS, Internal Vs External CSS, Selectors: Element, ID, Class. CSS properties: background, color, text, fonts, CSS with XML				8 Hrs.	8 Marks	
Unit IV	Web Services: Introduction, basic operational model of web services, benefits and challenges of using web services, Web Services Building Blocks: SOAP, WSDL and UDDI				7 Hrs.	7 Marks	

References:	Course Material/Learning Resources Text books: 1. Mastering XML, Ann Navaro, Chuck White, Linda Burman, BPB Publication. 2. XML: The Complete Reference, by Heather Williamson, Tata McGraw-Hill Education India. 3. HTML & CSS: The Complete Reference, Fifth Edition, by Thomas A. Powell, McGraw-Hill 4. Web Services Essentials, by Ethan Cerami, O'Reilly publication Reference Books: 1. XML How to Program Deitel. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr25_ed123 2. https://onlinecourses.swayam2.ac.in/e-learning/preview/nou24_cs09 Any pertinent media(recorded lectures, YouTube, etc.)if relevant: 1. https://www.youtube.com/watch?v=_jIdSHM9qR0 2. https://www.youtube.com/watch?v=AGDDdsiZ0Ko 1. https://www.youtube.com/watch?v=Hy_lhmeHF8I
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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: 123215	Course Title:XML and Web Services	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 PHP Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123216	Laboratory on PHP Programming	2	60	4Hrs	50

Course Objectives:	1. To introduce the basic concepts and syntax of PHP programming. 2. To develop understanding of variables, constants, operators, and control statements in PHP. 3. To enable students to implement decision-making and looping constructs using PHP. 4. To provide knowledge of functions, strings, and arrays in PHP programming. 5. To develop practical skills for creating simple web-based PHP applications. 6. To enhance logical thinking and problem-solving abilities through PHP programs.						
Course Outcomes:	After successful completion of the practical course, students will be able to: 1. Write and execute basic PHP programs using proper syntax. 2. Apply variables, constants, operators, and expressions in PHP applications. 3. Implement conditional and looping statements for problem solving. 4. Create and use user-defined functions with arguments and default values. 5. Perform string handling and manipulation operations in PHP. 6. Create and manipulate indexed and associative arrays effectively. 7. Develop simple dynamic web applications using PHP programming concepts.						
Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
	List of Practical: 1. Write a PHP program to display “Hello World”. 2. Write a PHP program to demonstrate variables and constants. 3. Write a PHP program to demonstrate different data types in PHP. 4. Write a PHP program to perform arithmetic operations. 5. Write a PHP program to demonstrate relational and logical operators. 6. Write a PHP program to demonstrate operator precedence.					Use any pedagogical technique suitable for the topic	

	7. Write a PHP program to check whether a number is even or odd using IF-Else statement. 8. Write a PHP program to find the largest of two numbers using IF-Else. 9. Write a PHP program to display day name using Switch Case. 10. Write a PHP program to print numbers from 1 to 10 using While loop. 11. Write a PHP program to display multiplication table using For loop. 12. Write a PHP program to demonstrate Break and Continue statements. 13. Write a PHP program to create and call a user-defined function. 14. Write a PHP program to add two numbers using function with arguments. 15. Write a PHP program to demonstrate default arguments in function. 16. Write a PHP program to find the length of a string. 17. Write a PHP program to convert string into uppercase and lowercase. 18. Write a PHP program to search and replace a string. 19. Write a PHP program to create and display indexed array elements. 20. Write a PHP program to create and display associative array elements using foreach().			
References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.geeksforgeeks.org/php/php-examples/#php-basic-programs			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)				
Practical	Course Code: 123216	Laboratory on PHP 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. III, SEMESTER – V (NEP)			
Practical	Course Code: 123216	Laboratory on PHP 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

Major Course (Elective-1): Mobile Application Development

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123217	Mobile Application Development	2	30	2 Hrs.	30

Course Objectives:	1. Understand the fundamentals of mobile computing and mobile application development. 2. Design and develop Android-based mobile applications. 3. Implement user interfaces, data storage, networking, and multimedia features. 4. Develop location-aware and cloud-enabled mobile applications. 5. Publish, test, and maintain mobile applications.				
Course Outcomes:	After successful completion of this course, students will be able to: 1. Understand mobile app development concepts 2. Develop basic Android applications. 3. Design simple mobile interfaces 4. Understand mobile platforms and Android architecture. 5. Design responsive user interfaces. 6. Develop Android applications using modern development tools.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction: Brief History of mobile technologies, Different mobile technologies, Mobile Computing, Mobile Operating Systems, Native vs Hybrid vs Cross-Platform Applications, Key Mobile Application Services	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Introducing Android: Android Architecture, Android Application Components, Android Studio Environment, Project Structure, Activity Lifecycle, Creating First Android Application	7 Hrs.	7 Marks		
Unit III	Android User Interface Design: Activities and Layouts, TextView, Button, EditText, ImageView and ListView, Event Handling, Menus and Dialog Boxes	8 Hrs.	8 Marks		
Unit IV	React Native – Overview, React Native Features, React Native Advantages,	7 Hrs.	7 Marks		

	Environment Setup, Basic ReactNative App, React Components, Creating Android Application, SQLite Database for Data Storage and Retrieval			
References:	Reference Books: 1. Android Programming: The Big Nerd Ranch Guide – Bill Phillips 2. React Native in Action – Nader Dabit 3. Mobile Application Development – James Keogh 4. Android Programming for Beginners – John Horton Text Books: 1. Professional Android by Reto Meier and Ian Lake 2. Mobile App Development for Beginners by Lalm Philip 3. Lightning-Fast Mobile App Development with Galio by Gheorghe Alin Swayam Portal Link: 1. https://onlinecourses.swayam2.ac.in/e-learning/preview/nou21_ge41 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs52 3. https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_SMARTBRIDGE_06 4. Reference Resources: 5. https://developer.android.com 6. https://reactnative.dev/docs/environment-setup 7. https://kotlinlang.org/docs/home.html 8. https://firebase.google.com Suggested Software 1. Android Studio (Professional development) 2. React Native (using Expo) 3. Kotlin SDK 4. Android Emulator 5. VS Code + Flutter (Low-end PC (4GB RAM)) 6. Thunkable (Beginner/no coding) 7. MIT App Inventor (Very old PC) 8. AIDE Android IDE (Android app development without PC)			

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: 123217	Course Title: Mobile Application 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, 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): Client Server Technology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123218	Client Server Technology	2	2 Hrs.	30	123218

