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School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

First Year Semester I

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC101	Applied Mathematics	3	-	1	3	-	1	4
UCAPC102	Fundamental of Computer Organization	3	-	-	3	-	-	3
UXXOE01X	Open Elective I	2	-	-	2	-	-	2
USTVE001	Environmental Science and Sustainability	2	-	-	2		-	2
UHSAE001	Professional Communication	1	2	-	1	1	-	2
UCAVS101	Object Oriented Programming using C++ Lab	-	4	-	-	2	-	2
UCASE101	Web Technology	-	4	-	-	2	-	2
UCAIK101	Ancient Indian Knowledge System: Science and Technology Perspective	2	-	-	2		-	2
UISCC0XX	Co-curricular courses I	-	4	-	-	2	-	2
UHSVE002	Universal Human Values I	2	-	-	-	-	-	Audit Course
Total		**15**	**14**	**1**	**13**	**7**	**1**	**21**

- Note :- Bridge course of 10 hrs of C language must be conducted before starting C++.

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School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

First Year BCA Program Semester I: Evaluation Scheme

Course Code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work/ Tutorial	Practical/ Oral /POE	
		T1	T2	FET	Total				
UCAPC101	Applied Mathematics	10	10	5	25	50	25	-	100
UCAPC102	Fundamental of Computer Organization	10	10	5	25	50	-	-	75
UXXOE01X	Open Elective I	-	10	5	15	35	-	-	50
USTVE001	Environmental Science and Sustainability	-	10	5	15	35	-	-	50
UHSAE001	Professional Communication	10	10	5	25	-	25	-	50
UCAVS101	Object Oriented Programming using C++ Lab	-	-	-	-	-	25	25	50
UCASE101	Web Technology	-	-	-	-	-	25	25	50
UCAIK101	Ancient Indian Knowledge System: Science and Technology Perspective	-	10	5	15	35	-	-	50
UISCC0XX	Co-curricular courses I	-	-	-	-	-	50	-	50
UHSVE002	Universal Human Values I	-	-	-	-	-	-	-	Audit Course

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - Semester End Examination P/F Pass/Fail. Course, AU Audit Course

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School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

First Year Semester II

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC103	Operating System	3	-	-	3	-	-	3
UCAPC104	Database Management System	3	-	-	3	-	-	3
UXXOE02X	Open Elective II	2	-	-	2	-	-	2
UXXMM0XX	Multi-disciplinary Minor-I	2	-	-	2	-	-	2
UCAPC105	Database Management System Lab	-	2	-	-	1	-	1
UCAPC106	Operating System Lab	-	2	-	-	1	-	1
UCAVS102	Power BI	-	4	-	-	2	-	2
UCASE102	Python Programming	-	4	-	-	2	-	2
UHSAE004	English	1	2	-	1	1	-	2
UHSVE001	Constitution of India	2	-	-	2	-	-	2
UISCC0XX	Co-curricular courses II	-	4	-	-	2	-	2
Total		**14**	**16**	**-**	**14**	**8**	**-**	**22**

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School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

First Year BCA Programs Semester II: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work/ Tutorial	Practical/ Oral POE	
		T1	T2	FET	Total				
UCAPC103	Operating System	10	10	5	25	50	-	-	75
UCAPC104	Database Management System	10	10	5	25	50	-	-	75
UXXOE02X	Open Elective II	-	10	5	15	35	-	-	50
UXXMM0XX	Multi-disciplinary Minor-I	-	10	5	15	35	-	-	50
UCAPC105	Database Management System Lab	-	-	-	-	-	25		25
UCAPC106	Operating System Lab	-	-	-	-	-	25		25
UCAVS102	Power BI	-	-	-	-	-	25	25	50
UCASE102	Python Programming	-	-	-	-	-	25	25	50
UHSAE004	English	10	10	5	25	-	25		50
UHSVE001	Constitution of India	-	10	5	15	35	-	-	50
UISCC0XX	Co-curricular courses II	-	-	-	-	-	50	-	50

Exit Option:

Students exiting the First Year programme after securing minimum 40 credits will be awarded UG Certificate in the relevant Discipline /Subject provided they secure 4 credits in work based vocational courses or internship / Apprenticeship offered during summer vacation in addition to 6 credits from skill-based courses earned during first and second semester.

