

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

INDEX

Sr. No.	Item	Page Number
01	Member's List - Board of Studies in Computer Science (including Computer Application, Information Technology etc.)	3
02	Scheme- Examination, Evaluation and Assessment (University Draft)	4
03	Semester-I, Credits, Workload, Examination, Evaluation and Assessment Scheme	8
04	Semester-II, Credits, Workload, Examination, Evaluation and Assessment Scheme	15
05	Syllabus, B.Sc.- I, Semester – I	
06	Major/Minor Course: Fundamentals of Computer (109201/110201/112201/123201/134201/135201/138201)	23
07	Major/Minor Course: Laboratory on Office Automation Tools (109202/110202/112202/123202/134202/135202/138202)	26
08	GOEC Theory1: Information Communication Technology (109271/110271/112271/123271/134271/135271/138271)	28
09	GOEC Theory2: Business Data Processing (109272/110272/112272/123272/134272/135272/138272)	30
10	SEC: Laboratory on Information Communication Technology Tools (109281/ 110281/ 112281/123281/134281 / 135281/138281)	32
11	Syllabus, B.Sc.- I, Semester – II	
12	Major/Minor Course: Programming with C (109203/110203/112203/123203/134203/135203/138203)	37
13	Major/Minor Course: Laboratory on Programming with C (109204/110204/112203/123204/134204/135204/138204)	40
14	GOEC Theory3: E-Business (109273/110273/112273/123273/134273/135273/138273)	42
15	GOEC Theory4: Website Design Principles (109274/110274/112274/123274/134274/135274/138274)	44
16	VSC: Laboratory on E-Commerce (109282/110282/112282/123282/134282/135282/138282)	46
17	SEC: Laboratory on Web Publishing (109283/110283/112283/123283/134283/135283/138283)	48

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

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

Examination, Evaluation and Assessment

Notes:

- a. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.
- b. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).
- c. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.
- d. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
- e. **Value Education Courses** to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.
- f. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University
- g. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language
- h.

Examination and Assessment Process:

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

Examination, Evaluation and Assessment Scheme

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

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

Examination, Evaluation and Assessment Scheme

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

Continuous Assessment Tests (CAT)

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

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

Conduction of the Examination:

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

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

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

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

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

SEMESTER – I

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SEMESTER – II

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SYLLABUS

B.Sc.- I, SEMESTER – I

Computer Science (112)

Information Technology (123)

Computer Application (Regular) (109)

Computer Application (Vocational) (110)

Data Analytics (134)

Data Science and Analytics (135)

Web Designing and Development (138)

Sant Gadge Baba Amravati University, Amravati

FACULTY: Science and Technology

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

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

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

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

Major/Minor Course: Fundamentals of Computer

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

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

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

Assessment Rubric: Major/Minor- Internal for Theory Course

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

Major/Minor Course: Laboratory on Office Automation Tools

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

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

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

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

Assessment Rubric: Internal Practical Course

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

GOEC Theory1: Information Communication Technology

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

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

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

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

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

GOEC Theory2: Business Data Processing

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

Course Objectives:	1. Student should understand the Data in Business. 2. Student should process the data in Business. 3. Student should present the data in Business in various forms. 4.			
Course Outcomes:	On 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 Libre 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

INDEX

Sr. No.	Item	Page Number
01	Member's List - Board of Studies in Computer Science (including Computer Application, Information Technology etc.)	3
02	Scheme- Examination, Evaluation and Assessment (University Draft)	4
03	Semester-III, Credits, Workload, Examination, Evaluation and Assessment Scheme	8
04	Semester-IV, Credits, Workload, Examination, Evaluation and Assessment Scheme	15
05	Syllabus, B.Sc.- II, Semester – III	
06	Major Course: Data Structure (109205/ 110205/ 112205/123205/ 134205/135205/138205)	23
07	Major Course: Relational Database Management System (RDBMS) (109207/110207/112207/123207/134207/135207/ 138207)	26
08	Major Practical: Laboratory on DS and RDBMS (109271/ 110271/ 112271/123271/ 134271/135271/ 138271)	29
09	IKS –Major Specific: IKS in Computational Sciences (109208/ 110208/ 112208/123208/ 134208/135208/138208)	32
10	Minor Theory: Data Structure and RDBMS (109261/ 110261/ 112261/123261/ 134261/135261/138261)	35
11	Minor Practical: Laboratory on Data Structure and RDBMS (109262/ 110262/ 112262/123262/ 134262/135262/138262)	38
12	GOEC Theory 5: E Content Development (109275/ 110275/ 112275/123275/ 134275/135275/138275)	40
13	VSC: Laboratory on MySQL	43
14	Field Project / Community Engagement Services: Phase-I (109291/ 110291/ 112291/123291/ 134291/135291/138291)	45
	Syllabus, B.Sc.- II, Semester – IV	
15	Major Course: OOP with C++ (109209/110209/ 112209/123209/ 134209/135209/ 138209)	51
16	Major Course: Computer Networks (109210/110210/ 112210/123210/ 134210/135210/138210)	54
17	Major Course: Python Programming (109211/110211/ 112211/123211/ 134211/135211/138211)	56
18	Major Practical: Laboratory on OOP with C++ (109212/110212/ 112212/ 123212/ 134212/135212/138212)	59
19	Minor Course: C++ and Python Programming (109263/110263/ 112263/123263/ 134263/135263/138263)	63
20	Minor Practical: Laboratory on C++ and Python Programming (109264/110264/ 112264/123264/ 134264/135264/138264)	67
21	GOEC Theory 6: Web Technologies (109276/110276/ 112276/123276/ 134276/135276/138276)	70
22	VSC: Database using Access Laboratory (109285/110285/ 112285/123285/ 134285/135285/138285)	72
23	Field Project / Community Engagement Services: Phase-II (109292/ 110292/ 112292/123292/ 134292/135292/138292)	76

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

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

Notes:

- a. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.
- b. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).
- c. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.
- d. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
- e. **Value Education Courses** to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.
- f. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University
- g. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training; Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Examination, Evaluation and Assessment

Examination and Assessment Process:

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

Examination, Evaluation and Assessment Scheme

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

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

Examination, Evaluation and Assessment Scheme

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

Continuous Assessment Tests (CAT)

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

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

conduction of the Examination:

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

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

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

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

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

SEMESTER – III

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

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

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

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

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

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

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

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

SYLLABUS

B.Sc.- II, SEMESTER – III

B.Sc. Computer Science (112)

Information Technology (123)

Computer Application (Regular) (109)

Computer Application (Vocational) (110)

Data Analytics (134)

Data Science and Analytics (135)

Web Designing and Development (138)

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

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

Major Course: Data Structure

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

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

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

Any pertinent media (recorded lectures, YouTube, etc.)if relevant:

1. <https://www.youtube.com/watch?v=RBSGKlAvoiM>
2. <https://www.youtube.com/watch?v=zg9ih6SVACc>

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=RBSGKIAv0iM 2. https://www.youtube.com/watch?v=zg9ih6SVACc 3. https://www.youtube.com/watch?v=3EJlovevfcA 4. https://www.youtube.com/watch?v=U2T_LCdO14Y 5. https://www.youtube.com/watch?v=7wj7UEdLI6U
Model Questions:	

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

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

Minor Practical: Laboratory on Data Structure and RDBMS

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

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

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

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

Assessment Rubric: Internal Practical Course

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

GOEC Theory 5: E Content Development

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

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

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

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

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

VSC: Laboratory on MySQL

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

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

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

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

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

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

Course Objectives:

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

Course Outcomes:

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

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

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

Guidelines/ SoP for FP/CEP

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

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

The guidelines regarding the field project are as follows:

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

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

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

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

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

1) Teaching

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

2) Services

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

3) Data Collection and Survey

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

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

Key Benefits of CES in Computer Science:

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

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

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

SYLLABUS

B.Sc.- II, SEMESTER – IV

B.Sc. Computer Science (112)

Information Technology (123)

Computer Application (Regular) (109)

Computer Application (Vocational) (110)

Data Analytics (134)

Data Science and Analytics (135)

Web Designing and Development (138)

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

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

Major Course: OOP with C++

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

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

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

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

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

Major Course: Computer Networks

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

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

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

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

Major Course: Python Programming

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

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

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

Assessment Rubric: Internal for Theory Course (Major)

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

Major Practical: Laboratory on OOP with C++

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

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

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

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

Assessment Rubric: Internal Practical Course

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

Minor Course: C++ and Python Programming

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

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

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

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

Weblink to Equivalent Virtual Lab if relevant:

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

Assessment Rubric: Internal for Theory Course (Minor)

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

Minor Practical: Laboratory on C++ and Python Programming

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

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

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

Assessment Rubric: External Practical Course

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

Assessment Rubric: Internal Practical Course

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

GOEC Theory 6: Web Technologies

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

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

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

Assessment Rubric: Internal for Theory Course (GOEC)

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

VSC: Database using Access Laboratory

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

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

	Prepare a form of above query “senior”. 6. Prepare a query to display only records including book name, writer name and publication name. Save the query as “q_book”. 7. Prepare a query to display all records on the basis of price which is more than Rs. 500. 8. Prepare a form on the basis of table. 9. Prepare a query named “senior” to display records including fields name, class, sec, rollno, status, photo and value of “status” field must be senior. Prepare a report of all the fields of above table.2. 10. Create a table named “student info” having following table structure. Field Name Data type, Description, ClassNumber, Section, Text, Roll no Number, Name Text 40 11. Create a database named“library.mdb” and perform the following tasks: Create a table named “Book” having following structure: Field name Field datatype Description 12. Create a table named “Book” having following structure: Field name Field datatype Description Prepare a form on the basis of table. 13. Create a database named “Nepal Bank” to store information about its staffs and do the following tasks: Create a table named “staffinfo” having following table structure: Field Name, Data Type, Discription 14. Create a form on the basis of “staffinfo” table and save as “entryform”. 15. Create a Student Table in MS-Access with the 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. Computer Science (112)