Course Objectives:	1. To understand the basics of Client/Server computing systems. 2. To study Client/Server architectures and topologies. 3. To learn client, server, and middleware components. 4. To understand networking protocols and communication technologies in Client/Server systems. 5. To study Client/Server database architecture and database access methods.					
Course Outcomes:	Students will be able to - 1. Define the underlying concepts in client server computing. 2. Differentiate Client/Server architectures and topologies. 3. Identify client, server, and middleware components. 4. Analyze the concept of middleware, and communication protocols. 5. Perform basic Client/Server database operations in a lab environment.					
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies		
Unit I	Introduction to Client/Server Computing, Stateless or Stateful Client/Server, Stateless vs Stateful Servers, Client/Server functions, Client/Server topologies - single client-single server, multiple clients-single server and multiple clients-multiple servers, classification of Client/Server systems - two-tier, three-tier and N-Tier, Clients/Server - advantages and disadvantages.	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic		
Unit II	Architectures of Client/Server Systems: components, client components, server components, communication middleware components, Existing Client/Server Architecture: Mainframe-Based, LAN-Based and Internet-Based.	7 Hrs	7 Marks			
Unit III	Client/Server Application Components: Service of a client/server application, Categories of client/server applications, client services-Remote services, Window services, Dynamic data exchange (DDE), Object Linking and Embedding (OLE), Database services, Server	8 Hrs	8 Marks			

	services- Application services, File services, Database services, System Development: Software Requirements- Client OS, Server OS and Network OS, Communication Interface Technology- NIC, TCP/IP, SNMP, NFS, SMTP.			
Unit IV	Client/Server and Databases: Client/Server Databases, Client/Server Database Computing, Client/Server Database Architecture, Database Middleware Component, Access to Multiple Databases, Distributed Client/Server Database Systems, Web/database System for Client/Server Applications.	7 Hrs	7 Marks	
References:	Course Material/Learning Resources Text books: 1. An Introduction to Client/Server Computing by Subhash Chandra Yadav and Sanjay Kumar Singh, New Age International Publishers Reference Books: 1. Client / Server Computing, Patrick Smith & Steave Guengerich, PHI 2. Client/Server Computing, Dawna Travis Dewire, TMH 3. Novell's Guide to Client-Server Application & Architecture, Jeffrey D.Schank, Novell Press 4. Client/Server Survival Guide, Robert Orfali, Dan Harkey, Jeri Edwards, Wiley India Edition, Third Edition Weblink to Equivalent MOOC on SWAYAM if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=HEYY7m7EroU 2. https://www.youtube.com/watch?v=38AmteiiYiQ			

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: 123218	Course Title: Client Server 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-1 Laboratory): Laboratory on Mobile Application Development

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123219	Laboratory on Mobile Application Development	2	60	4 Hrs.	50

Course Objectives:	1. Understand mobile application development tools and environment 2. Design and develop basic Android applications 3. Create user-friendly mobile interfaces 4. Implement database and API integration 5. Develop real-time mobile applications using modern tools						
Course Outcomes:	After completion of practical sessions, students will be able to: 1. Install and configure mobile development tools 2. Develop Android applications using UI components 3. Implement event handling and navigation 4. Develop and test complete mobile applications						
Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
List of Practical Perform practical to ... 1. Installation and configuration of Android Studio/ VS Code + Flutter/ Android Emulator / other tools 2. Create “Hello World” Android Application 3. Create and run a simple Android application. 4. Design UI using various layouts. 5. Design simple user interface using: TextView, Button, EditText, ImageView 6. Develop Calculator Application.						Use any pedagogical technique suitable for the topic	

7. Develop Unit Converter Application. 8. Implement event handling for buttons and menus 9. Design Login and Registration Form. 10. Push Notification Application 11. Camera Handling Application 12. Develop To-Do List Application 13. Design Simple Chat Application 14. Develop Weather Information Application Mini Projects (Any One) 1. Student Attendance Management System 2. Online Shopping Application 3. Hospital Appointment System 4. Event Management Application 5. Food Ordering Application 6. Expense Tracker Application Students should develop a complete mobile application using: 1. Android Studio (Professional development) 2. React Native (using Expo) 3. Kotlin SDK 4. Android Emulator 5. VS Code + Flutter (Low-end PC (4GB RAM)) 6. Thunkable (Beginner/no coding) 7. MIT App Inventor (Very old PC) 8. AIDE Android IDE (Android app development without PC)			
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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: 123219	Laboratory on Mobile Application Development	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. III, SEMESTER – V (NEP)			
Practical	Course Code: 123219	Laboratory on Mobile Application Development	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

Major Course (Elective-1 Laboratory): Laboratory on Client Server Technology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123220	Laboratory on Client Server Technology	2	60	4 Hrs.	50

Course Objectives:	1. To provide practical knowledge of Client/Server computing concepts. 2. To develop skills in configuring client and server environments. 3. To understand Client/Server communication and networking protocols. 4. To perform practical implementation of Client/Server database applications. 5. To study middleware and database connectivity techniques. 6. To analyze different Client/Server topologies and services through experiments.			
Course Outcomes:	Students will be able to - 1. Students will be able to test Client/Server communication. 2. Students will be able to perform database operations in Client/Server model. 3. Students will be able to use networking and middleware tools. 4. Students will be able to demonstrate multi-client server access.			
Contents:		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Draw and explain the architecture of a simple client/server system using one client and one server. 2. Draw and explain the block diagram of three-tier client/server architecture and label all components. 3. Explain various Client/Server topologies. 4. Demonstrate how middleware helps communication between client and server. 5. Identify and explain client components and server components in a practical setup. 6. Explain client services in detail. 7. Explain server services in detail. 8. Explain the Communication Interface Technology- NIC, TCP/IP, SNMP, NFS, SMTP.			Use any pedagogical technique suitable for the topic

	9. Install and configure a database server (MySQL/XAMPP) on local system using localhost environment. 10. Demonstrate Client/Server communication using a database tool (MySQL Workbench / phpMyAdmin). 11. Demonstrate LAN-based client/server architecture (access Local Server from Another Computer in LAN). 12. Perform database operations (INSERT and SELECT) using client application. 13. Perform database operations (UPDATE and DELETE) using client application. 14. Demonstrate Client/Server database computing using SQL queries through a client tool. 15. Create a webpage that displays records from a database table. 16. Create a simple distributed database example using two tables. 17. Demonstrate database connectivity using PHP/Python/Java.			
References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.youtube.com/watch?v=OT6VSmHMxmY&t=39s 2. https://www.youtube.com/watch?v=npBQgNbCf-o&list=PL-h5aNeRKouF5PMqk8aAR5Hz0VxkvE3Lj 3. https://www.youtube.com/watch?v=JtG3bb6scEE&list=PL0b6OzIxLPbzXPdt9pKeQXm6NoPA9MdKW 4. https://www.youtube.com/watch?v=d7jWB59bwnQ 5. https://www.youtube.com/watch?v=7v2OnUti2eM 6. https://www.youtube.com/watch?v=vR5utJvN4JY			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)				
Practical	Course Code: 123220	Laboratory on Client Server Technology	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. III, SEMESTER – V (NEP)			
Practical	Course Code: 123220	Laboratory on Client Server Technology	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: Advance Computer Network