School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Second Year Semester III

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC201	Software Engineering	3	-	-	3	-	-	3
UCAPC202	Core Java	3	-	-	3	-	-	3
UXXOE03X	Open Elective III	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor II	3	-	-	3	-	-	3
UHSAE003 UHSAE004	Modern Indian Language – Hindi OR Modern Indian Language – Marathi	2	-	-	2	-	-	2
UCAVS201	MERN Stack	-	4	-	-	2	-	2
UCAPC203	Core Java Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor II Lab	-	2	-	-	1	-	1
UISCC0XX	Co-curricular Courses III	-	4	-	-	2	-	2
UCAFP201	Field Project I	-	4	-	-	2	-	2
Total		**13**	**16**	**-**	**13**	**08**	**-**	**21**

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Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Second Year B.C.A. Program Semester III: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work / *Tutorial*	Practical/ POE	
		T1	T2	FET	Total				
UCAPC201	Software Engineering	10	10	5	25	50	-	-	75
UCAPC202	Core Java	10	10	5	25	50	-	-	75
UXXOE03X	Open Elective III	-	10	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor II	10	10	5	25	50	-	-	75
UHSAE003 OR UHSAE004	Modern Indian Language –Hindi Modern Indian Language – Marathi	10	-	5	15	35	-	-	50
UCAVS201	MERN Stack	-	-	-	-	-	25	25	50
UCAPC203	Core Java Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor II Lab	-	-	-	-		25	-	25
UISCC0XX	Co-curricular Courses III	-	-	-	-	-	50	-	50
UCAFP201	Field Project I	-	-	-	-	-	25	25	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - Semester End Examination P/F Pass/Fail. Course, AU Audit Course.

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Second Year Semester IV

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC204	Data Structures	3	-	-	3	-	-	3
UCAPC205	Computer Network	3	-	-	3	-	-	3
UXXOE04X	Open Elective IV	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor III	3	-	-	3	-	-	3
UCAPC206	Data Structures Lab	-	2	-	-	1	-	1
UCAPC207	Computer Network Lab	-	2	-	-	1	-	1
UCAPC208	ASP.Net with MVC Lab	-	4	-	-	2	-	2
UCASE201	MOOC Course	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor III Lab	-	2	-	-	1	-	1
UISCC0XX	Co-curricular Courses IV	-	4	-	-	2	-	2
UHSVE003	Universal Human Values II	2	-	-	2	-	-	2
Total		**15**	**14**	**-**	**15**	**7**	**-**	**22**

- # During the induction Program, students would get an initial exposure to human values through Universal Human Values-1

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AY 2025-26 (Batch 2025-28) (R25)

Second Year Semester IV: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work / *Tutorial*	Practical/ POE	
		T1	T2	FET	Total				
UCAPC204	Data Structures	10	10	5	25	50	-	-	75
UCAPC205	Computer Network	10	10	5	25	50	-	-	75
UXXOE04X	Open Elective IV	-	10	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor III	10	10	5	25	50	-	-	75
UCAPC206	Data Structures Lab	-	-	-	-	-	25	-	25
UCAPC207	Computer Network Lab	-	-	-	-	-	25	-	25
UCAPC208	ASP.Net with MVC Lab	-	-	-	-	-	25	25	50
UCASE201	MOOC Course	-	-	-	-	50	-	-	50
UXXMM0XX	Multidisciplinary Minor III Lab	-	-	-	-	-	25	-	25
UISCC0XX	Co-curricular Courses IV	-	-	-	-	-	50	-	50
UHSVE003	Universal Human Values II	-	10	5	15	35	-	-	50

Exit Option:

Students exiting the Second Year Programme after securing minimum 80 credits will be awarded UG Diploma in the relevant Discipline /Subject provided they secure additional 4 credits in skill based vocational courses offered during summer vacation after first year or second year.

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Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Third Year Semester V

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	**Pr**	**Tu**	**Th**	**Pr**	**Tu**	
UCAPC301	Artificial Intelligence	3	-	-	3	-	-	3
UCAPC302	Design and Analysis of Algorithms	3	-	-	3	-	-	3
UXXOE05X	Open Elective V	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor IV	3	-	-	3	-	-	3
UCAPE3XX	Program Elective I	3	-	-	3	-	-	3
UCAVS301	Robotics	2	-	-	2	-	-	2
UCAPC303	Artificial Intelligence Lab	-	2	-	-	1	-	1
UCAPC304	Design and Analysis of Algorithms Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor IV Lab	-	2	-	-	1	-	1
UCAPE3XX	Program Elective I Lab	-	2	-	-	1	-	1
UCAFP301	Field Project II	-	4	-	-	2	-	2
Total		**16**	**12**	**-**	**16**	**6**	**-**	**22**

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Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Third Year Semester V: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work/ *Tutorial*	Practical/ POE	
		T1	T2	FET	Total				
UCAPC301	Artificial Intelligence	10	10	5	25	50	-	-	75
UCAPC302	Design and Analysis of Algorithms	10	10	5	25	50	-	-	75
UXXOE05X	Open Elective V	-	10	5	15	35			50
UXXMM0XX	Multidisciplinary Minor IV	-	10	5	15	35	-	-	50
UCAPE3XX	Program Elective I	10	10	5	25	50	-	-	75
UCAVS301	Robotics	-	10	5	15	35	-	-	50
UCAPC303	Artificial Intelligence Lab	-	-	-	-	-	25	-	25
UCAPC304	Design and Analysis of Algorithms Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor IV Lab	-	-	-	-	-	25	-	25
UCAPE3XX	Program Elective I Lab	-	-	-	-	-	25	-	25
UCAFP301	Field Project II	-	-	-	-	-	25	25	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - Semester End Examination P/F Pass/Fail. Course, AU Audit Course.