Semester - V and VI

FACULTY: SCIENCE AND TECHNOLOGY

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

SYLLABUS

INDEX

Sr. No.	Item	Page Number
01	Member's List - Board of Studies in Computer Science (including Computer Application, Information Technology etc.)	3
02	Scheme- Examination, Evaluation and Assessment (University Draft)	4
03	Semester-V, Credits, Workload, Examination, Evaluation and Assessment Scheme	8
04	Semester-VI, Credits, Workload, Examination, Evaluation and Assessment Scheme	9
05	Syllabus, B.Sc.- III, Semester – V	
06	Major Course: Core Java Programming (112213)	11
07	Major Course: Software Engineering (112214)	14
08	Major Course: Advance Python Programming (112215)	17
09	Major Course: Laboratory on core Java Programming and Advanced Python Programming (112216)	20
10	Major Course (Elective-1): Data Mining (112217)	24
11	Major Course (Elective-1): Data Science (112218)	27
12	Major Course (Elective-1 Laboratory): Laboratory on Data Mining Tools (112219)	30
13	Major Course (Elective-1 Laboratory): Laboratory on Data Science (112220)	32
14	Minor Course: Computer Network and Advanced python Programming (112265)	35
15	Minor Course: Laboratory on Advanced python Programming (112266)	38
16	VSC: Laboratory on PHP Programming (112286)	41
17	SEC: Laboratory on VB.Net (112287)	43
18	Project in Computer Science (112293)	46
19	Foundation of Artificial Intelligence	49
	Syllabus, B.Sc.- III, Semester – VI	
20	Major Course: Advance Java Programming (112221)	55
21	Major Course: Computer Animation (112222)	58
22	Major Course: Digital System and Microprocessor (112223)	61
23	Major Course: Laboratory on Advanced Java Programming (112224)	64
24	Major Course (Elective-2): Artificial Intelligence (112225)	67
25	Major Course (Elective-2): Machine Learning (112226)	70
26	Major Course (Elective-2 Laboratory): Laboratory on Artificial Intelligence (112227)	73
27	Major Course (Elective-2 Laboratory): Laboratory on Machine learning (112228)	76
28	Minor Course: Software Engineering and Java Programming (112267)	78
29	Minor Course: Laboratory on Software Engineering and Java Programming (112268)	81
30	VSC: Laboratory on R Programming (112288)	84
31	Internship/Apprenticeship: (112294)	86

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 (HVP), Amravati
06	Dr. Chandrashekhar H. Sawarkar	Member	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
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11	Prof. Sureshkumar Mapari	Member	Rajasthan Aryan Arts, Shri Mithulal Kacholia Commerce and Shri Satyanarayanji Ramkrishnaji Rathi Science College, Washim

Subcommittee appointed for drafting syllabus of B. Sc. III Sem V and VI (NEP) in B.Sc. Computer Science (112)

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01	Dr. Narendra Jathe,	Chairman	Smt. Narsamma Arts, Commerce and Science College, Kiran Nagar, Amravati. 444606
02	Dr. Saurabh Ghogare,	Member	Adarsha Mahavidyalaya Dhamangaon Rly.
03	Prof. Meena Doifode,	Member	Bhartiya Mahavidyalaya, Amravati
04	Prof. Amarpal Chavan	Member	Arts & Science College, Balapur
05	Prof. Rupali Kale	Member	Shivaji Arts, Commerce & Science College, Akola
06	Dr. Sonali Gaikwad	Member	Shivaji Arts, Commerce & Science College, Chikhali

Scheme- Examination, Evaluation and Assessment

Notes:

- a. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.
- b. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).
- c. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.
- d. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
- e. **Value Education Courses** to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.
- f. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University
- g. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training; Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Examination and Assessment Process:

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

Examination, Evaluation and Assessment Scheme

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

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

Examination, Evaluation and Assessment Scheme

[illegible]

	CC		A detailed SOP for this assessment process is prescribed for Phase I and Phase II
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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

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-T7	112213	Core Java Programming	2	2	30	9	20	6	50	20
Major-T8	112214	Software Engineering	2	2	30	9	20	6	50	20
Major-T9	112215	Advanced Python Programming	2	2	30	9	20	6	50	20
Major-Lab/Practical-15	112216	Laboratory on Core Java Programming and Advanced Python Programming	2	4	25	10	25	10	50	20
Major-Elective T1	112217	Data Mining	2	2	30	9	20	6	50	20
Major-Elective T1	112218	Data Science	2	2	30	9	20	6	50	20
Major-Elective Lab/Practical-17	112219	Laboratory on Data Mining Tools	2	4	25	10	25	10	50	20
Major-Elective Lab/Practical-17	112220	Laboratory on Data Science	2	4	25	10	25	10	50	20
Minor-T5	112265	Computer Networks and Advanced Python Programming	2	2	30	9	20	6	50	20
Minor-P18	112266	Laboratory on Advanced Python Programming	2	4	25	10	25	10	50	20
VSC-P19	112286	Laboratory on PHP Programming	2	4	-	-	50	20	50	20
SEC-P	112287	Laboratory on VB.Net	2	4	-	-	50	20	50	20
FP/CES	112293	Project in Computer Science	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

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

The Vertical	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Practical	
					External		Internal		(Total)	
					Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major-T10	112221	Advance Java Programming	2	2	30	9	20	6	50	20
Major-T11	112222	Computer Animation	2	2	30	9	20	6	50	20
Major-T	112223	Digital Systems and Microprocessors (DSM)	2	2	30	9	20	6	50	20
Major-Lab/Practical-20	112224	Laboratory on Advance Java Programming	2	4	25	10	25	10	50	20
Major-Elective T12	112225	Artificial Intelligence	2	2	30	9	20	6	50	20
Major-Elective T2	112226	Machine Learning	2	2	30	9	20	6	50	20
Major-Elective Lab/Practical-22	112227	Laboratory on Artificial Intelligence	2	4	25	10	25	10	50	20
Major-Elective Lab/Practical-22	112228	Laboratory on Machine Learning	2	4	25	10	25	10	50	20
Minor-T6	112267	Software Engineering and Java Programming	2	2	30	9	20	6	50	20
Minor-P23	112268	Laboratory on Software Engineering and Java Programming	2	4	25	10	25	10	50	20
VSC-P24	112288	Laboratory on R Programming	2	4	-	-	50	20	50	20
Internship / Apprenticeship	112294	Internship / Apprenticeship in Computer Science	4	8	-	-	50	20	50	20

SYLLABUS

B.Sc.- III, SEMESTER – V

Computer Science (112)

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)

(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: Core Java Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112213	Core Java Programming	2	30	2 Hrs.	30

Course Objectives:	1. To understand the concepts and features of object-oriented programming. 2. The skills to apply OOP in Java programming in problem solving 3. To understand the concept of polymorphism and inheritance 4. To understand the creation of user defined interfaces						
Course Outcomes:	Students will be able to - 1. Understand the basic Concept of Java. 2. Knowledge and ability to implement the control structures to get desired output. 3. Students will Able Identify classes, objects, members of a class and relationships among them needed for a specific problem 4. Students will Understanding the Inheritance and polymorphism. 5. To build directories and manage applications with interfaces.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to JAVA: History and evolution, Feature, JRE, JDK, JVM, Data types, Keywords, Operators, Structure of Java Program, Java Command line argument, Simple java programs.				8 Hrs.	8 Marks	Use any pedagogical technique

Unit II	Decision Making and Branching: Simple if statement, if...else statement, Nesting of if...else statement, Else...if ladder, switch statement. Decision Making and Looping: While statement, Do-While statement, For statement, jumps in loop.	7 Hrs.	7 Marks	suitable for the topic
Unit III	Classes, Objects and Methods: Introduction, defining a class, declaration of fields, methods, objects creation, accessing class members, method overloading, constructor and its type, constructor Overloading, use of new, delete &this keyword. Access Specifier: public, private &protected	8 Hrs.	8 Marks	
Unit IV	Inheritance: Introduction, type of Inheritance, Super &Extended class Final Variable, method & class, abstract methods and classes Interfaces: Introduction, defining interfaces, extending interfaces, Implementing interfaces.	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 1.Programming with Java A Primer, Fourth Edition- E. Balguruswami (McGraw Hill) Reference Books: 1. Java - The Complete Reference 11th edition - Herbert Schildt (McGraw Hill) 2. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education. 3. “Java Handbook” Patricks Naughton, Osborne McGraw Hill Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview 2. https://onlinecourses.nptel.ac.in/noc22_cs47/preview 3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_cs85 Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=mglWM6PKZVk 2. https://www.youtube.com/watch?v=wBJDrRBPmuY 3. https://www.youtube.com/watch?v=Qg3HDbmbW6I			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 112213	Course Title:Core Java 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: Software Engineering

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112214	Software Engineering	2	30	2 Hrs.	30

Course Objectives:	1. Understand the fundamental concepts of Software Engineering 2. Analyse software requirements, risk management techniques, and software quality measurement methods used in software development. 3. Apply software design principles, architectural design, user interface design, and UML modeling techniques for developing software systems. 4. Understand software testing strategies, debugging techniques, and quality assurance standards for producing reliable software products.						
Course Outcomes:	Students will be able to - 1. Explain the basic principles of Software Engineering. 2. Identify and analyse functional and non-functional requirements 3. Design software architecture, user interfaces, and UML-based system models for software applications. 4. Apply testing methods, risk management strategies, and software quality assurance standards to improve software reliability.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Software Engineering: Characteristics of Software, Types of Software, Need of Software Engineering, Software Development Life Cycle (SDLC), Phases of SDLC, Software Development Models: Introduction to Process Models, Waterfall Model, Prototype Model, Spiral Model				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Software Requirements: Functional and non-functional requirements, User requirements, System requirements Requirements engineering process: Requirements elicitation and analysis, Requirements validation, Requirements management.				7 Hrs.	7 Marks	
Unit III	Risk management: Risk strategies, software risks, Risk identification, RMMM Plan Design Engineering: Design process and Design quality. Introduction to software Architecture, Data design and Architectural pattern				8 Hrs.	8 Marks	