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123265	Advance Computer Network	2	30	2Hrs.	30

Course Objectives:	1. Understand the fundamentals of advanced computer networking concepts, architectures, and communication models. 2. Learn IP addressing, subnetting, routing techniques, and routing protocols used in modern networks. 3. Understand the working principles of wired, wireless, and mobile communication networks. 4. Gain knowledge of network devices, wireless technologies, and mobile communication systems. 5. Explore emerging networking technologies such as Cloud Networking, SDN, Network Virtualization, and IoT.				
Course Outcomes:	1. Students will understand modern networking concepts, IP addressing, and routing mechanisms. 2. Students will gain knowledge of wireless technologies and mobile networking systems. 3. Students will understand network protection methods and network administration concepts. 4. Students will learn recent advancements and future technologies in networking. 5. Evaluate future trends in computer networks and the role of Artificial Intelligence in networking systems.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Fundamentals of Advanced Computer Networks: Review of Computer Network Concepts, OSI and TCP/IP Reference Models, Network Topologies and Transmission Media, IPv4 and IPv6 Addressing, Subnetting and Super netting, Routing Fundamentals, Static and Dynamic Routing, Introduction to Routing Protocols: RIP, OSPF, BGP Network Devices: Routers, Switches, Gateways, Firewalls.	8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Wireless and Mobile Networks: Wireless Communication Basics, Wi-Fi Standards and Architecture, Bluetooth and ZigBee Networks, Mobile IP and Mobile Communication, Cellular Networks: 3G, 4G, 5G Overview, Wireless Sensor Networks (WSN), Challenges in Wireless Networks, Ad Hoc and Mesh Networks.	7 Hrs	7 Marks		
Unit III	Network Security and Management: Basics of Network Security, Cryptography Fundamentals, Firewalls and Intrusion Detection Systems, Virtual Private Networks (VPN), Network Attacks and Prevention Techniques, Secure Socket Layer (SSL) and TLS, SNMP	8 Hrs	8 Marks		

	and Network Management, Quality of Service (QoS) Concepts.			
Unit IV	Emerging Trends in Networking: Cloud Networking, Software Defined Networking (SDN), Network Virtualization, Internet of Things (IoT) Networking, Data Center Networks, Introduction to Cyber Physical Systems, Basics of Artificial Intelligence in Networking, Future Trends in Computer Networks.	7 Hrs	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Computer Networking: A Top-Down Approach – by James F. Kurose and Keith W. Ross 2. Data Communications and Networking – by Behrouz A. Forouzan 3. Computer Networks – by Andrew S. Tanenbaum 4. TCP/IP Protocol Suite 5. Network Security Essentials – by William Stallings 6. Computer Networks* — Computer Networks Publisher: Pearson 7. Data Communications and Networking* — Data Communications and Networking, Publisher: McGraw Hill 8. Computer Networks – V.S. Bagad & I.A. Dhotre* — Computer Networks Publisher: Technical Publications Swayam/NPTEL Link: 1. https://nptel.ac.in/courses/106105183 2. https://nptel.ac.in/courses/106106243 3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_cs19 4. https://onlinecourses.swayam2.ac.in/e-learning/preview/cec21_cs19 5. https://nptel.ac.in/courses/106106091			

Assessment Rubric: Internal for Theory Course (Minor)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 123265	Course Title: Advance Computer Network	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 Advance Computer Network

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123266	Laboratory on Advance Computer Network	2	60	4Hrs.	50

Course Objectives:	1. Configure IPv4 addressing and perform basic network troubleshooting using networking commands. 2. Design and simulate LANs and routing configurations using Cisco Packet Tracer. 3. Apply subnetting techniques and analyze routing information in computer networks. 4. Configure and manage wireless, Bluetooth, and mobile communication networks. 5. Implement virtual networking and IoT device communication using simulation tools.						
Course Outcomes:	On completion of the following syllabus the students will be able to – 1. Understand the basic concepts of computer networking and IP addressing. 2. Develop practical skills in configuring and troubleshooting wired and wireless networks. 3. Apply subnetting, routing, and network simulation techniques using networking tools. 4. Analyze network communication using packet analysis and monitoring tools. 5. Understand wireless, mobile, and IoT networking concepts through practical implementation.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Configure IPv4 address on a computer system. 2. Check IP address using ipconfig / ifconfig command. 3. Test network connectivity using ping command. 4. Display routing information using tracert / traceroute. 5. Create a simple LAN using Cisco Packet Tracer 6. Perform subnetting for a given IP address and identify network and host ranges. 7. Configure static routing between two routers using network simulation software. 8. Create a small LAN using switches and routers in Cisco Packet Tracer.						Use any pedagogical technique suitable for the topic

	9. Compare TCP and UDP traffic using packet analysis tools. 10. Observe mobile network settings for 3G, 4G, and 5G connectivity. 11. Configure a wireless network using Wi-Fi settings. 12. Configure Bluetooth-based file sharing between devices. 13. Study signal strength and coverage area of wireless networks. 14. Demonstrate virtual networking concepts using simulation tools. 15. Connect and monitor a simple IoT device. 16. Simulate mobile communication concepts using network simulation tools. 17. Configure firewall rules in a Linux or Windows environment. 18. Demonstrate VPN connection setup and testing. 19. Perform vulnerability scanning in a simulated environment. 20. Configure IoT devices for network communication. 21. Monitor IoT network traffic and analyze communication protocols.			
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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: 123266	Laboratory on Laboratory on Advance Computer Network	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. III, SEMESTER – V (NEP)			
Practical	Course Code: 123266	Laboratory on Laboratory on Advance Computer Network	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 Multimedia Content Development

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123286	Laboratory on Multimedia Content Development	2	60	4Hrs	50