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Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Third Year Semester VI

Course code	Course name	Teaching scheme (Hrs/week)			Credits Assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC305	Generative AI	3	-	-	3	-	-	3
UCAPC306	Android Application Development	3	-	-	3	-	-	3
UXXOE06X	Open Elective VI	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor V	3	-	-	3	-	-	3
UCAPE3XX	Program Elective II	3	-	-	3	-	-	3
UCAPC307	Generative AI Lab	-	2	-	-	1	-	1
UCAPC308	Android Application Development Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor V Lab	-	2	-	-	1	-	1
UCAPE3XX	Program Elective II Lab	-	2	-	-	1	-	1
UCAOT301	Industrial Internship	-	8	-	-	4	-	4
Total		**14**	**16**	**-**	**14**	**8**	**-**	**22**

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Third Year Semester VI: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work /*Tutorial*	Practical / POE	
		T1	T2	FET	Total				
UCAPC305	Generative AI	10	10	5	25	50	-	-	75
UCAPC306	Android Application Development	10	10	5	25	50	-	-	75
UXXOE06X	Open Elective VI	-	10	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor V	10	10	5	25	50	-	-	75
UCAPE3XX	Program Elective II	10	10	5	25	50	-	-	75
UCAPC307	Generative AI Lab	-	-	-	-	-	25	-	25
UCAPC308	Android Application Development Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor V Lab	-	-	-	-	-	25	-	25
UCAPE3XX	Program Elective II Lab	-	-	-	-	-	25	-	25
UCAOT301	Industrial Internship	-	-	-	-	-	50	50	100

Exit Option:

Students exiting the 3-year UG programme will be awarded UG Degree in the relevant Discipline /Subject upon securing minimum 120 credits.

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Curriculum Structure for Bachelor of Computer Applications (BCA)

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Program Structure for B.C.A. with Honors Degree
Fourth Year Semester VII

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC401	Natural Language Processing	3	-	-	3	-	-	3
UCAPC402	Data Analytics	3	-	-	3	-	-	3
UCAPC403	Server Configuration Management	2	-	-	2	-	-	2
UCAPE4XX	Program Elective III	3	-	-	3	-	-	3
USTRM001	Research Methodology	4	-	-	4	-	-	4
UCAPC404	Natural Language Processing Lab	-	2	-	-	1	-	1
UCAPC405	Data Analytics Lab	-	2	-	-	1	-	1
UCAPC406	Server Configuration Management Lab	-	4	-	-	2	-	2
UCAPE4XX	Program Elective III Lab	-	2	-	-	1	-	1
Total		**15**	**10**	**-**	**15**	**5**	**-**	**20**

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Fourth Year Semester VII: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work /*Tutorial*	Practical/ POE	
		T1	T2	FET	Total				
UCAPC401	Natural Language Processing	10	10	5	25	50	-	-	75
UCAPC402	Data Analytics	10	10	5	25	50	-	-	75
UCAPC403	Server Configuration Management	-	10	5	15	35	-	-	50
UCAPE4XX	Program Elective III	10	10	5	25	50	-	-	75
USTRM001	Research Methodology	10	10	5	25	75	-	-	100
UCAPC404	Natural Language Processing Lab	-	-	-	-	-	25	-	25
UCAPC405	Data Analytics Lab	-	-	-	-	-	25	-	25
UCAPC406	Server Configuration Management Lab	-	-	-	-	-	25	25	50
UCAPE4XX	Program Elective III Lab	-	-	-	-	-	25	-	25

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

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AY 2025-26 (Batch 2025-28) (R25)

Program Structure for B.C.A. with Honors Degree
Fourth Year Semester VIII

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC407	Deep Learning	2	-	-	2	-	-	2
UCAPC408	MOOC	4	-	-	4	-	-	4
UCAPE4XX	Program Elective IV	3	-	-	3	-	-	3
UCAPC409	Deep Learning Lab	-	4	-	-	2	-	2
UCAPE4XX	Program Elective IV Lab	-	2	-	-	1	-	1
UCAOT401	Industrial Internship	-	16	-	-	8	-	8
	Total	**9**	**22**	**-**	**9**	**11**	**-**	**20**

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Fourth Year Semester VIII: Evaluation Scheme

Course code	Course Name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work /*Tutorial*	Practical/ Oral POE	
		T1	T2	FET	Total				
UCAPC407	Deep Learning	-	10	5	15	35	-	-	50
UCAPC408	MOOC	-	-	-	-	100	-	-	100
UCAPE4XX	Program Elective IV	10	10	5	25	50	-	-	75
UCAPC409	Deep Learning Lab	-	-	-	-	-	25	25	50
UCAPE4XX	Program Elective IV Lab	-	-	-	-	-	25	-	25
UCAOT401	Industrial Internship	-	-	-	-	-	100	100	200

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course

Exit Option:

Exit options shall be provided with Certification, Diploma and basic Bachelor's degrees to the students at the end of the second, fourth and sixth semester, respectively, in the four-year degree programme. Students will receive a Bachelor's degree with Honors/ Honors with Research on successfully completing all eight semesters of the UG Programmes either at a stretch or with opted exits and re- entries.