	User interface design: Golden rules, and interface design steps,			
Unit IV	overview of System models and UML Diagrams. Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging	7 Hrs.	7 Marks	
References :	Course Material/Learning Resources Text books: 1. Software Engineering: A Practitioner's Approach – Roger S. Pressman 2. Software Engineering – Ian Sommerville 3. Fundamentals of Software Engineering – Rajib Mall 4. An Integrated Approach to Software Engineering – Pankaj Jalote Reference Books: 1. Software Engineering Principles and Practice – Hans Van Vliet 2. Object Oriented and Classical Software Engineering – Stephen R. Schach 3. Software Engineering – K. K. Aggarwal & Yogesh Singh 4. Software Engineering Concepts – Richard Fairley 5. UML Distilled – Martin Fowler Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs108 2. https://cse.iitk.ac.in/pages/CS455.html Weblink to Equivalent Virtual Lab if relevant: https://se-iitkgp.vlabs.ac.in/ Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=Z6f9ckEElsU 2. https://onlinecourses-archive.nptel.ac.in/noc18_cs43/preview 3. https://www.youtube.com/playlist?list=PL_pbwdIyffslgxMVyXhnHiSn_EWTvx1G-			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 112214	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: Advance Python Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112215	Advance Python Programming	2	30	2 Hrs.	30

Course Objectives:	1. To understand and apply Python data structures for solving computational problems. 2. To develop skills in file handling using Python modules. 3. To learn pattern matching and text processing in Python modules. 4. To understand object-oriented programming concepts in Python.						
Course Outcomes:	Students will be able to: 1. Discover the need for working with the strings Method. 2. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets. 3. Indicate the use of regular expressions and built-in functions to navigate the file system. 4. Infer the Object-oriented Programming concepts in Python.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Strings and Lists: Basic string operations, string indexing and slicing, string formatting, commonly used string methods, creating lists, list operations, indexing and slicing in lists, built-in functions used on lists and list methods. Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Tuples and Sets: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozen set.				7 Hrs.	7 Marks	
Unit III	Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules, Regular Expression Operations: Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module..				8 Hrs.	8 Marks	

Unit IV	Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, Polymorphism.	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text Books: 1. Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press. 2. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, No Starch Press. 3. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, O'Reilly Media. 4. Martin C. Brown, Python: The Complete Reference, McGraw Hill Education. 5. Paul Barry, Head First Python, O'Reilly Media. Reference Books: 1. Mark Lutz, Learning Python, O'Reilly Media. 2. David Beazley and Brian K. Jones, Python Cookbook, O'Reilly Media. 3. Al Sweigart, Automate the Boring Stuff with Python, No Starch Press. 4. Mark Summerfield, Programming in Python 3: A Complete Introduction to the Python Language, Addison-Wesley. 5. Luciano Ramalho, Fluent Python, O'Reilly Media. Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_cs01 2. https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp33 3. https://www.coursera.org/specializations/python?utm_source 4. https://developers.google.com/edu/python?utm_source 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=t2_Q2BRzeEE&list=PLGjplNEQ1it8-0CmoljS5yeV-GIKSUEt0 2. https://www.youtube.com/watch?v=6i3EGqOBRiU&list=PLdo5W4Nhv31bZSiqiOL5ta39vSnBxpOPT 3. https://www.youtube.com/live/Yrtm7d3TJbs?si=5_7EumDayLB8BHO0 4. https://youtu.be/UrsmFxEIp5k?si=G1GkZEFysrSU9dRH 5. https://youtu.be/AEE9ecgLgdQ?si=cFT2eJyNDPtnxrGs			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 112215	Course Title: Advance 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, 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 core Java Programming and Advanced Python Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112216	Laboratory on core Java Programming and Advanced Python Programming	2	60	4Hrs.	50

Course Objectives:	1. To understand the basic concepts of Java programming language. 2. To develop problem-solving skills using Java programs. 3. To understand the advance concepts of python programming language. 4. To understands database connectivity and GUI in python programming
Course Outcomes:	On competition of the following syllabus the students will be able to - 1. Understand and apply the fundamentals of Java programming language. 2. Write, compile, debug, and execute Java programs successfully. 3. Understand the advance python programming concept 4. TO understand the SQL, GUI and other advance concept in Python programming

Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Write a program in Java to Swap Two Numbers using third Variables. 2. Write a program in Java to determine whether an input number is an even number. 3. Write a program in Java to Find Greatest of Three Number 4. Write a program in Java to Switch Case Statement 5. Write a program in Java to Print Factorial of number 6. Write a program in Java to Print Prime Number 7. Write a program in Java to Generate Fibonacci Series 8. Write a Java Program for Printing Multiplication table using do-while statement. 9. Write a Program in java by using while loop to reverse the inputted number 10. Write a program in Java to Print following pattern <pre> * * * * * * * * * * </pre>			Use any pedagogical technique suitable for the topic

11. Write a program in Java to print the following pattern: <pre> 1 12 123 1234 12345 </pre> 12. Write a program in Java code to print the following pattern: <pre> 1 22 333 4444 55555 </pre> 13. Write a program in Java code to print the following pattern: <pre> 1 2 3 4 5 6 7 8 9 10 </pre> 14. Write a program in Java to demonstrate classes and objects. 15. Write a program in Java to demonstrate method overloading 16. Write a program in Java to demonstrate constructor. 17. Write a program in Java to demonstrate constructor overloading. 18. Write a program in Java to demonstrate single inheritance 19. Write a program in Java to demonstrate method overriding. 20. Write a program in Java to demonstrate Interface. 21. Write a Python program to create, append and remove lists. 22. Python program to check if a substring is present in a given string. 23. Write a program to demonstrate working with tuples in Python. 24. Write a program to demonstrate working with dictionaries in Python. 25. Write a Python program to find largest of three numbers. 26. Write a Python program to construct the following pattern using nested for loop. <pre> * * * * * * * * * * </pre> 27. Write a Python program to print prim numbers less than 20. 28. Write a Python program to find factorial of a number using recursion.			
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	29. Write a Python program to map two lists into a dictionary. 30. Write a Python program to count the frequency of words appearing in a string using a dictionary. 31. Write a Python program to create a dictionary with key as first character and value as words starting with that character. 32. Write a Python program to read the contents of a file in reverse order. 33. Write a Python program to map two lists into a dictionary. 34. Write a Python Program to demonstrate the class and object. 35. Write a Python Program to demonstrate constructor method..			
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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: 112216	Laboratory on core Java Programming and Advanced 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. III, SEMESTER – V (NEP)			
Practical	Course Code: 112216	Laboratory on core Java Programming and Advanced 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

Major Course (Elective-1): Data Mining

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112217	Data Mining	2	30	2 Hrs.	30

Course Objectives:	1. To understand basics of Data Mining and preprocessing. 2. To study association rules and classification techniques. 3. To learn OLAP and clustering methods. 4. To understand data mining applications and trends.				
Course Outcomes:	Students will be able to - 1. Explain basic Data Mining concepts and preprocessing. 2. Apply association and classification techniques. 3. Understand OLAP and clustering methods. 4. Identify applications and trends in Data Mining.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction and Data Preprocessing: Introduction to Data Mining, Need and Applications of Data Mining, Data Mining Functionalities, Types of Data in Data Mining Data Preprocessing: Data Cleaning, Data Integration, Data Transformation, Data Reduction Introduction to Data Warehouse, Difference between Data Mining and Data Warehouse	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Association Rules and Classification: Frequent Patterns and Association Rules, Basic Concepts of Association Rule Mining, Classification and Prediction, Decision Tree Classification, Bayesian Classification, Rule-Based Classification, Accuracy and Error Measures	7 Hrs.	7 Marks		
Unit III	Clustering and OLAP Technology: Overview of OLAP Technology, Multidimensional Data Model, Data Cube and Data Generalization, Introduction to Clustering, Partitioning Methods, Hierarchical Methods, Density-Based Methods,	8 Hrs.	8 Marks		

	Difference between Classification and Clustering			
Unit IV	Advanced Topics and Applications: Introduction to Web Mining and Text Mining, Social Network Analysis, Graph Mining, Mining Time-Series Data, Applications of Data Mining in Healthcare, Banking, Education, and Business, Recent Trends in Data Mining	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Data Mining: Concepts and Techniques - J. Han, M. Kambe Reference Books: 1. Data Mining: Introductory and Advanced Topics – Margaret H. Dunham, Pearson Education 2. Data Warehousing in the real world - Sam Anahory, Dennis Murry, Pearson Education 3. Principles of Data Mining - David Hand, Heikki Manila, Padhraic Symth, PHI 4. Data Warehousing, Data Mining & OLAP, Alex Bezon, Stephen J. Smith McGraw-Hill Edition 5. Data Warehousing Fundamentals, Paulraj Ponniah, Wiley-Inter science Publication Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview 2. https://onlinecourses.swayam2.ac.in/cec19_cs01/preview Any pertinent media (recorded lectures, YouTube, etc.)if relevant: 1. https://youtu.be/T_D2tDTmrWE 2. https://youtu.be/cLI_bllq-oU 3. https://youtu.be/KgjUsie50WQ 4. https://youtu.be/ykZ-_UGcYWg 5. https://youtu.be/jzDZZ-msoQc 6. https://youtu.be/m-aKj5ovDfg			

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: 112217	Course Title: Data Mining	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course (Elective-1): Data Science

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112218	Data Science	2	30	2 Hrs	30

Course Objectives:	1. To introduce the fundamentals of Data Science and its applications. 2. To understand data collection, preprocessing, and visualization techniques. 3. To learn basic statistical and machine learning concepts used in Data Science. 4. To develop analytical thinking for solving real-world problems using data.						
Course Outcomes:	Students will be able to - 1. Explain the basic concepts and importance of Data Science. 2. Apply data preprocessing and visualization techniques on datasets. 3. Analyze statistical methods and machine learning models used in Data Science. 4. Evaluate real-world problems and suggest suitable Data Science solutions.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Data Science: Definition and importance of Data Science, Data Science lifecycle, Applications of Data Science, Types of data, Data Science tools and platforms, Introduction to Big Data and AI				8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Data Collection and Preprocessing: Data collection methods, Structured and unstructured data, Data cleaning and handling missing values, Data transformation and normalization, Data integration and reduction, Introduction to Python for Data Science				7 Hrs	7 Marks	
Unit III	Data Visualization: Importance of data visualization Charts and graphs: Bar chart, Pie chart, Histogram, Scatter plot Statistics: Descriptive statistics, Mean, Median, Mode, Correlation and Regression basics, Probability concepts in Data Science				8 Hrs	8 Marks	
Unit IV	Introduction to Machine Learning: Machine Learning overview, Supervised and Unsupervised learning, Classification and Regression, Clustering basics, Applications of Machine Learning in real life, Ethical issues in				7 Hrs	7 Marks	