Course Objectives:	1. To understand the fundamental concepts and components of multimedia systems. 2. To develop skills in creating and editing digital images, audio, video, and animations. 3. To learn the use of multimedia authoring and editing tools for content creation. 4. To design and develop interactive multimedia applications and presentations. 5. To develop creativity and communication skills through multimedia production.			
Course Outcomes:	After successful completion of this laboratory course, students will be able to: 1. Design graphics, audio, video, and animation components. 2. Integrate multimedia elements into web and presentation platforms. 3. Apply multimedia compression and optimization techniques. 4. Develop complete multimedia applications for educational, business, or entertainment purposes. 5. Demonstrate creativity and technical skills in multimedia project development.			
Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Study of Multimedia Components 2. Create and edit images using tools such as Adobe Photoshop or GIMP etc. 3, Design a logo, poster, and web banner for a given organization 4. Digital Image Enhancement: to Perform cropping, resizing, color correction, filtering, and retouching. 5. Audio Recording and Editing: To Record audio and apply noise reduction, trimming, mixing, and effects.			Use any pedagogical technique suitable for the topic

	6. Audio Compression and Format Conversion: Compare and convert audio formats such as MP3, WAV, and AAC. 7. Video Capture and Editing: Create and edit videos using different tools such as Adobe Premiere Pro or DaVinci Resolve etc. 8. To Add titles, transitions, subtitles, and visual effects to a video project. 9. 2D Animation Development: Create frame-by-frame or tween animations. 10. 3D Modeling and Animation: Design simple 3D objects and animations using Blender. 11. Interactive Multimedia Presentation Develop an interactive presentation with navigation, audio, and video integration. 12. Web Multimedia Integration: Embed images, audio, video, and animations into a website. 13. Develop a multimedia story using text, graphics, audio, and video. 14. Screen Recording and Tutorial Creation: To Produce an educational video tutorial with narration. 15. E-Learning Content Development: Design multimedia-based learning modules. 16. Mini Project: Multimedia Application Development: To Develop a complete multimedia product such as: Educational courseware, Promotional video, Interactive website, Digital portfolio, Advertisement campaign Softwares /Tools: (You can use following softwares/ tools or can used other respective softwares) Image Editing : Tools: GIMP or Photoshop. Audio Editing: Tools: Audacity Video Editing & Production: Tools: OpenShot, HandBrake (for compression), or Premiere Pro. 2D & 3D Animation: Tools: Blender or Wick Editor. Web & Interactive Authoring: Tools: WordPress or Figma Or can			
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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/			
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Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 123286	Laboratory on Multimedia Content Development	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 XML and Web Services

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123287	Laboratory on XML and Web Services	2	60	4Hrs	50

Course Objectives:	1. To develop coding and understanding of extensible markup language XML 2. To understand how XML is used as a native database for major online applications 3. To understand the use of XML, CSS with major web services.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Be able to design execute the XML document. 2. Be capable to identity the application of XML with web services. 3. Have practical knowledge on the applications of XML, CSS 4. Ability to implement web application with XML and CSS 5. Ability to write complex XML, CSS code to use it as native database						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
1. Create a simple XML document 2. creating a simple XML document with attributes 3. Create an XML file using the Internal DTD 4. Create an XML file using the External DTD 5. Create an XML file with CSS attributes 6. Create an XML file with CSS properties 7. Create an XML file using the Internal CSS 8. Create an XML file using the External CSS 9. Write an XML file with CSS which will display the Book information which includes the following: i) Title of the book ii) Author Name iii) ISBN number iv) Publisher name v) Edition vi) Price 10. Write a Document Type Definition (DTD) to validate the above XML file and display in web browser.							Use any pedagogical technique suitable for the topic

Assessment Rubric: Internal Examination Practical Course |(SEC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 123287	Laboratory on XML and Web Services	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

Project in Information Technology (123)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	123293	Project in Information Technology	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 Information Technology	Max Marks: 50
Sr. 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 Undergraduate 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

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.
- iv)

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 -- 25 to 29

Grade C -- 20 to 24

FAIL 19 and below

- 8) 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."
- 9) In case of failure, student need to appear in back log examination by paying prescribed fees.
- 10) Valuated answer book shall be kept in college custody for one academic year and random verification may be done by the University if required.
- 11) 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.
- 12) Grade secured by an examinee in examination of said course shall be shown on fifth and last semester marksheet.
- 13) 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.
- 14) 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.

15) 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

Unit2: AI Structures,Architectures&Techniques(7Hours)

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)

Unit3: Applications of AI inSociety (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

Unit4: Ethical, Social& Future Aspectsof AI (8Hours)

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:

MelanieMitchell–*ArtificialIntelligence:AGuideforThinkingHumans* Reference Books:

1. Boden,MargaretA., Artificial Intelligence: A Very Short Introduction
2. Elaine Rich – Artificial Intelligence (3rd Edition)
3. Godbole, Achyut, Artificial Intelligence Bookganga Publication.
4. Stuart Russell – Human Compatible (2019)

SYLLABUS

B.Sc.- III, SEMESTER – VI

Information Technology (123)

Major Course: Programming with Prolog

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123221	Programming with Prolog	2	30	2 Hrs.	30

Course Objectives:	1. Understand declarative programming concepts 2. Write logic-based programs using Prolog 3. Build rule-based systems and knowledge bases 4. Apply Prolog in AI and problem solving 5. Develop basic NLP and reasoning applications						
Course Outcomes:	students will be able to: 1. Design logic-based programs 2. Build AI rule systems 3. Solve problems using recursion and backtracking 4. Understand symbolic AI concepts 5. Develop simple NLP applications						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	History of Prolog, Procedural vs Declarative Programming, Applications of Prolog,				8 Hrs.	8 Marks	Use any

	Logic programming concepts, Facts, Rules, and Queries, Structure of a Prolog program Basic Syntax and Data Types Atoms, Variables, Compound, Numbers, Strings, Constants, Terms and Structures, Comments and formatting, Clauses and Predicates			pedagogical technique suitable for the topic
Unit II	Operators and Arithmetic: Operators, Arithmetic, Equality Operators, Logical Operators Input and Output: Outputting Terms, Inputting Terms, Input and Output Using Characters, Outputting Characters, Inputting Characters	7 Hrs.	7 Marks	
Unit III	Loops: Looping a Fixed Number of Times, Looping Until a Condition Is Satisfied, Backtracking with Failure List Processing: Representing Data as Lists, Notation for Lists, decomposing a List, Built-in Predicate: member, length, reverse, append	8 Hrs.	8 Marks	
Unit IV	String Processing: Converting Strings of Characters To and From Lists, Joining Two Strings, trimming a String, inputting a String of Characters, searching a String, Dividing a String into Its Component Parts File Handling: Reading files, Writing files	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources 1. Logic Programming with Prolog by Max Bramer 2. Programming in Prolog by W.F. Clocksin and C.S. Mellish. Reference Books: 1. Learn Prolog Now! by Patrick Blackburn, Johan Bos, and Kristina Striegnitz. 2. Clause and Effect: Prolog Programming for the Working Programmer by William F. Clocksin 3. Prolog Programming for Artificial Intelligence by Ivan Bratko Swayam Portal Link: https://onlinecourses.swayam2.ac.in/e-learning/preview/nou23_cs14 https://youtu.be/zK7J7lyl9J0?si=ZFrHcpw8IOGgGowM Recommended Prolog Software SWI-Prolog: https://www.swi-prolog.org/ GNU Prolog: https://www.gprolog.org/			