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Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Program Structure for B.C.A. with Honors with Research Degree

Fourth Year Semester VII

Course Code	Course Name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC401	Natural Language Processing	3	-	-	3	-	-	3
UCAPC402	Data Analytics	3	-	-	3	-	-	3
UCAPE4XX	Program Elective III	3	-	-	3	-	-	3
USTRM001	Research Methodology	4	-	-	4	-	-	4
UCAPC404	Natural Language Processing Lab	-	2	-	-	1	-	1
UCAPC405	Data Analytics Lab	-	2	-	-	1	-	1
UXXPE4XX	Program Elective III Lab	-	2	-	-	1	-	1
UCARP401	Research Project	-	8	-	-	4	-	4
Total		**13**	**14**	-	**13**	**7**	-	**20**

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Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Fourth Year Semester VII: Evaluation Scheme

Course Code	Course Name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work/ *Tutorial*	Practical / POE	
		T1	T2	FET	Total				
UCAPC401	Natural Language Processing	10	10	5	25	50	-	-	75
UCAPC402	Data Analytics	10	10	5	25	50	-	-	75
UCAPE4XX	Program Elective III	10	10	5	25	50	-	-	75
USTRM001	Research Methodology	10	10	5	25	75	-	-	100
UCAPC404	Natural Language Processing Lab	-	-	-	-	-	25	-	25
UCAPC405	Data Analytics Lab	-	-	-	-	-	25	-	25
UXXPE4XX	Program Elective III Lab	-	-	-	-	-	25	-	25
UCARP401	Research Project	-	-	-	-	-	50	50	100

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Curriculum Structure for Bachelor of Computer Applications (BCA)

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Program Structure for B.C.A. with Honors with Research Degree

Fourth Year Semester VIII

Course Code	Course Name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
UCAPC407	Deep Learning	2	-	-	2	-	-	2
UCAPC408	MOOC	4	-	-	4	-	-	4
UCAPE4XX	Program Elective IV	3	-	-	3	-	-	3
UCAPC409	Deep Learning Lab	-	4	-	-	2	-	2
UCAPE4XX	Program Elective IV Lab	-	2	-	-	1	-	1
UCARP402	Research Project	-	16	-	-	8	-	8
Total		**9**	**22**	**-**	**9**	**11**	**-**	**20**

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Fourth Year Semester VIII: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work	Practical/ Oral POE	
		T1	T2	FET	Total				
UCAPC407	Deep Learning	-	10	5	15	35	-	-	50
UCAPC408	MOOC	-	-	-	-	100	-	-	100
UCAPE4XX	Program Elective IV	10	10	5	25	50	-	-	75
UCAPC409	Deep Learning Lab	-	-	-	-	-	25	-	25
UCAPE4XX	Program Elective IV Lab	-	-	-	-	-	25	-	25
UCARP402	Research Project	-	-	-	-	-	100	100	200

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course

Exit Option:

Exit options shall be provided with Certification, Diploma and basic Bachelor's degrees to the students at the end of the second, fourth and sixth semester, respectively, in the four-year degree programme. Students will receive a Bachelor's degree with Honors/ Honors with Research on successfully completing all eight semesters of the UG Programmes either at a stretch or with opted exits and re- entries.

Curriculum Structure for Bachelor of Computer Applications (BCA)

AY 2025-26 (Batch 2025-28) (R25)

Program Specific Electives

Program Elective –I	
UCAPE301	Machine Learning
UCAPE302	Data Visualization
UCAPE303	Cloud Computing
Program Elective –II	
UCAPE304	Artificial Neural Network
UCAPE305	Data Mining and Warehousing
UCAPE306	Internet of Things
Program Elective –III	
UCAPE401	Speech Recognition
UCAPE402	Cyber Security
UCAPE403	Advance Web Services
Program Elective –IV	
UCAPE404	Augmented Reality & Virtual Reality
UCAPE405	Ethical Hacking
UCAPE406	Cloud Application Development

Open Elective for UG program

Sr. No.	Semester	Course Code	Course Name	Credits
1	I	UCAOE011	MS Office & Latex	2
2	II	UCAOE021	Python Programming	2
3	III	UCAOE031	Data Analytics Tools	2
4	IV	UCAOE041	Web Designing Tools	2
5	V	UCAOE051	Data Visualization Techniques using Tableau	2
6	VI	UCAOE061	Multimedia Computing	2
Total Credits 12				