	Data Science			
References:	Course Material/Learning Resources Text books: 1.Data Science for Beginners, Andrew Park, Tech World Publications -2nd Edition 2.Introduction to Data Science, Laura Igual& Santi Seguí, Springer -1st Edition 3. Data Science from Scratch, Joel Grus, O'Reilly Media -2nd Edition 4. Practical Statistics for Data Scientists, Peter Bruce & Andrew Bruce, O'Reilly Media -2nd Edition Reference Books: 1. Python for Data Analysis, Wes McKinney, O'Reilly Media - 3rd Edition 2. Hands-On Machine Learning with Scikit-Learn, Keras& TensorFlow, Aurélien Géron, O'Reilly Media - 3rd Edition 3. Introduction to Machine Learning with Python, Andreas Müller & Sarah Guido, O'Reilly Media - 1st Edition 4. The Elements of Data Science, Allen B. Downey, Lulu Publication - 1st Edition Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_cs99 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_cs21 3. https://online-degree.swayam2.ac.in/mri24_07_d03_s1_el09/preview Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=ua-CiDNNj30 2. https://www.youtube.com/watch?v=-ETQ97mXXF0			

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: 112218	Course Title: Data Science	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course (Elective-1 Laboratory): Laboratory on Data Mining Tools

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112219	Laboratory on Data Mining Tools	2	60	4Hrs.	50

Course Objectives:	1. To understand the use of data mining tools and techniques. 2. To perform data preprocessing and data analysis operations. 3. To apply classification, clustering, and association rule mining techniques.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. use data mining tools effectively. 2. preprocess and analyze datasets. 3. implement classification and clustering techniques. 4. generate association rules and interpret results.						
Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
List of Practical: 1. Create and Load Employee Dataset. 2. Create and Load Weather Dataset. 3. Create and Load Student Dataset. 4. Explore Dataset Attributes and Records. 5. Add and Remove Attributes from Weather Dataset. 6. Handle Missing Values in Employee Dataset. 7. Apply Normalization on Weather Dataset. 8. Apply Normalization on Employee Dataset. 9. Perform Data Filtering on Student Dataset. 10. Visualize Weather Dataset using Charts/Graphs. 11. Visualize Banking Dataset using Visualization Tools. 12. Generate Association Rules for Buying Dataset. 13. Generate Association Rules for Banking Dataset. 14. Generate Association Rules for Employee Dataset.						Use any pedagogical technique suitable for the topic	

	15. Construct Decision Tree for Weather Dataset. 16. Construct Decision Tree for Customer Dataset. 17. Construct Decision Tree for Student Dataset. 18. Sort employee or student records based on marks, salary, or experience. 19. Find records using employee ID or student roll number. 20. Create bar chart or pie chart for salary analysis. 21. Apply K-Means Clustering on Student Dataset. 22. Perform Hierarchical Clustering on Employee Dataset.			
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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:112219	Laboratory on Data Mining Tools	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code:112219	Laboratory on Data Mining Tools	Max Marks: 25
Q. No.	Assessment Criteria		Marks
1.	Attendance/Regularity in practical's / Students' overall performance		05
2.	Record book Preparation (Preferably handwritten)		10
3.	Internal Viva Voce		10

Major Course (Elective-1 Laboratory): Laboratory on Data Science

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112220	Laboratory on Data Science	2	60	4Hrs	50

Course Objectives:	1. To understand basic Data Science tools and techniques through hands-on practice. 2. To perform data collection, preprocessing, and visualization using Python. 3. To apply statistical and machine learning concepts on datasets. 4. To develop problem-solving and analytical skills using Data Science methods.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Identify and use basic Data Science tools and Python libraries. 2. Apply preprocessing and visualization techniques on datasets. 3. Analyze datasets using statistical and machine learning methods. 4. Develop simple Data Science solutions for real-world problems.						
Contents:					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Study and installation of Python and Jupyter Notebook for Data Science. 2. Write a Python program to perform basic mathematical operations. 3. Implement different reshape functions in NumPy such as reshape(), resize(). 4. Implement different ways of concatenating arrays in NumPy using functions. 5. Implement array splitting functions in NumPy such as split(), hsplit(). 6. Implement different random number generation functions in NumPy using the random module. 7. To perform various statistical operations on NumPy arrays such as min, max, sum, mean, median, var, std, and percentile. 8. To study and implement array creation in NumPy. 9. Access array elements using indexing and slicing techniques. 10. To study and implement different arithmetic operations on NumPy arrays, including element-wise operations and scalar operations. 11. To study and implement different matrix operations in NumPy.						Use any pedagogical technique suitable for the topic

	12. To study and implement different string operations in NumPy using the numpy. char module. 13. To study and implement sorting and searching operations in NumPy arrays using functions. 14. To study and implement creation of Series in Pandas and access their elements using indexing and slicing. 15. To study and perform basic operations on Pandas DataFrame. 16. To study and implement data selection, filtering, and conditional operations on Pandas DataFrames. 17. To study and implement techniques for detecting, removing, and replacing missing data (NaN values) in Pandas DataFrames 18. To study and implement reading and writing operations in Pandas using different file formats such as CSV, Excel, and JSON. 19. To study and implement data visualization using Pandas plotting functions. 20. To study and implement data visualization using Matplotlib.			
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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: 112220	Laboratory on Data Science	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: 112220	Laboratory on Data Science	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: Computer Network and Advanced python Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112265	Computer Network and Advanced python Programming	2	30	2Hrs.	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 introduce Python string formatting and list operations. 4. To enable students to use Python data structures such as lists, dictionaries, tuples and sets. 5. To develop basic programming and data handling skills using Python built-in functions and methods.						
Course Outcomes:	Students will be able to - 1. Learn the fundamental concept of networking 2. Study the various deices and OSI model 3. Apply Python string formatting, list operations, indexing, slicing, built-in functions and list methods to solve simple programming problems. 4. Create and manipulate Python data structures such as dictionaries, tuples, sets and frozen set using appropriate functions and methods.						
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 Network: 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	String Methods: Formatting Strings, Lists, Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement				8 Hrs	8 Marks	
Unit IV	Tuples and Sets: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in				7 Hrs	7 Marks	

	Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Usingzip() Function, Sets, Set Methods, Traversing of Sets, Frozenset.			
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/			

Assessment Rubric: Internal for Theory Course (Minor)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Theory	Course Code: 112265	Course Title: Computer Network and Advanced 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, 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 Advanced python Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112266	Laboratory on Advanced python Programming	2	60	4Hrs.	50

Course Objectives:	1. To develop basic programming skills using Python language. 2. To understand and apply Python data structures such as lists, tuples and dictionaries. 3. To perform string processing, pattern generation, mathematical computation and recursion-based problem solving. 4. To apply dictionary operations for mapping, counting and grouping data. 5. To understand basic file handling operations such as reading and processing file contents. 6. To introduce object-oriented programming concepts such as class, object and constructor through simple Python programs. 7. To improve logical thinking, problem-solving ability and practical programming confidence among students.						
Course Outcomes:	On completion of the following syllabus the students will be able to – 1. Write simple Python programs using variables, operators, control statements and loops. 2. Apply string, list, tuple and dictionary operations to solve basic programming problems. 3. Develop Python programs using functions and recursion for mathematical and logical problems. 4. Analyse problems involving mapping, counting, grouping and searching of data using dictionaries. 5. Implement basic file handling programs to read, process and display file contents. 6. Create simple object-oriented Python programs using classes, objects and constructors.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Write a Python program to create, append and remove lists. 2. Python program to check if a substring is present in a given string. 3. Write a program to demonstrate working with tuples in Python. 4. Write a program to demonstrate working with dictionaries in Python. 5. Write a Python program to find largest of three numbers. 6. Write a Python program to construct the following pattern using nested for loop. *						Use any pedagogical technique suitable for the topic

	* * * * * * * * * 7. Write a Python program to print prime numbers less than 20. 8. Write a Python program to find factorial of a number using recursion. 9. Write a Python program to map two lists into a dictionary. 10. Write a Python program to count the frequency of words appearing in a string using a dictionary. 11. Write a Python program to create a dictionary with key as first character and value as words starting with that character. 12. Write a Python program to read the contents of a file in reverse order. 13. Write a Python program to perform union, intersection, difference and symmetric difference on two sets. 14. Write a Python Program to demonstrate the class and object. 15. Write a Python Program to demonstrate constructor method.			
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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: 112266	Laboratory on Advanced python Programming	Max Marks: 25	Time: 4 Hrs.
Q. No.	Exercise			Marks
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout			10
2.	Submitted Record book (Preferably handwritten)			05
3.	External Viva Voce			10

Assessment Rubric: Internal Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 112266	Laboratory on Advanced python Programming	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 PHP Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112286	Laboratory on PHP Programming	2	60	4Hrs	50

Course Objectives:	1. To help the students getting started with web programming using HTML5, PHP . 2. To learn how to build own website. 3. To create dynamic content and user interface. 4. Integrating the front end and backend perspective of the application.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Learn the environment of Server-Side Script. 2. Understand what PHP is and how to write PHP scripts. 3. Learn PHP syntax and how to use variables and data types. 4. Use conditional statements (if, else, switch) and loops (while, for). 5. Use functions to make code reusable. 6. Handle forms and user input with PHP. 7. Learn how to use Arrays management.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Write a PHP program to perform addition, subtraction, multiplication, and division of two numbers. 2. Write a PHP program to swap two numbers. 3. Write a PHP program to find the largest of three numbers. 4. Write a PHP program to calculate sum of digits. 5. Write a PHP program to check palindrome number/string. 6. Write a PHP program to check positive, negative, or zero. 7. Write a PHP program to count digits in a number. 8. Write a PHP program to find sum of first N natural numbers. 9. Write a PHP program to reverse a string.						Use any pedagogical technique suitable for the topic