	Visual Prolog: https://www.visual-prolog.com/
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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: 123221	Course Title: Programming with Prolog	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: Internet of Things (IoT)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123222	Internet of Things (IoT)	2	30	2 Hrs.	30

Course Objectives:	1. To introduce the fundamentals and architecture of the Internet of Things (IoT). 2. To understand IoT communication protocols and networking concepts. 3. To study IoT devices, sensors, cloud integration, and security issues. 4. To develop knowledge about IoT applications in smart environments and industries.						
Course Outcomes:	students will be able to: 1. Understand the concepts, architecture, and components of IoT. 2. Explain IoT communication protocols and networking technologies. 3. Analyze IoT security, privacy, and cloud-based services. 4. Design basic IoT solutions for real-world applications such as smart homes, healthcare, and smart cities.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Internet of Things: Introduction to IoT, Characteristics and Features of IoT, IoT Ecosystem and Components, Sensors and Actuators, IoT Architecture and Functional Blocks, Applications of IoT, Challenges and Opportunities in IoT.				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	IoT Communication and Protocols: Basics of Networking for IoT, Communication Models in IoT, IPv4 and IPv6, RFID and Wireless Sensor Networks (WSN), IoT Protocols: MQTT, CoAP, ZigBee, Bluetooth, Wi-Fi, Introduction to M2M Communication.				7 Hrs.	7 Marks	
Unit III	IoT Platforms, Security and Cloud: IoT Hardware Platforms: Arduino, Raspberry Pi, Cloud Computing and IoT, Data Collection and Storage, IoT Analytics Basics, Security and Privacy Issues in IoT, Authentication and Access Control.				8 Hrs.	8 Marks	
Unit IV	IoT Applications and Case Studies: Smart Home Systems, Smart Cities, Smart Healthcare, Industrial IoT (IIoT), Agriculture and Environmental Monitoring, Future				7 Hrs.	7 Marks	

	Trends in IoT.			
References:	Course Material/Learning Resources Text books: 1. Internet of Things: A Hands-On Approach Authors: Arshdeep Bahga and Vijay Madisetti 2. Internet of Things Author: Raj Kamal Publisher: McGraw Hill Education (India) 3. Learning Internet of Things technical guide by Peter Waher, published by Packt Publishing. 4. Designing the Internet of Things book by Adrian McEwen and Hakim Cassimally, Publisher: Wiley. Reference Books: 1. Internet of Things: A Hands-On Approach – Vijay Madisetti & Arshdeep Bahga, Universities Press, 2014. 2. From Machine-to-Machine to the Internet of Things – Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Academic Press, 2014. 3. Internet of Things: Principles and Paradigms – Rajkumar Buyya& Amir Vahid Dastjerdi, Elsevier, 2016. 4. The Internet of Things: Enabling Technologies, Platforms and Use Cases – CRC Press, 2017. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. SWAYAM-NPTEL Introduction to Internet of Things Course 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs54 3. https://onlinecourses.swayam2.ac.in/elearning/preview/ntr26_ed23 4. https://nptel.ac.in/courses/106105195			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 123222	Course Title:Internet of Things (IoT)	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: Software Engineering

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123223	Software Engineering	2	30	2 Hrs.	30

Course Objectives:	1. Understand fundamental concepts of software engineering. 2. Learn software development life cycle (SDLC) models. 3. Apply software design and testing techniques. 4. Understand software project management and quality assurance.						
Course Outcomes:	Students will be able to - 1. Explain the fundamental concepts of software engineering, software process models, and Software Development Life Cycle (SDLC). 2. Analyze software requirements and prepare Software Requirement Specification (SRS) documents using appropriate requirement gathering techniques. 3. Design software systems using design principles, modular approaches, and UML modeling techniques. 4. Apply software testing methods and quality assurance practices to verify and validate software systems. 5. Utilize software project management techniques, including project planning, scheduling, risk management, and cost estimation.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Software and Software Engineering, Software Characteristics and Applications, Software Crisis and Challenges, Software Development Life Cycle (SDLC) Process Models: Waterfall Model, Prototype Model, Spiral Model, Incremental Model, Agile Model. Feasibility Study and Requirement Analysis				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Software Requirement Specification (SRS), Requirement Gathering Techniques, Functional and Non-Functional Requirements, Software Design Concepts, Modular Design, Cohesion and Coupling, Structured Design, UML Diagrams: Use Case Diagram, Class Diagram, Activity Diagram,				7 Hrs.	7 Marks	

Unit III	Software Testing Fundamentals, Verification and Validation, Testing Levels: Unit Testing, Integration Testing, System Testing, Acceptance Testing Testing Techniques:Black Box Testing, White Box Testing Debugging Concepts Software Quality Assurance (SQA) Software Metrics	8 Hrs.	8 Marks	
Unit IV	Software Project Planning, Project Scheduling and Cost Estimation, Risk Management, Configuration Management. Software Maintenance: Corrective Maintenance, Adaptive Maintenance, Perfective Maintenance, Preventive Maintenance, Software Reengineering. CASE Tools Introduction to DevOps	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Course Material/Learning Resources Text books: 1. Software Engineering: A Practitioner's Approach – Roger S. Pressman & Bruce Maxim 2. Software Engineering – Ian Sommerville. Reference Books: · Fundamentals of Software Engineering – Rajib Mall. Weblink to Equivalent MOOC on SWAYAM if relevant: Video lecture link: 1. https://nptel.ac.in/courses/106105182 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs68 3. https://www.coursera.org/articles/software-engineering-for-beginners-video			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 123223	Course Title:Software Engineering	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 Programming with Prolog and IoT

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123224	Laboratory on Programming with Prolog and IoT	2	60	4Hrs.	50