Multi-Disciplinary Minor Track I –Data Science and Analytics

Semester	Course Code	Course Name	Credits
II	UCAMM011	Basics of Data Science	2
III	UCAMM021	Statistical Computing	3
	UCAMM022	Statistical Computing Lab	1
IV	UCAMM031	Python for Data Science	3
	UCAMM032	Python for Data Science Lab	1
V	UCAMM041	Foundation Skills of Machine Learning	3
	UCAMM042	Foundation Skills of Machine Learning Lab	1
VI	UCAMM051	Predictive Modeling and Analytics	3
	UCAMM052	Predictive Modeling and Analytics Lab	1

Multi-Disciplinary Minor Track II –Information and Cyber Security

Semester	Course Code	Course Name	Credits
II	UCAMM012	Introduction to Data Communication	2
III	UCAMM023	Information Security	3
	UCAMM024	Information Security Lab	1
IV	UCAMM033	Cyber Security Awareness	3
	UCAMM034	Cyber Security Awareness Lab	1
V	UCAMM043	Cyber Security	3
	UCAMM044	Cyber Security Lab	1
VI	UCAMM053	Ethical hacking	3
	UCAMM054	Ethical hacking Lab	1

Multi-Disciplinary Minor Track III – Artificial Intelligence and Applications

Semester	Course Code	Course Name	Credits
II	UCAMM013	Basics of Artificial Intelligence	2
III	UCAMM025	Artificial Neural Networks	3
	UCAMM026	Artificial Neural Networks Lab	1
IV	UCAMM035	Fuzzy Logic	3
	UCAMM036	Fuzzy Logic Lab	1
V	UCAMM045	Introduction to Genetic Algorithm	3
	UCAMM046	Introduction to Genetic Algorithm Lab	1
VI	UCAMM055	Soft Computing	3
	UCAMM056	Soft Computing Lab	1

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCAPC101	Applied Mathematics	03	-	1	03	-	1

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)						End Semester Exam (SEE)		
		T1	T2	FET	Term-work /Tutorial	Total	Min. Passing %	Marks	Min pass	Total (Marks)
UCAPC101	Applied Mathematics	10	10	5	25	50	40%	50	40%	100

Course Description:
The document Applied Mathematics; covers essential mathematical concepts for AI and computer science, including set theory, mathematical logic, statistics, and regression analysis, interpolation, and optimization techniques.

Pre-requisites: Elementary Mathematics

Course Objectives:

1. To learn fundamental concepts such as sets, subsets, Venn diagrams, and their applications.
2. To develop skills in logical reasoning, propositions, truth tables, and logical equivalences..
3. To understand statistical concepts and methods for practical applications.
4. To gain knowledge of interpolation, extrapolation, and linear programming for problem-solving.

Course Outcomes: after the end of this course students will be able to

CO1	Draw Venn diagram to represent set.
CO2	Construct mathematical arguments, and truth tables.
CO3	Compute measures of central tendency, correlation, and regression for data analysis.
CO4	Implement interpolation and optimization techniques to solve the problem.

Course Contents

Module	Unit	Description	Hours
1.0		**Set theory**	
1	1.1	Sets and their representations, The empty set, finite and infinite sets, equal and equivalent sets.Subsets, power set, universal set, Venn diagrams, complement of set operations on sets, applications of sets.	9
	1.2	Subsets, power set, universal set, Venn diagrams, complement of set operations on sets, applications of sets.	
2.0		**Mathematical Logic**	
2	2.1	Propositions and Logical connectives: Definition, Types of Propositions.	9
	2.2	Truth values and Truth Tables, Tautology and Contradiction, Logical equivalence	
3.0		**Statistics**	
3	3.1	Measures of central tendency, measures of dispersion, Random variable, Discrete probability distribution, continuous probability distribution, Probability density function.	9
	3.2	Binomial distribution, Poisson distribution, Normal distribution, Mean and Variance of a Distribution.	
4.0		**Curve Fitting and lines of Regressions**	
4	4.1	Introduction, Principle of Least Squares, Fitting a straight line $y=a+bx$, Fitting a parabola $y=ax^2+bx+c$, Fitting to a exponential curve.	9

	4.2	Correlation, Karl Pearson Coefficient of Correlation, Coefficient of Correlation of Bivariate Frequency Distribution, Coefficient of Correlation by Rank differences, Linear Regression, Nonlinear regressions.	
5.0		**Interpolation and optimization technique**	
5	5.1	**Interpolation:** Forward & Backward difference operator, Shift operator, Interpolation & Extrapolation Methods , Newton‟s formulae (Equal intervals), Divided difference formula.	9
	5.2	**Optimization technique:** Basic Concepts, Unconstrained Optimization: single objective and multi objective optimization, Linear Programming, Simplex Method.	