	10. Write a PHP program to count vowels in a string 11. Write a PHP program to replace a word in a string. 12. Write a PHP program to create and display an array. 13. Write a PHP program to calculate average using user-defined function. 14. Write a program to Create a student registration form using PHP. 15. Write a program Create a login form validation using PHP.			
References:	Web link to Equivalent MOOC on SWAYAM if relevant: 1. https://www.geeksforgeeks.org/php/php-program-to-perform-arithmetic-operations/ 2. https://www.geeksforgeeks.org/php/php-program-to-swap-two-numbers/ 3. https://www.geeksforgeeks.org/php/sum-of-first-n-natural-number-in-php/ 4. https://www.geeksforgeeks.org/php/php-reverse-string/ 5. https://www.w3schools.com/php/php_arrays.asp 6. https://www.geeksforgeeks.org/php/creating-a-registration-and-login-system-with-php-and-mysql/			

Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 112286	Laboratory on PHP Programming	Max Marks: 50
Q. No.	Assessment Criteria	Marks	
1.	Single Program Writing, Algorithm, Flowchart, Execution, with Sample inputs and Outputs, and Printout	20	
2.	Record book preparation (Preferably handwritten) / Assignments preparation during semester	10	
3.	Attendance in practical session / Students' overall performance	10	
4.	Internal Viva Voce	10	

SEC: Laboratory on VB.Net

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112287	Laboratory on VB.Net	2	60	4Hrs	50

Course Objectives:	1. Understand the concept of VB.NET. 2. Know the importance of VB.NET. 3. Explain the functions of VB.NET. 4. Define the scope and benefits and limitations of VB.NET.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. To develop simple VB.NET program using form. 2. To apply simple VB.NET program using form. 3. To execute VB.NET application with various controls						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Write a VB.NET program to determine whether an input number is an even number. 2. Write VB.Net to Find Greatest of Three Number 3. Write VB.Net for Conditional if else. 4. Write VB.Net for Select Case 5. Write VB.Net for Print Factorial 6. Write VB.Net for Print Prime Number 7. Write VB.Net to Generate Fibonacci Series 8. Write VB.Net to Swap Two Numbers using 2 Variables. 9. Write VB.Net to Print * like * * * * * * * * * * * * * * * 10. Write VB.Net code to print the following pattern: 1 12						Use any pedagogical technique suitable for the topic

	123 1234 12345 11. Write VB.Net code to print the following pattern: I I N I N D I N D I I N D I A 12. Write VB.Net code to print the following pattern: 1 2 3 4 5 6 7 8 9 10 13. Write VB.Net program to demonstrate constructor. 14. Write VB.Net program to demonstrate constructor overloading. 15. Write VB.Net program to demonstrate passing argument by val. 16. Write VB.Net program to demonstrate passing argument by ref. 17. Write VB.Net program to demonstrate arrays. 18. Write VB.Net program to demonstrate built in dialog boxes. 19. Write VB.Net program to demonstrate timer control. 20. Write VB.Net program to demonstrate check box. 21. Write VB.Net program to demonstrate radio button. 22. Write VB.Net program to demonstrate repeater data controls. 23. Write VB.Net program to demonstrate data grid control 24. Write VB.Net program to demonstrate panels. 25. Write VB.Net program to demonstrate string manipulation functions. 26. Write VB.Net to demonstrate classes and objects. 27. Write VB.Net to demonstrate method overloading 28. Write VB.Net to create menu editor 29. Write VB.Net for ADO.NET connection objects. 30. Write VB.Net for ADO.NET command objects.			
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References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.programiz.com/cpp-programming/online-compiler/ 2. https://www.onlinegdb.com/online_cplusplus_compiler 3. https://onecompiler.com/cpp 4. https://www.codechef.com/cpp-online-compiler 5. https://www.w3schools.com/cpp/cpp_compiler.asp 6. https://www.tutorialspoint.com/compile_cpp_online.php 7. https://nextleap.app/online-compiler/cpp-programming 8. https://www.jdoodle.com/online-compiler-cplusplus			
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Assessment Rubric: Internal Examination Practical Course |(SEC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – V (NEP)			
Practical	Course Code: 112287	Laboratory on VB.Net	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 Computer Science (112)

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	V	112293	Project in Computer Science	2	--	--	--

Course Objectives:

1. To understand the research project development process.
2. To motivate students to undertake research projects and pursue innovations.
3. To cultivate a research and innovation mindset in students.
4. To create awareness about Design Thinking and innovative research idea generation.

Course Outcomes:

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

1. Develop new research ideas and innovations.
2. Create innovative solutions for identified problems.
3. Use research tools effectively.
4. Develop feasible solutions aligned with Sustainable Development Goals (SDGs).

Guidelines:

1. The Project must be research or Application based and focus on innovation and problem-solving.
2. The research work needs to be carried out collaboratively and the topic shall be in area of Computer Science or an interdisciplinary in nature.
3. Single or at the most group of Four student will engage in Research Project.
4. Student or group of students responsible for regularly reporting the progress of their research project to their guide (Project In-charge).
5. The synopsis must be submitted within the timeframe provided by the guide (Project In-charge)/Department.
6. Students must submit the Title and Synopsis (5-8 pages) in the prescribed format provided by guide (Project In-charge)/Department.
7. Plagiarism is strictly prohibited. Projects found to contain plagiarism will be rejected.
8. The single or at the most group of four students will conduct the project.
9. Students must submit One copy of their final project report for examination to the department.
10. All students must adhere to the given schedule for submissions and presentations.
11. Students should ensure that their research work is aligned with ethical research practices.
12. The project report and synopsis should strictly follow the provided format for consistency.
13. Students are encouraged to seek funding or support from relevant bodies and publish their research where applicable.

Formats of the Proposal/Synopsis and Report

Synopsis Format:

1. Title Page
2. Certificate
3. Acknowledgement
4. Index/Table of Contents
5. Abstract
6. Introduction
7. Motivation
8. Aims and Objectives
9. Literature Review
10. Methodology
11. Proposed System/Model
12. Applications
13. References

Research Project Report Format:

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

Assessment Rubric/Internal evaluation for the Project:

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



SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(Extra-Ordinary)

Wednesday, the 24th December, 2025

(NOTIFICATION)

No. 241/2025

Date: 24/12/2025

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

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

Sd/-

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

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 appeared in backlog 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

Unit 2: AI Structures, Architectures & Techniques

(7 Hours)

Basic Structure of an AI System; AI Architectures (Simplified): Rule Based System, Machine Learning, Neural Networks; Key Concepts:

Knowledge Representation (using symbols, facts), Search & Problem Solving (maze example, finding shortest route), Natural Language Understanding (Google Translate, chatbots)

Unit 3: Applications of AI in Society

(7 Hours)

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

Unit 4: Ethical, Social & Future Aspects of AI

(8 Hours)

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

Textbook:

Melanie Mitchell – *Artificial Intelligence: A Guide for Thinking Humans* Reference Books:

1. Boden, Margaret A., 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

Computer Science (112)

FACULTY: Science and Technology

Teaching and Learning Scheme: for the Degree of Bachelor of Science with the Major: Computer Science (112)

(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: Core Java Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112221	Advance Java Programming	2	30	2 Hrs.	30

Course Objectives:	5. To understand the concepts and features of object-oriented programming. 6. The skills to apply OOP in Java programming in problem solving 7. To understand the concept of polymorphism and inheritance 8. To understand the creation of user defined interfaces						
Course Outcomes:	Students will be able to - 6. Understand the fundamental concepts GUI Programming's. 7. Knowledge and ability to implement Event get desired output. 8. Analyze the power of JDBC for communication between client and server 9. Acquire the basic knowledge of Web Programming.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Exception Handling & Multithreaded Programming: Exception Handling: Concept of Exception, Types of Exception, Try, Catch, and Finally. Multiple Catch blocks, Nested Try Statements, throw throws. Multithreading: Thread basics, Thread Life Cycle, Concept of Multithreading, and Creating & Running Threads.				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Applet Programming: Introduction to Applet, Applet Life Cycle, Difference between Application & Applet, HTML applet tag with all attributes, Different				7 Hrs.	7 Marks	

	Applet methods.			
Unit III	Event handling: Event Delegation model, Event classes, Event Listener Interfaces, Handling Mouse and Keyboard events, Adapter classes. AWT: AWT concept, AWT class hierarchy, components, Containers, Frames, Panels, Window, AWT Controls: Button, Label, Text Field, Layout managers.	8 Hrs.	8 Marks	
Unit IV	JDBC: JDBC concept, JDBC Architecture, JDBC API, Types of JDBC Drivers, Steps to create JDBC Application, Java SQL packages, Inserting & Updating, selecting, modifying Records.	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 2. Programming with Java A Primer, Fourth Edition- E. Balguruswami (McGraw Hill) Reference Books: 1. Java - The Complete Reference 11th edition - Herbert Schildt (McGraw Hill) 2. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education. 3. “Java Handbook” Patricks Naughton, Osborne McGraw Hill Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview 2. https://onlinecourses.nptel.ac.in/noc22_cs47/preview 3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_cs85 Any pertinent media (recorded lectures, YouTube, etc.) if relevant: 1. https://www.youtube.com/watch?v=mglWM6PKZVk 2. https://www.youtube.com/watch?v=wBJDrRBPmuY 3. https://www.youtube.com/watch?v=Qg3HDmbW6I			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 112221	Course Title:Core Java 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: Computer Animation

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112222	Computer Animation	2	30	2 Hrs.	30

Course Objectives:	1. To understand the basics of computer graphics and animation. 2. To learn animation principles and multimedia concepts. 3. To create 2D and basic 3D animations using animation tools. 4. To understand animation applications in media and entertainment.						
Course Outcomes:	Students will be able to - 1. understand the fundamentals of computer animation. 2. use animation tools and techniques. 3. create simple 2D and basic 3D animations. 4. understand real-world applications of animation.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction to Computer Graphics and Animation: History and Evolution of Animation, Types of Animation, Traditional Animation, 2D Animation, 3D Animation, Stop Motion Animation, Principles of Animation, Multimedia Concepts, Applications of Computer Animation				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Introduction to Animation Software, Interface and Tools of Animation Software, Creating Shapes and Objects, Working with Layers and Frames, Timeline and Keyframes, Basic Drawing and Coloring Techniques, Image Editing Basics				7 Hrs.	7 Marks	
Unit III	Creating 2D Animation, Motion Tweening and Shape Tweening, Text Animation, Audio and Video Integration, Introduction to 3D Animation, Basic 3D Objects and Transformations, Lighting and Camera Basics, Rendering Concepts				8 Hrs.	8 Marks	
Unit IV	Character Animation Basics, Storyboarding Techniques, Visual Effects Basics, Animation in Gaming and Films, Web Animation Basics, Applications of Animation in Education, Advertising, and Entertainment, Recent Trends in Computer Animation				7 Hrs.	7 Marks	