Course Objectives:	1. To understand the fundamentals of logic programming. 2. To learn the syntax and structure of the Prolog language. 3. To develop problem-solving skills using logical reasoning and rule-based programming. 4. To apply Prolog in AI applications such as: Expert systems, Natural language processing 5. To provide hands-on experience with IoT devices and platforms. 6. To understand sensor interfacing and communication protocols. 7. To develop basic IoT applications using Arduino/Raspberry Pi. 8. To implement cloud connectivity and data monitoring systems. 9. To study real-world IoT applications and security practices.						
Course Outcomes:	After completion of practical sessions, students will be able to: 1. Understand the concepts of logic programming and the architecture of Prolog systems. 2. Write Prolog programs using facts, rules, predicates, and queries. 3. Debug logical errors in Prolog code. 4. Implement recursive and list-processing programs in Prolog. 5. Interface sensors and actuators with IoT hardware platforms. 6. Configure IoT communication protocols and cloud services. 7. Develop simple IoT applications for real-world problems.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: Write a program in prolog for... 1. Hello World program 2. Maximum of three numbers 3. Fibonacci series 4. Even/Odd checking						Use any pedagogical technique suitable for the

	5. Reverse number 6. Find length of list 7. Concatenate two lists 8. Reverse a list 9. Delete and check element from list 10. String length & Reverse string 11. Palindrome string check 12. Count vowels and words 13. Concatenate strings 14. Convert uppercase/lowercase 15. Read & write from/ into file IoT Based Practicals ... 16. Interfacing LED with Arduino for basic IoT device control. 17. Interfacing sensors (Temperature/LDR/Motion sensor) with Arduino. 18. Study of Wireless Sensor Network (WSN) simulation/tools. 19. Development of Smart Home automation system. 20. Design of Smart Street Light system using sensors.			topic
	Weblink to Equivalent MOOC on SWAYAM if relevant: 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs110 3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs31 4. https://onlinedegree.swayam2.ac.in/mri22_01_d03_s1_cc3/preview 5. https://onlinedegree.swayam2.ac.in/mri23_07_d03_s4_cc02/preview 6. https://swayam.gov.in/			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 123224	Laboratory on Programming with Prolog and IoT	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. III, SEMESTER – VI (NEP)			
Practical	Course Code:123224	Laboratory on Programming with Prolog and IoT	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

Major Course (Elective-2): Neural Network

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123225	Neural Network	2	30	2 Hrs.	30

Course Objectives:	1. To understand the concepts of Artificial Neural Network 2. To understand the NN and its architecture 3. To understand biological neurons and Artificial neurons 4. To understand Deep Learning				
Course Outcomes:	Students will be able to - 1. learn the of basics of ANN, 2. Learn the benefits of ANN in the real world applications 3. Design and develop complex algorithms using ANN and deep learning mechanism. 4. Develop skills to work with AI applications using ANN				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	ANN: Basics Neural Networks, Biological Neuron vs Artificial Neuron, History and Evolution of Neural Networks, Characteristics of ANN, Types of Neural Network Architectures, Advantages and Limitations of ANN.	7 Hrs.	7 Marks	Use any pedagogical technique suitable for the topic	
Unit II	ANN Learning: Supervised, Unsupervised, and Reinforcement Learning. Backpropagation Algorithm, Clustering-K-mean, non-associative learning	8Hrs.	8 Marks		
Unit III	Deep Learning: Introduction to deep learning, Deep Reinforcement Learning basics, Deep Learning frameworks: TensorFlow and PyTorch, Convolutional Neural Network (CNN) and Recurrent Neural Networks (RNN).	8 Hrs.	8 Marks		
Unit IV	Artificial Intelligence (AI): Introduction, AI and ANN, AI and ML. Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Application of Neural Network with Fuzzy Logic.	7 Hrs.	7 Marks		

References:	Course Material/Learning Resources Text books: 1. M. C. Trivedi, Deep Learning and Neural Network_MC Trivedi, Khanna Publishing House, 2024. Reference Books: 1. Deep Learning: By Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press Book 2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://nptel.ac.in/courses/117105084 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs04 3. https://nptel.ac.in/courses/106106184 4. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs01 Video lecture link: 4. https://youtu.be/xbYgKoG4x2g?si=6qYK55wDC18JrpV6 5. https://youtu.be/tRG-OnnQ9g4?si=za8uY4Tc3Q23Ep4A 6. https://youtu.be/nz3NYD73H6E?si=XYauYJbTUV2Q8pET https://youtu.be/NhimXdFenrg?si=WZoxnlT2zqj77Fwj
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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: 123225	Course Title:Neural Network	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): Visual Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123226	Visual Programming	2	30	2 Hrs	30

Course Objectives:	1. To understand visual and event-driven programming concepts using C# and .NET. 2. To learn basic and object-oriented programming features of C#. 3. To develop Windows Forms GUI applications using common controls. 4. To implement event handling and user interaction in applications. 5. To develop database applications using ADO.NET.						
Course Outcomes:	Students will be able to - 1. To understand visual programming concepts using C# and .NET. 2. To develop C# programs using control statements and OOP concepts. 3. To design Windows Forms applications using GUI controls. 4. To use menus and dialog boxes in GUI applications. 5. To create database applications using ADO.NET.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Visual Programming, Event-driven programming, Overview of .NET framework. Introduction to C#: C# program structure, Data Types, Variable declaration, Operators, C# decision making and looping statements, console input, console output.				8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	OOP in C#: Class, Objects, methods, Constructor, destructor, Inheritance. Windows Forms: Windows Forms applications. Basic controls: Label, Textbox, Button, common properties and methods, events & event handling.				7 Hrs	7 Marks	
Unit III	Controls: RadioButton, CheckBox, Combobox, Listbox, DateTimePicker, MonthCalendar, Menu Creation. Dialog boxes- MessageBox, FontDialog, ColorDialog, OpenFileDialog, SaveFileDialog.				8 Hrs	8 Marks	

Unit IV	Database Programming using ADO.NET: Introduction to ADO.NET architecture, Connection Object, Command Object, Dataset, DataReader, DataAdapter objects, connecting to a database, Adding, updating, deleting, and viewing records in the database, DataGridView for displaying data.	7 Hrs	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Programming in C# - A Primer by E. Balagurusamy, 3rd Edition, TMH Reference Books: 1. The Complete Reference: C# 4.0 by Herbert Schildt, Tata McGraw Hill, 2012. 2. Inside C# - Microsoft Press by Tom Archer, Andrew Whitechapel 3. Programming Microsoft Visual C# 2005 - The Language (Microsoft Press) by Donis Marshall Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://online-degree.swayam2.ac.in/mri22_07_d01_s6_cc01/preview Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=YrtFtdTTfv0 2. https://www.youtube.com/watch?v=Z3EpnGi52tE&list=PLEiEAq2VkUULDJ9tZd3lc0rcH4W5SNSoW 3. https://www.youtube.com/watch?v=03YGv7Myb3o&list=PLbDsRCGLbN1_-ZWS6G5ionKox0Ahrdv_H 4. https://www.youtube.com/watch?v=gfkTfcpWqAY&list=PLTjRvDozrdlz3_FPXwb6lX_HoGXa09Yef			