Text Books

1 Discrete Mathematics & Combinatorial Mathematics,R. P. Grimaldi,Pearson Education, 998.(For unit 1 & 2)

2 Grewal. B. S “Higher Engineering Mathematics”, 41st Edition, Khanna Publications, Delhi, (2011). (Unit 3)

3 Probability and Mathematical Statistics, Prasanna Sahoo, KY40292 USA. (Unit 5 & 6)

References

1 Theory of Sets, E. Kamke, Dover Publishers,1950, 1 & 2

2 Dass, H.K., and Er. RajnishVerma, Higher Engineering Mathematics, S. Chand Private Ltd., (2011).

3 Glyn James, Advanced Modern Engineering Mathematics, 3rd Edition, Pearson Education, (2012).

- **Internal Assessment (T1, T2 and FET):**

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.

2. Fifth module will be assessed for 5 marks separately.
3. Tutorial should be assessed based on accuracy, completeness, conceptual understanding, problem-solving approach, clarity of explanation, and presentation quality.
4. Term work assessment shall be based on the overall performance of the student with every tutorial graded from time to time.
5. The grades will be converted to marks as per „credit and grading system" manual and should be added and averaged.

- **Semester End Examination:**
  1. Question paper will comprise of 5 questions, each carrying 10 marks.
  2. The duration of end semester examination shall be 2 hours.
  3. The students need to solve all 5 questions.
  4. Question No.1 will be compulsory and based on entire syllabus.
  5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCAPC102	**Fundamental of Computer Organization**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
UCAPC102	**Fundamental of Computer Organization**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:
This course helps to know basic architectural concepts, the background of internal communication of computer, memory management techniques, IO devices communication with processor. It covers the topics like Introduction to Computer Systems: Digital Logic Fundamentals Processor Architecture: Memory Systems, Input/output Organization, Storage Systems.

Pre-requisites: Knowledge of Computer basics and fundamentals.

Course Objectives:

1. Understanding the basic components of a computer system.
2. To know different types of memory.
3. Exploring methods of data transfer between the CPU and peripherals.
4. Learning about secondary storage devices.

Course Outcome: At the end of this course students will able to:	
CLO1	**Understand**[2] **t**he fundamental concepts and principles of computer architecture
CLO2	**Manipulate**[3] binary arithmetic, Boolean algebra, and logic gates
CLO3	**Demonstrate**[3]the knowledge of different processor architectures.
CLO4	**Identify**[4] memory types, hierarchy, and organization.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Computer Organization**	
	1.1	Introduction to Computer System, Characteristics of Computer, Evolution of Computers, Generation of Computers, Classification of Computers, Applications of Computers	9
	1.2	Overview of Computer Architecture, CPU Components: ALU, Registers, Control Unit, Instruction Set, Input/output, Von Neumann Architecture	
2.0		**Number System, Boolean Algebra and Logic Gates**	
2	2.1	Introduction to Binary, Decimal, and Hexadecimal Number Systems, Conversion of Number Systems	9
	2.2	Introduction to Boolean Algebra, Basic Laws of Boolean Algebra, Logic Gates, Combinational and Sequential Circuits, Coding Systems: ASCII, EBCDIC, Unicode	
3.0		**Input and Output Devices**	
3	3.1	Introduction to Input Devices, Keyboard, Pointing Devices, Scanning Devices, Optical Recognition Devices,	9
	3.2	Introduction to Output Devices, Monitors, Printers, Plotters, Projectors	
4.0		**Computer Software and Memory Systems**	
4	4.1	Definition, Relationship between Hardware and Software, Types of Computer Software: System Software, Application Software, Firmware, Language Translators, Utility Programs	9
	4.2	Introduction, Memory Representation, Types of Memory: Cache, RAM, ROM, Memory Hierarchy and Organization, Virtual Memory and	

		Paging	
5.0		**Input / Output Organization and Secondary Storage**	
5	5.1	I/O Devices and Interfaces, I/O Techniques: Polling, Interrupts, DMA I/O Controllers and Communication Protocols	9
	5.2	Secondary Storage Devices: HDDs, SSDs, File Systems and Data Organization, Disk Management and File Allocation.	

Text Books:

1. Sinha, P. K., & Sinha, P. (2023). Computer Fundamentals. New Delhi: BPB Publications.
2. Balagurusamy, E. (2009). Fundamentals of Computers. Tata McGraw-Hill Education.
3. "Structured Computer Organization" by Andrew S. Tanenbaum, 2013.
4. "Computer Organization and Architecture: Designing for Performance" by William Stallings, 2015.

References:

1. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy - This book covers computer organization and architecture, emphasizing the relationship between hardware and software.
2. "Structured Computer Organization" by Andrew S. Tanenbaum - Offers a structured approach to understanding computer organization, covering topics from digital logic to system architecture.