References:	Course Material/Learning Resources Text books: 1. Computer Graphics and Animation – Pradeep K. Sinha 2. Multimedia and Animation – R. P. Singh 3. Computer Graphics – Donald Hearn and M. Pauline Baker Reference Books: 1. The Animator’s Survival Kit – Richard Williams 2. 3D Animation Essentials – Andy Beane 3. Fundamentals of Computer Graphics – Peter Shirley 4. Introduction to Computer Graphics – James D. Foley 5. Multimedia Systems – John F. Koegel Buford Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/e-learning/preview/cec21_cs18 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_cs82 3. https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr25_ed64 Any pertinent media (recorded lectures, YouTube, etc.)if relevant: 1. https://www.youtube.com/watch?v=NZbrdCAsYqU 2. https://www.youtube.com/watch?v=wibh3x3h03I 3. https://www.youtube.com/watch?v=N-HFQeZvaP0&t=275s 4. https://www.youtube.com/watch?v=uDqjIdI4bF4 5. https://www.youtube.com/watch?v=EFmxPMdBqmU 6. https://www.youtube.com/watch?v=B5RYDDgAMP4&list=PLV9FdvTG6uyRtoAl-any4kOaRZYOmHozS
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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: 112222	Course Title: Computer Animation	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: Digital System and Microprocessor

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112223	Digital System and Microprocessor	2	30	2 Hrs.	30

Course Objectives:	1. To introduce students to number systems, binary arithmetic, and coding techniques used in digital electronics and microprocessor systems. 2. To develop understanding of logic gates, Boolean algebra, and combinational logic circuits for digital system design. 3. To enable students to simplify Boolean expressions and solve logic design problems using Boolean laws and K-Maps. 4. To familiarize students with the basic architecture, organization, and functioning of the 8085 Microprocessor and microcomputer system.						
Course Outcomes:	Students will be able to – 1. Understand different number systems. 2. Analyze and implement digital logic circuits using basic and universal logic gates, adders, and combinational circuits. 3. Apply Boolean algebra and K-Map techniques to simplify Boolean expressions and design optimized digital circuits. 4. Understand the architecture and Pin configuration of the 8085						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Binary Arithmetic: Binary, Octal & Hexadecimal number system and their inter conversion, Binary arithmetic: Addition and Subtraction using 1's & 2's compliments, Multiplication & Division. Binary codes: 8421 BCD, Excess-3 & Gray code.				8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Logic Gates: Definition and truth tables of NOT, OR, AND, NAND, NOR gates. EX-NOR & EX-OR gates, Universal gates, Designing of Basic gates using NAND and NOR gates, Half adder, Full adder, 4-bit binary full adder.				7 Hrs.	7 Marks	
Unit III	Boolean Algebra: Boolean laws, De-morgan's theorem, Simplification of Boolean equations using				8 Hrs.	8 Marks	

	Boolean algebra, Fundamental Products & Sum terms, K-maps: up to 2,3,4 variables.			
Unit IV	Microprocessor: Block diagram of microcomputer, Evaluation of microprocessor, Architecture of 8085 Microprocessor, 8085 pin Microprocessor.	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Digital and analog technique by Navneet, Kale and Gokhale (Kitab mahal prakashan) 2. Introduction to digital electronics by Mohinder Singh 3. Digital principle and application by Malvino and Leach 4. Microprocessor Architecture, Programming and Applications with 8085 by Ramesh S. Gaonkar Reference Books: 1. Pulse, digital and switching waveforms by Millman and Taub 2. Principle of electronics by V. K. Mehta 3. Basics of electronics by B. L. Theraja 4. The 8085 Microprocessor: Architecture, Programming and Interfacing by K. Udaya Kumar, B. S. Umashankar Weblink to Equivalent MOOC on SWAYAM if relevant: https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ee125 https://onlinecourses.swayam2.ac.in/e-learning/preview/cec21_cs16 Weblink to Equivalent Virtual Lab if relevant: https://www.vlab.co.in/broad-area-electronics-and-communications Any pertinent media (recorded lectures, YouTube, etc.) if relevant: https://www.youtube.com/watch?v=jte2S2iWRMI https://www.youtube.com/watch?v=1oHz2svCOC8			

Assessment Rubric: Internal for Theory Course (Major)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 112223	Course Title: Digital System and Microprocessor	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 Advanced Java Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112224	Laboratory on Advanced Java Programming	2	60	4Hrs.	50

Course Objectives:	1. To understand the concepts of advanced Java programming and object-oriented techniques. 2. To develop applications using exception handling and multithreading concepts in Java. 3. To understand GUI programming using AWT, Applets, layouts, controls, and event handling. 4. To design and implement interactive Java applications using AWT components and event-driven programming. 5. To understand database connectivity using JDBC and perform database operations such as create, insert, update, display, and delete.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Apply advanced Java concepts such as exception handling, multithreading, Applets, and event handling in application development. 2. Design and develop GUI-based applications using AWT controls, layouts, panels, buttons, and frames. 3. Implement event-driven programming techniques for solving mathematical and logical problems using Java. 4. Create interactive Java applications using Applets and AWT components. 5. Establish database connectivity using JDBC and perform CRUD (Create, Read, Update, Delete) operations on databases. 6. Develop Java applications integrated with relational databases for storing and retrieving data. 7. Debug, test, and execute Java programs effectively in different application environments.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Write a program to show exception handling in java. 2. Write a java program for creating multiple catch blocks. 3. Write a program to show the concept of threads. 4. Write a program to show the concept of Applets. 5. Implements and create five buttons and put on different direction and centre by using border layout manager. 6. Write a program in AWT to create a frame with two buttons having text “Welcome” and “SGBAU” to respective command B1 and B2.						Use any pedagogical technique suitable for the topic

	7. Write a program to create a panel with two command buttons having different color to respective button as well as panel using AWT controls. 8. Write a program to calculate factorial of a number using AWT controls and events. 9. Write a program to calculate whether the given number is prime or not using AWT controls and events. 10. Write a program to calculate mathematical model using AWT controls and events. 11. Write a program in JDBC to create name of students table that contain the field student(Sid int, Sname varchar(20), marks int). 12. Write a program in JDBC to accept students data from student and register the new student in database. 13. Write a program in JDBC to display students information from students table. 14. Write a program in JDBC to receive marks from command line and update students marks or specified Sid. 15. Write a program in JDBC to receive marks from command line and delete the record of specified student with respect to the desirable marks.			
	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs110 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs31 3. https://onlinedegree.swayam2.ac.in/mri22_01_d03_s1_cc3/preview 4. https://onlinedegree.swayam2.ac.in/mri23_07_d03_s4_cc02/preview 5. 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: 112224	Laboratory on Advanced Java 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: 112224	Laboratory on Advanced Java 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-2): Artificial Intelligence

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112225	Artificial Intelligence	2	30	2 Hrs.	30

Course Objectives:	1. Apply knowledge of Artificial Intelligence to solve complex engineering problems. 2. Identify the problem, formulate, and analyze AI-based problems using search algorithms. 3. Design intelligent systems and AI models using suitable algorithms for problem-solving, planning, reasoning, and decision-making applications. 4. Enable students to understand the foundational principles, structural components, and practical utility of expert systems in mimicking human decision-making. 5. To enable students to deconstruct human communication and identify the mathematical boundaries that separate natural human languages from formal programming languages.				
Course Outcomes:	Students will be able to - 1. Explain the concepts, applications, and problem-solving approaches of Artificial Intelligence. 2. Apply blind search techniques for AI problem solving. 3. Implement heuristic search methods including Hill Climbing, Best First Search, A*, AO*, Generate and Test, and Means-End Analysis. 4. To architect, engineering, and deploy functional, knowledge-based systems that capture human expertise and deliver automated, rule-based decision-making across enterprise and web environments. 5. To architect, audit, and debug computational pipelines that convert highly ambiguous human speech or text into structured, machine-interpretable logical data.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction: Introduction to artificial intelligence, AI problems and Techniques background, applications, Turing test, Artificial General Intelligence, Super AI, rational agent approaches to AI, introduction to intelligent agents, their structure, behavior and task environment.	7 Hrs.	7 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Problem Solving and Searching Techniques: Problem characteristics, production systems, control strategies, breadth-first search, depth-first search, hill climbing and its variations, heuristics search techniques: best-first search, A* algorithm, constraint	8Hrs.	8 Marks		

	satisfaction problem, means-end analysis, min-max and alpha-beta pruning algorithms.			
Unit III	Expert systems: Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents.	8 Hrs.	8 Marks	
Unit IV	Understanding Natural Languages: Components and steps of communication, the contrast between formal and natural languages in the context of grammar, Chomsky hierarchy of grammars, parsing, and semantics, Parsing Techniques, Context-Free and Transformational Grammars, Recursive transition nets.	7 Hrs.	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Russell, Stuart, J. and Norvig, Peter, <i>Artificial Intelligence – A Modern Approach</i>, Pearson, 4th edition, 2020.. 2. Patterson, DAN, W, <i>Introduction to A.I. and Expert Systems</i> – PHI, 2007 Reference Books: 1. Artificial Intelligence Elaine Rich and Kevin Knight 2. Tata McGraw Hill, 2nd Edition 3. Computational Intelligence Eberhart Elsevier Publication 4. Artificial Intelligence: A New Synthesis Nilsson Elsevier Publication 5. Artificial Intelligence with Python Prateek Joshi Packt Publishing Ltd 6. Artificial Intelligence Saroj Kausik Cengage Learning Weblink to Equivalent MOOC on SWAYAM if relevant: https://onlinecourses.swayam2.ac.in/e-learning/preview/cec21_cs08 https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_cs42 https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_cs04 Weblink to Equivalent Virtual Lab if relevant: https://ai1-iiith.vlabs.ac.in/ Any pertinent media (recorded lectures, YouTube, etc.) if relevant: https://www.youtube.com/watch?v=V5zSFToG7eg https://www.youtube.com/watch?v=O-FZ4Q8RXds https://www.youtube.com/watch?v=Ur3NZZo9hEI			