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: 123226	Course Title: Visual 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
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Major Course (Elective-2 Laboratory): Laboratory on Neural Network

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123227	Laboratory on Neural Network	2	60	4Hrs	50

Course Objectives:	1. To learn the syntax and semantics of the TensorFlow. 2. To understand the practical concept of ANN. 3. Perform programs in TensorFlow 4. Perform programs on ANN using TensorFlow						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Able to write, compile and debug programs in TensorFlow. 2. Design programs involving ANN concepts. 3. Able to use TensorFlow to implement neural network applications						
Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
	List of Practical: 1. Implement simple vector addition in TensorFlow 2. Implement a Feed-Forward Network in TensorFlow 3. Write a program to implement Perceptron 4. Implement a perceptron in TensorFlow 5. Implement a regression model in TensorFlow 6. Study Neural Network with backpropagation 7. Study Neural Network with Clustering-K-mean 8. Study Neural Network with TensorFlow 9. To study Long Short Term Memory for Time Series Prediction 10. To study Convolutional Neural Network and Recurrent Neural Network 11. To study ImageNet, GoogleNet, ResNet convolutional Neural Networks					Use any pedagogical technique suitable for the topic	

References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://nptel.ac.in/courses/106106213 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs95 3. http://www.digimat.in/nptel/courses/video/106106213/L01.html 4. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs04 5. https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs44			
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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: 123227	Laboratory on Neural Network	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. III, SEMESTER – VI (NEP)			
Practical	Course Code: 123227	Laboratory on Neural Network	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

Major Course (Elective-2 Laboratory): Laboratory on Machine learning

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123228	Laboratory on Visual Programming	2	60	4 Hrs	50

Course Objectives:	1. To gain practical skills in visual programming using C# and .NET framework. 2. To design Windows Forms applications using GUI controls. 3. To use dialog boxes, menus, and common controls in applications. 4. To implement database connectivity using ADO.NET. 5. To develop GUI-based database applications in C#.						
Course Outcomes:	On completion of the following syllabus students will be able to - 1. Write, compile and debug programs in C# language. 2. Understand the basics of OOP with C#. 3. Get knowledge of windows programming. 4. To connect applications with databases using ADO.NET.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Install and configure Visual Studio for C# Windows Forms development. 2. Write a C# program to declare variables of different data types. Accept two integer numbers from the user and perform various arithmetic operations. 3. Write a C# program to accept marks of a student and display the grade using if-else statements according to the percentage. 4. Write a C# program using for loop to find factorial of a number. 5. Write a C# program using while loop to calculate the sum of first N natural numbers. 6. Write a C# program to demonstrate class, object and methods. 7. Write a C# program to demonstrate constructor and destructor. 8. Write a C# program to demonstrate single inheritance. 9. Create a basic Windows Forms application that displays a form with Form title and One label showing “Welcome to Windows Forms”.						Use any pedagogical technique suitable for the topic

	10. Design a Windows Form using Label, TextBox, and Button controls for arithmetic operations. 11. Design a Windows Form to demonstrate MessageBoxes. 12. Design a Windows Form to demonstrate CheckBox controls. 13. Design a Windows Form to demonstrate RadioButton controls. 14. Create a Windows Form containing ComboBox for selecting a course and ListBox for selecting subjects. Display selected course and subject using a button click event. 15. Design a Windows Form that allows the user to Select a date using DateTimePicker and Select a date from MonthCalendar. Display the selected dates in labels. 16. Design a Menu using MenuStrip in Windows Forms containing File → New, Exit and Help → About. “Exit” closes the application. “About” displays application information in a MessageBox. 17. Create a login form with using TextBoxes to enter Username and password and a Login Button. Display “Login Successful” if username and password are correct otherwise “Invalid Username or Password” using MessageBox. 18. Create a Windows Forms application using FontDialog. Use One Label and One Button. When the button is clicked, open FontDialog and allow the user to change the font style of the label. 19. Create a Windows Forms application with one Button. When the button is clicked, open ColorDialog and allow the user to change the background color of the form. 20. Create a Windows Forms application to demonstrate OpenFileDialog and SaveFileDialog. 21. Create a C# Windows Forms application to establish connection with database (Access/Oracle/MySQL/SQL Server) using ADO.NET. Use one button, when the button is clicked, connect to the database and display message “Connection Established Successfully” if connection succeeds otherwise display error message. 22. Create a Windows Forms application to insert student details into a “Student” (RollNo, Name, Marks) database. 23. Create a Windows Forms application to display all records from the “Student” database in a DataGridView. 24. Create a Windows Forms application to update marks of a student in the “Student” database. 25. Create a Windows Forms application to delete a student record from the “Student” database using Roll Number.			
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References :	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.programiz.com/csharp-programming/online-compiler/ 2. https://www.onlinegdb.com/online_csharp_compiler 3. https://onecompiler.com/csharp 4. https://dotnetfiddle.net/ 5. https://www.jdoodle.com/compile-c-sharp-online			
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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: 123228	Laboratory on Visual 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. III, SEMESTER – VI (NEP)			
Practical	Course Code: 123228	Laboratory on Visual 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: Machine Learning

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123267	Machine Learning	2	30	2 Hrs.	30

Course Objectives:	1. To introduce the basic concepts and applications of Machine Learning. 2. To understand supervised and unsupervised learning techniques. 3. To develop knowledge of regression, classification, and clustering methods. 4. To understand probability, Bayes learning, and neural network concepts. 5. To provide practical exposure to simple Machine Learning algorithms. 6. To develop problem-solving skills using Machine Learning techniques.						
Course Outcomes:	After successful completion of this course, students will be able to: 1. Understand fundamental concepts and types of Machine Learning. 2. Apply basic regression and classification techniques for simple problems. 3. Implement simple Machine Learning algorithms using programming tools. 4. Analyze datasets using clustering and probability-based methods. 5. Understand the working of neural networks and recommendation systems. 6. Develop simple Machine Learning models for real-world applications.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Machine Learning: Basic Definitions and Concepts, Types of Learning, Supervised Learning, Unsupervised Learning, Hypothesis Space and Inductive Bias, Model Evaluation and Cross Validation, Applications of Machine Learning				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Regression and Classification Techniques: Introduction to Regression, Linear Regression, Logistic Regression, Decision Tree Basics, Overfitting and Underfitting, Simple Classification Concepts				7 Hrs.	7 Marks	
Unit III	Probability and Neural Networks: Basics of Probability, Bayes Theorem and Bayes Learning, Introduction to Neural Networks, Perceptron Model, Multilayer Neural				8 Hrs.	8 Marks	