- **Internal Assessment (T1, T2 and FET):**
    1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
    2. Fifth module will be assessed for 5 marks separately.
- **Semester End Examination:**
    1. Question paper will comprise of 5 questions, each carrying 10 marks.
    2. The duration of end semester examination shall be 2/3/4 hours.
    3. The students need to solve all 5 questions.
    4. Question No.1 will be compulsory and based on entire syllabus.

5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCAOE011	**Microsoft Office & LaTex**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
U16OE011	**Microsoft Office & LaTex**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		-	10	5	15	40%	35	40%	50

Course Description:

This course provides an introduction to the Microsoft Office Suite, including Microsoft Word, Excel, PowerPoint, Outlook, and Access. Students will learn the basics of each application, including creating and formatting documents, spreadsheets, presentations, emails, and databases. Advanced features such as data analysis, collaboration, and customization will also be covered. By the end of the course, students will have understanding of the MS Office Suite and its applications, and be able to effectively use these tools in various industries.

Pre-requisites: Basic computer skills with Windows operating system.

Course Objectives:

1. Understand the functions and applications of the different Microsoft Office Suite applications.
2. Gain proficiency in using Microsoft Word, Excel, PowerPoint, Outlook, and Access.
3. Learn how to create, format, and edit documents, spreadsheets, presentations, emails, and databases.
4. Develop skills in data analysis, sorting and filtering data, using formulas and functions, and creating charts and reports.

Course Outcomes: after the end of this course students will able to	
CO1	**Understand**[2] scientific and technical documents incorporating equations, images, tables, and bibliographies.
CO2	**Practise**[3] spreadsheets to perform calculations, display data, conduct analysis.
CO3	**Design**[5] and construct databases to store, extract, and analyse scientific and real-world data.
CO4	**Develop**[5] technical and scientific presentations which use charts and visual aids to share data.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to MS Office Suite**	
1	1.1	Overview of MS Office Suite and its applications, Understanding the importance of MS Office in various industries, Exploring the user interface of MS Office Suite, Navigating through the different applications.	6
	1.2	Introduction to Microsoft Word, Creating, opening, and saving documents, Formatting text and paragraphs (font, size, alignment, etc.), Inserting and editing images, tables, and charts, applying styles and themes, using mail merge for personalized documents, Working with headers, footers, and page numbers, Spell check, grammar check, and other proofreading tools, Collaboration and sharing features in MS Word.	
2.0		**Microsoft Excel**	

2	2.1	Understanding spreadsheets and their applications, Overview of Excel interface and workbook elements, navigating through worksheets and cells, Entering data and formulas, Formatting cells and numbers.	6
	2.2	Working with basic and advanced functions (IF, VLOOKUP, SUMIF, etc.)Sorting and filtering data, Conditional formatting and data validation, Creating and formatting charts, Pivot tables for data analysis, using formulas and functions for financial calculations, Importing and exporting data.	
3.0		**Microsoft PowerPoint**	
3	3.1	Understanding the purpose and benefits of presentations, Exploring PowerPoint interface and slide elements, Creating, opening, and saving presentations, Adding and formatting text, images, and multimedia elements, Applying themes and templates.	6
	3.2	Working with slide layouts and master slides, Inserting and formatting shapes, charts, and SmartArt graphics, applying animations, transitions, and timings, collaborating on presentations, using presenter view and rehearsing timings, Printing and delivering presentations effectively.	
4.0		**Microsoft Outlook and Access**	
4	4.1	Introduction to Microsoft Outlook, configuring email accounts, Composing, sending, and managing emails, organizing emails using folders and rules, using calendar and scheduling appointments, Managing contacts and tasks.	6
	4.2	Introduction to Microsoft Access, creating tables and relationships, designing queries for data retrieval, building forms to input data, creating reports for data analysis, Importing and exporting data, Database management and security measures.	
5.0		**LaTex**	

	5.1	Installation of Kile and MikeTeX, Fonts, symbols, indenting, paragraphs, line spacing, word spacing, titles and subtitles, Document class, page style, parts of the documents, table of contents,	6
	5.2	Mathematical environments, math mode, mathematical symbols, Tables, tables with captions, References to figures and tables in text, Preparing book, project report in LaTeX.	