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: 112225	Course Title: Artificial Intelligence	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	Any Two of the Activity (weekly or monthly assignment/ Unit Test/Class Test) (CAT-1)		10
2	Any One of the Activity includes Open Book Test, MCQ Tests, / Theory related Class activity/Task etc.) etc. (CAT-2)		5
3	Participation in any one Activity includes Quiz, Seminar, Group Discussion, Industry visit, Case Study, Mini project, innovative work, etc. based on Theory Course. Involvement in subject related activities such as Conference, Workshop, Coding Competitions etc. (CAT-3)		5

Major Course (Elective-2): Machine Learning

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112226	Machine Learning	2	30	2 Hrs	30

Course Objectives:	1. To introduce students to the basic concepts, types, applications, and workflow of Machine Learning. 2. To develop an understanding of data preprocessing techniques required for preparing datasets for Machine Learning models. 3. To enable students to understand and apply supervised learning techniques for regression and classification problems. 4. To introduce students to unsupervised learning techniques, dimensionality reduction, and basic handling of image data. 5. To provide basic knowledge of neural networks and model evaluation techniques used to measure the performance of Machine Learning models.						
Course Outcomes:	1. Students will be able to explain the basic concepts of Machine Learning and apply preprocessing techniques to prepare data for model training. 2. Students will be able to apply regression and classification algorithms such as Linear Regression, Logistic Regression, KNN, Decision Tree, and SVM. 3. Students will be able to analyze clustering methods, dimensionality reduction using PCA, and understand the basics of image data processing. 4. Students will be able to describe basic neural network concepts and evaluate Machine Learning models using standard performance measures.						
Unit System	Contents				Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction & Data Preprocessing Definition of Machine Learning. Traditional programming vs. ML. Application of Machine Learning, Types of ML: Supervised, Unsupervised, and Reinforcement Learning. Machine Learning pipeline: data collection, preprocessing, training, testing, evaluation and prediction. Data Preprocessing: Handling missing values, categorical data encoding, feature scaling, and train-test splitting. Preprocessing of Image Data: image resizing, grayscale conversion, converting images or video frames into arrays, pixel normalization.				8 Hrs	8 Marks	Use any pedagogical technique suitable for the topic
Unit II	Supervised Learning Regression: Simple and Multiple Linear Regression, Cost function, basics of Gradient Descent.				7 Hrs	7 Marks	

	Classification: Logistic Regression, K-Nearest Neighbours (KNN), and Decision Trees. Naive Bayes Classifier, Support Vector Machines (SVM)			
Unit III	Unsupervised Learning: Introduction, clustering, K-Means clustering algorithm, choosing number of clusters using Elbow Method. Dimensionality Reduction: Need, introduction to Principal Component Analysis(PCA). Image Feature Extraction: Basics of image data, converting images into arrays, resizing images, extracting basic features from image data for classification models.	8 Hrs	8 Marks	
Unit IV	Neural Networks & Model Evaluation Neural Networks: Biological vs. Artificial Neurons, the Perceptron model, basic activation functions (Sigmoid, ReLU). Evaluation: Confusion Matrix, Accuracy, Precision, F1-Score, Recall. Understanding Underfitting, Overfitting, and using Cross-validation.	7 Hrs	7 Marks	
References:	Course Material/Learning Resources Text books: 1. Tom M. Mitchell, Machine Learning, McGraw-Hill. 2. Ethem Alpaydin, Introduction to Machine Learning, MIT Press. 3. Muller, Andreas C. and Guido, Sarah. Introduction to Machine Learning with Python: A Guide for Data Scientists. O'Reilly Media 4. Theobald, Oliver. Machine Learning for Absolute Beginners: A Plain English Introduction. 3rd Edition, Scatterplot Press, 2021. Reference Books: 1. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer. 2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning, Springer. (Springer) 3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer. 4. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow, O'Reilly Media. 5. Sebastian Raschka and Vahid Mirjalili, Python Machine Learning, Packt Publishing. 6. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press. Weblink to Equivalent MOOC on SWAYAM if relevant: https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg46 https://onlinecourses.swayam2.ac.in/e-learning/preview/ini26_cs01 https://www.coursera.org/specializations/machine-learning-introduction?utm_source https://nptel.ac.in/courses/106106139?utm_source nptel.ac.in/courses/106105152?utm_source https://developers.google.com/machine-learning/crash-course?utm_source https://openlearninglibrary.mit.edu/courses/course-v1%3AMITx%2B6.036%2B1T2019/course/?utm_source			

	Web link to Equivalent Virtual Lab if relevant: https://ml-iitr.vlabs.ac.in/ https://ml-dei.vlabs.ac.in/ https://cse19-iiith.vlabs.ac.in/ Digital Resources 1. https://www.geeksforgeeks.org/machine-learning/machine-learning/ 2. https://www.kaggle.com/code/abdallahwagih/machine-learning-notes 3. https://learnwith.campusx.in/products/100-Days-of-Machine-Learning-Notes-663a0d6101204179049a591b 4. Scikit-learn User Guide. (Scikit-learn) 5. Scikit-learn Supervised Learning Documentation. (Scikit-learn)
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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: 112226	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

Major Course (Elective-2 Laboratory): Laboratory on Artificial Intelligence

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112227	Laboratory on Artificial Intelligence	2	60	4Hrs	50

Course Objectives:	1. To learn the syntax and semantics of the Python programming language. 2. Write and Debug Code: Develop executable Python scripts using control structures, loops, and custom functions. 3. Handle Data: Utilize AI-specific Python libraries (e.g., NumPy and pandas) for data cleaning, pre-processing, and manipulation. 4. Build AI Models: Use frameworks like PyTorch or TensorFlow to construct, train, and evaluate basic machine learning models. 5. Problem Analysis: Formulate, design, and interpret data-driven solutions and predictive models for real-world scenarios.			
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Apply blind search techniques for AI problem solving. 2. Data Literacy & Engineering: Proficiency in manipulating large datasets using libraries like NumPy for numerical data and Pandas for structured data. 3. Apply mathematical foundations and algorithmic principles to model and solve complex engineering problems. 4. Ability to perform Knowledge Acquisition—gathering domain-specific expertise from human experts and documenting it for a knowledge base. 5. Computer Vision & NLP: Competency in processing digital images and videos, as well as text-based sentiment analysis and tokenization.			
Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Write a Program to print multiplication table for given no. 2. Write a Program to check whether the given no is prime or not. 3. Write a Program to find factorial of the given no. 4. Write a program to implement List Operations 5. Write a program to Illustrate Different Set Operations. 6. Write a program to implement Simple Chatbot. 7. Write a Program to Implement Breadth First Search. 8. Write a Program to Implement Depth First Search 9. Write a program to implement Hill Climbing Algorithm 10. Write a program to implement A* Algorithm			Use any pedagogical technique suitable for the topic

	11. Write a program to solve Traveling salesman problem 12. Write a program to solve Water jug problem 13. Write a program to implement Regression algorithm. 14. Write a program for chomsky hierarchy grammar stratification.			
References:	Web link to Equivalent MOOC on SWAYAM if relevant: 1. https://www.programiz.com/pythonprogramming/examples/multiplication-table 2. https://www.programiz.com/python-programming/examples/prime-number 3. https://realpython.com/build-a-chatbot-python-chatterbot/ 4. https://www.geeksforgeeks.org/python/python-program-for-breadth-first-search-or-bfs-for-a-graph/			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 112227	Laboratory on Artificial Intelligence	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: 112227	Laboratory on Artificial Intelligence	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	112228	Laboratory on Machine learning	2	60	4Hrs	50

Course Objectives:	1. To familiarize students with Python libraries used for Machine Learning such as NumPy, Pandas, Matplotlib and Scikit-learn. 2. To develop practical skills for creating, loading, exploring and preprocessing datasets. 3. To enable students to apply data preprocessing techniques such as handling missing values, categorical encoding, feature scaling and train-test splitting. 4. To provide hands-on experience in implementing supervised and unsupervised Machine Learning algorithms. 5. To train students to evaluate Machine Learning models using standard performance measures.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Use Python libraries such as NumPy, Pandas, Matplotlib and Scikit-learn for Machine Learning practical. 2. Create, load, explore and preprocess datasets for Machine Learning applications. 3. Apply preprocessing techniques such as missing value handling, categorical data encoding, feature scaling and train-test splitting. 4. Implement supervised and unsupervised learning algorithms such as Linear Regression, Logistic Regression, KNN, Decision Tree, K-Means and PCA. 5. Evaluate Machine Learning models using confusion matrix, accuracy, precision and recall.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Study and use NumPy, Pandas, Matplotlib and Scikit-learn for Machine Learning. 2. Create and load a dataset using Pandas. 3. Perform data preprocessing by handling missing values. 4. Apply categorical data encoding and feature scaling. 5. Split a dataset into training and testing data. 6. Implement Simple Linear Regression. 7. Implement Logistic Regression for classification. 8. Implement K-Nearest Neighbours classification. 9. Implement Decision Tree classification.						Use any pedagogical technique suitable for the topic

	10. Implement K-Means clustering and plot clusters. 11. Apply PCA for dimensionality reduction. 12. Evaluate a classification model using confusion matrix, accuracy, precision and recall.			
References:	Web-link to Equivalent MOOC on SWAYAM if relevant: https://nptel.ac.in/courses/106106179 https://nptel.ac.in/courses/106105152 https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs44 https://nptel.ac.in/courses/106106179			

Assessment Rubric: External Practical Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)				
Practical	Course Code: 112228	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: 112228	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

Minor Course: Software Engineering and Java Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112267	Software Engineering and Java Programming	2	30	2 Hrs.	30