	Network, Introduction to Deep Neural Networks			
Unit IV	Clustering and Recommendation Systems: Introduction to Clustering, K-Means Clustering, Hierarchical Clustering Basics, Gaussian Mixture Model (Introduction Only), Introduction to Recommendation Systems, Collaborative Filtering Based Recommendation System	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Reference Books: 1. Tom Mitchell (1997). Machine Learning. First Edition, McGraw- Hill. 2. Ethem Alpaydin (2009). Introduction to Machine Learning Edition 2. The MIT Press. 3. Dipanjan Sarkar, Raghav Bali, and Tushar Sharma, “ Practical Machine Learning with Python” A Problem-Solver’s Guide to Building Real-World Intelligent Systems, ISBN-13 (pbk): 978-14842-3206-4, Apress. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.coursera.org/courses?query=free&skills=Machine%20Learning 2. https://www.geeksforgeeks.org/machine-learning/machine-learning/ 3. https://www.mygreatlearning.com/machine-learning/free-courses 4. https://www.udemy.com/topic/machine-learning/free/?srsltid=AfmBOoqv1WftgqFZrq06M4D5d45V9D1exVWOvpr-3gl2S3ViQ2-JngxG Weblink to Equivalent Virtual Lab if relevant: 1. https://www.programiz.com/python-programming/online-compiler/?utm_source=chatgpt.com 2. https://colab.research.google.com/ 3. https://www.kaggle.com/code/scratchpad/notebooka782e4887d/edit			

Assessment Rubric: Minor Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 123267	Course Title:Machine Learning	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 Machine Learning

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123268	Laboratory on Machine Learning	2	60	4Hrs.	50

Course Objectives:	1. To introduce students to basic Machine Learning algorithms and techniques. 2. To develop practical understanding of classification, regression, and clustering methods. 3. To provide hands-on experience in implementing Machine Learning programs using Python. 4. To understand performance evaluation measures used in Machine Learning models. 5. To develop analytical and problem-solving skills using real-world datasets. 6. To familiarize students with neural networks and data visualization techniques.						
Course Outcomes:	After successful completion of this practical course, students will be able to: 1. Implement basic Machine Learning algorithms using Python programming. 2. Apply classification and regression techniques on sample datasets. 3. Evaluate Machine Learning models using confusion matrix, precision, recall, and F-measure. 4. Perform clustering and pattern analysis using different clustering methods. 5. Develop simple neural network models and understand their working. 6. Visualize and analyze data using graphs and Machine Learning experiments.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Write a program to implement the Find-S algorithm. 2. Write a program to implement the Candidate Elimination algorithm. 3. Write a program to create a simple Decision Tree classifier. 4. Write a program to calculate Information Gain for a dataset. 5. Write a program to implement K-Nearest Neighbour (KNN) using Euclidean Distance. 6. Write a program to classify the Iris dataset using KNN algorithm. 7. Write a program to implement Naïve Bayes classifier using a sample dataset.						Use any pedagogical technique suitable for the topic

	8. Write a program to create and display a Confusion Matrix. 9. Write a program to calculate Precision, Recall, and F-Measure. 10. Write a program to implement Linear Regression. 11. Write a program to calculate SSE, SST, and R^2 values in Linear Regression. 12. Write a program to implement K-Means Clustering. 13. Write a program to implement Agglomerative Clustering. 14. Write a program to implement simple Artificial Neural Network using Backpropagation. 19. Write a program to plot dataset graphs for Machine Learning experiments.			
References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.geeksforgeeks.org/machine-learning/machine-learning-with-python/ 2. https://www.w3schools.com/python/python_ml_getting_started.asp			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 123268	Laboratory on Machine Learning	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. III, SEMESTER – VI (NEP)			
Practical	Course Code: 123268	Laboratory on Machine Learning	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

VSC: Laboratory on Programming with SCALA

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123288	Laboratory on Programming with SCALA	2	60	4Hrs.	50

Course Objectives:	After successful completion of this laboratory course, students will be able to: 1. Understand the fundamentals of Scala programming language. 2. Learn object-oriented and functional programming concepts in Scala. 3. Develop applications using collections, pattern matching, and concurrency. 4. Build scalable and maintainable software solutions. 5. Apply Scala in data processing and modern software development.						
Course Outcomes:	Students will be able to : 1. Understand Scala basics. 2. Write simple Scala programs. 3. Develop programs using control structures and functions. 4. Apply recursion and functional programming concepts. 5. Design object-oriented applications using Scala. 6. Implement code reuse through inheritance						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Installation and configuration of Scala and SBT. 2. To study features and applications SCALA 3. Write a Hello World Program. 4. Program to perform arithmetic operations. 5. Program for user input and output. 5. To demonstrate the use of conditional statements in SCALA. 6. Program to generate Fibonacci series. 7. Program to find factorial using recursion.						Use any pedagogical technique suitable for the topic

	9. Program to Create a class & object for Student and display details. 10. Program demonstrating inheritance. 11. Program to implement string operations in scala 12. Program to demonstrating exception Handling in Scala 13. Write a Scala program to create a list in different ways. 14. Write a Scala program to add / remove single element and multiple elements to a given listbuffer/list. 15. Write a Scala program to find the largest and smallest number from a given list. 16. Program to demonstrate Read and write data from files.			
References:	Reference Books: 1. Programming in Scala – Martin Odersky, Lex Spoon, Bill Venners. 2. Scala for the Impatient – Cay S. Horstmann. 3. Functional Programming in Scala.			
	Softwares /Tools: 1. Visual Studio Code + Scala CLI 2. Apache NetBeans 3. Scala Online Compiler (Scastie) Important Links: 1. https://docs.scala-lang.org 2. https://www.scala-lang.org 3. https://www.w3resource.com/scala-exercises/list/index.php			

Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Practical	Course Code: 123288	Laboratory on Programming with SCALA	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

Internship/Apprenticeship:

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	123294	Internship/Apprenticeship in Information Technology	4	120	--	100

Course Objectives:	1. Gain practical exposure to industry, research organizations, startups, or professional work environments related to Information Technology. 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 Information Technology 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 Computer Science:

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI B.Sc. III, SEMESTER – VI (NEP)

Internship/Apprenticeship	Course Code: 123294	Internship/Apprenticeship in Information Technology	Max Marks: 100
Sr. 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