Course Objectives:	1. Understand the fundamental concepts of Software Engineering 2. Analyse software requirements, risk management techniques, and software quality measurement methods used in software development. 3. . standards for producing reliable software products.				
Course Outcomes:	Students will be able to - 1. Understand the basic principles of Software Engineering 2. Identify and analyse functional and non-functional requirements using requirement engineering techniques. 3. To understand the concepts and features of Java Programming. 4. The skills to apply Decision making and Branching in Java programming				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
Unit I	Introduction to Software Engineering: Characteristics of Software, Types of Software, Need of Software Engineering, Software Development Life Cycle (SDLC), Phases of SDLC, Software Development Models: Introduction to Process Models, Waterfall Model.	8 Hrs.	8 Marks	Use any pedagogical technique suitable for the topic	
Unit II	Software Requirements: Functional and non-functional requirements, User requirements, System requirements Requirements engineering process: Requirements elicitation and analysis, Requirements validation, Requirements management. Metrics for Process and Products: Software Measurement, Metrics for software quality	7 Hrs.	7 Marks		
Unit III	Introduction to JAVA: History and evolution, Feature, JRE, JDK, JVM, Data types, Keywords, Operators, Structure of Java Program, Java Command line argument, Simple java programs.	8 Hrs.	8 Marks		
Unit IV	Decision Making and Branching: Simple if statement, if...else statement, Nesting of if...else statement, Else...if ladder, switch statement. Decision Making and Looping: While statement, Do-While statement, For statement, jumps in loop	7 Hrs.	7 Marks		
References:	Course Material/Learning Resources				

Text books:

5. Software Engineering: A Practitioner's Approach – Roger S. Pressman
6. Software Engineering – Ian Sommerville
7. Programming with Java A Primer, Fourth Edition- E. Balguruswami (McGraw Hill)

Reference Books:

1. Software Engineering Principles and Practice – Hans Van Vliet
2. Object Oriented and Classical Software Engineering – Stephen R. Schach
3. Software Engineering – K. K. Aggarwal & Yogesh Singh
4. Java - The Complete Reference 11th edition - Herbert Schildt (McGraw Hill)
5. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.
6. "Java Handbook" Patricks Naughton, Osborne McGraw Hill

Weblink to Equivalent MOOC on SWAYAM if relevant:

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs108
2. <https://cse.iitk.ac.in/pages/CS455.html>
3. https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
4. https://onlinecourses.nptel.ac.in/noc22_cs47/preview
5. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_cs85

Weblink to Equivalent Virtual Lab if relevant:

<https://se-iitkgp.vlabs.ac.in/>

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

1. <https://www.youtube.com/watch?v=Z6f9ckEElsU>
2. https://onlinecourses-archive.nptel.ac.in/noc18_cs43/preview
3. https://www.youtube.com/playlist?list=PL_pbwdIyffslgxMVyXhnHiSn_EWTvx1G-
4. <https://www.youtube.com/watch?v=mglWM6PKZVk>
5. <https://www.youtube.com/watch?v=wBJDrRBPmuY>
6. <https://www.youtube.com/watch?v=Qg3HDmbmbW6I>

Assessment Rubric: Minor Course

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI THEORY EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Theory	Course Code: 112267	Course Title: Software Engineering and Java 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

Minor Course: Laboratory on Software Engineering and Java Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112268	Laboratory on Software Engineering and Java Programming	2	60	4Hrs.	50

Course Objectives:	1. To understand the basic concepts of Java programming language. 2. To develop problem-solving skills using Java programs. 3. To provide the knowledge of basic of Computer Network. 4. To understand importance of OSI model in Computer Networking.						
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Understand and apply the fundamentals of Java programming language. 2. Execute Write, compile, debug, and execute Java programs successfully. 3. Use decision-making statements, loops, and functions to solve programming problems. 4. Provide the knowledge of basic of Computer Network. 5. Understand importance of OSI model in Computer Networking.						
Contents					Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
List of Practical: 1. Write a program in Java to Swap Two Numbers using third Variables. 2. Write a program in Java to determine whether an input number is an even number. 3. Write a program in Java to Find Greatest of Three Number 4. Write a program in Java to Switch Case Statement 5. Write a program in Java to Print Factorial of number 6. Write a program in Java to Print Prime Number 7. Write a program in Java to Generate Fibonacci Series 8. Write a Java Program for Printing Multiplication table using do-while statement. 9. Write a Program in java by using while loop to reverse the inputted number 10. Write a program in Java to Print following pattern * * *							Use any pedagogical technique suitable for the topic

	<pre> * * * * * * * * * * * * </pre> 11. Write a program in Java to print the following pattern: <pre> 1 12 123 1234 12345 </pre> 12. Write a program in Java code to print the following pattern: <pre> 1 22 333 4444 55555 </pre> 13. Write a program in Java code to print the following pattern: <pre> 1 2 3 4 5 6 7 8 9 10 </pre> 14. Write a program in Java to demonstrate classes and objects. 15. Write a program in Java to demonstrate method overloading 16. Write a program in Java to demonstrate constructor. 17. Write a program in Java to demonstrate constructor overloading. 18. Write a program in Java to demonstrate single inheritance 19. Study of various phases of SDLC. 20. Identifying the Requirements from Problem Statements. 21. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios. 22. Modeling UML ER Diagrams and Sequence diagrams. 23. State chart and Activity Modeling. 24. Modeling Data Flow Diagram. 25. Study of various testing methods			
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References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp13 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs108 3. https://cse.iitk.ac.in/pages/CS455.html 4. https://se-iitkgp.vlabs.ac.in/			
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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: 112268	Laboratory on Software Engineering and Java 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: 112268	Laboratory on Software Engineering and Java 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

VSC: Laboratory on Laboratory on R Programming

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.5	VI	112288	Laboratory on R Programming	2	60	4Hrs.	50

Course Objectives:	1. To understand the fundamentals of R Programming for data analysis. 2. To develop skills in data manipulation, visualization, and statistical analysis using R. 3. To apply R libraries and functions for solving real-world problems. 4. To build analytical and programming skills using R tools and techniques.			
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Identify and use basic R programming syntax and tools. 2. Apply data handling and visualization techniques using R. 3. Analyze datasets using statistical methods in R. 4. Develop simple analytical solutions and mini projects using R programming.			
Contents		Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
	List of Practical: 1. Installation and configuration of R Programming and RStudio environment for statistical computing. 2. Write an R program to perform basic arithmetic, relational, and logical operations. 3. Create and manipulate vectors, matrices, arrays, and lists in R programming. 4. Write an R program to perform operations on data frames and factors. 5. Import and export CSV and Excel datasets using R functions. 6. Perform data cleaning and handling of missing values using R. 7. Implement string manipulation functions and date-time operations in R. 8. Write R programs using conditional statements and looping constructs. 9. Create user-defined functions in R for mathematical and statistical operations. 10. Perform sorting, filtering, and merging of datasets using R programming. 11. Create bar charts, pie charts, and histograms using R visualization libraries. 12. Plot scatter plots, line graphs, and box plots for data analysis in R. 13. Calculate Mean, Median, Mode, Variance, and Standard Deviation using R. 14. Perform correlation and covariance analysis on datasets using R.			Use any pedagogical technique suitable for the topic

	15. Implement simple linear regression analysis using R programming. 16. Perform hypothesis testing using statistical functions in R. 17. Use the ggplot2 library for advanced data visualization in R. 18. Analyze a real-world dataset using descriptive statistics and graphical representation in R. 19. Develop a mini project for student performance analysis using R programming. 20. Develop a mini project for sales prediction or survey data analysis using R tools and visualization techniques.			
References:	Weblink to Equivalent MOOC on SWAYAM if relevant: 1. https://www.youtube.com/watch?v=_V8eKsto3Ug 2. https://www.youtube.com/watch?v=iROHLA_TXQM 3. https://www.youtube.com/watch?v=h29g21z0a68 4. https://www.r-project.org/ 5. https://posit.co/products/open-source/rstudio 6. https://cran.r-project.org/ 7. https://cran.r-project.org/manuals.html 8. https://www.datacamp.com/tracks/r-programmer 9. https://www.coursera.org/learn/r-programming 10. https://www.kaggle.com/learn			

Assessment Rubric: Internal Examination Practical Course |(VSC)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. III, SEMESTER – VI (NEP)			
Practical	Course Code: 112288	Laboratory on R Programming	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	112294	Internship/Apprenticeship in Computer Science	4	120	--	100

Course Objectives:	1. Gain practical exposure to industry, research organizations, startups, or professional work environments related to Computer Science. 2. Apply theoretical knowledge acquired during the academic program to real-world computing problems and industry practices. 3. Enhance professional skills such as communication, teamwork, leadership, project management, and workplace ethics. 4. Strengthen problem-solving, analytical thinking, innovation, and decision-making abilities through experiential learning. 5. Understand organizational structure, work culture, professional responsibilities, and industry standards.
Course Outcomes:	On completion of the following syllabus the students will be able to - 1. Demonstrate the ability to apply Computer Science concepts, tools, and technologies in real workplace or project environments. 2. Analyze industry-specific problems and develop appropriate technical solutions using modern computing techniques. 3. Communicate effectively with team members, supervisors, clients, and stakeholders through reports, presentations, and discussions. 4. Demonstrate teamwork, leadership qualities, project management skills, and collaborative learning abilities. 5. Prepare internship/apprenticeship reports documenting objectives, methodology, activities performed, outcomes achieved, and lessons learned. 6. Evaluate industry practices and identify opportunities for innovation, entrepreneurship, higher studies, research, and career development.

Contents

Internship/Apprenticeship in Computer Science Related to Major (During vacations/break period of Semester V and Semester VI) for duration of 120 hours mandatory to all the students, to be completed during vacations of Semester V and/or VI. This will carry 4 Credits for learning of 120 hours. Its credits and grades will be reflected in Semester VI credit grade report.

General Guidelines

1. The examinee shall be required to produce hard copy and soft copy of completion of internship/apprenticeship certificate duly signed by competent authority to Faculty Mentors.
2. Student can take internship work in the form of Online/Onsite mode.
3. Research internship under Faculty member (Internal and External), IISC, IIT's, NIT's, research project or innovative project and other Research organizations also be considered.

Guidelines for Internship/Research Internship for Under Graduate Students:

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

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

Internship Work Evaluation:

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

Assessment Rubric/Internal evaluation for the Internship/Apprenticeship in Computer Science:

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

Internship/Apprenticeship	Course Code: 112294	Internship/Apprenticeship in Computer Science	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