Text Books:

1. Smith, J. "Microsoft Office Suite: A Comprehensive Guide"., XYZ Publishers, 2020

References:

1. Pasewark, W. R., & Pasewark, K. W. "Microsoft Office Suite: A Complete Introduction" ABC Publishers, 2019
2. Frye, C. "Microsoft Excel 2019 Step by Step" , XYZ Publishers.2018
3. Lowe, D. "PowerPoint 2019 For Dummies" ABC Publishers., 2020
4. Courter, G. "Mastering Microsoft Outlook 2019", XYZ Publishers.2019
5. Kopka, H., & Daly, P. W. "Guide to LaTeX", fourth edition. ABC Publishers, 2021

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
USTVE001	Environmental Science and Sustainability	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)				Semester End Exam (ESE)			
		T1	**T2**	**FET**	**Total**	**Min pass**	**Marks**	**Min pass**	**Total (Marks)**
USTVE001	Environmental Science and Sustainability	10	--	5	15	40%	35	40%	50

Course Description:

To provide a general understanding of our environment, problems during exploitation of natural resources, the importance of biodiversity and the need for its conservation, pollution and its impacts, and approaches for environment sustainability.

Course Objectives:

1. To study factors affecting the availability of natural resources, their conservation and management.
2. Develop a critical understanding of the environmental issues of concern.
3. Study of the sectoral effects on the local, regional, and global environmental issues.
4. Study of factors impacting biodiversity loss and ecosystem degradation in India and the world.
5. Study of sources of different kinds of pollution and their adverse health impacts.
6. Study of major international institutions and programmes and their role played.

Course Outcomes: after the end of this course students will able to	
CO1	Explain the multidisciplinary nature of environmental studies and assess the importance of natural resources, their conservation, and sustainable utilization.
CO2	Describe the **structure, function, and classification** of **ecosystems**, including energy flow, food chains, and ecological pyramids.
CO3	**Describe and modify**[2] solution on local environmental issues. Analyze the concept of biodiversity, its significance, threats, conservation strategies, and India's role as a mega-diverse nation
CO4	Examine various types of **environmental pollution**, their causes, impacts on ecosystems and human health, and management techniques.
CO5	Evaluate the principles of environmental management and sustainable development, including concepts like carbon footprint, green technology, and environmental impact assessment (EIA).

Course Contents

Module	**Unit**	**Description**	**Hours**
1.0		**Multidisciplinary nature of environmental studies and Natural Resources**	
1	1.1	Multidisciplinary nature of environmental studies, Renewable and non-renewable Natural resources, Overexploitation and conservation of the following natural resources: forest, water, food, energy, mineral and land resources, Role of individuals in the up keeping of environment.	6
2.0		**Ecosystem**	
2	2.1	Concept of ecosystem. Components, structure and function of an eco-system, classification of Ecosystem, A brief description: terrestrial and aquatic Ecosystem, Food chain and food web, Ecological Pyramids, Energy flow in the Ecosystem	6
3.0		**Biodiversity**	

3	3.1	Concept of Biodiversity, hot spots of biodiversity, India as a mega diversity nation, Threats to biodiversity, Value of biodiversity, Brief description of economic valuation of biodiversity, Red Data Base and Red data Book, International Union for Conservation of Nature (IUCN), Red List of Threatened Species (Brief description), Conservation of biodiversity.	6
4.0		**Environmental Pollution**	
4	4.1	Pollution of air, acid rain, global warming and climate change, ozone layer depletion, Water pollution, Soil pollution. Industrial and urban solid wastes, Hospital wastes, Hazardous waste, Collection, segregation of solid waste, Plastic pollution, microplastics and its environmental and health effects, E-waste.	6
5.0		**Environmental Management plan and sustainable development**	
5	5.1	Brief description of Carbon Footprint, Environmental Impact Assessment (EIA), Environment Management Plan (EMP), Green Technology, Green Business, Green Accounting, Green Buildings, Eco-Labeling, Sustainable Development Goals	6

Text Books:

1. G. Tyler Miller and Scott Spoolman (2018) “Living in the Environment”, International Edition
2. Eldon D. Enger (2016) “Environmental Science: A study of interrelationships”
3. Richard T. Wright, Dorothy F. Boorse (2017) Environmental Science: Toward A Sustainable Future, Pearson, 13th Edition
4. http://www.ourplanet.com, Accessed May 2019.
5. https://www.undp.org/content/undp/en/home/sustainable-development-goals.html, Accessed May 2019.

6. www.myfootprint.org Accessed May 2019.
7. http://www.globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem/ecosystem.html, Accessed May 2019.
8. Series of AFED reports on Arab Environment (2008-2019)
9. www.afedonline.org

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fouth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UHSAE001	Professional Communication	1	2	-	1	1	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)				Term Work			
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UHSAE001	Professional Communication	10	10	5	25	40%	25	40%	50

Course Description:

This subject is designed to develop the English Communicative capacity required in social and professional life. The students will excel in professional communication that will help them in the academia and the world of practical affairs.

Course Objectives:

1. To acquaint learners with the process of communication.
2. To train learners to effectively apply LSRW skills in professional life.

Course Outcomes: At the end of this course students will be able to:

CO1	**Identify**[1] the importance of communication in formal situations.
CO2	**Analyze**[4] the process and forms of communication.
CO3	**Apply**[3] LSRW skills for effective communication in professional life.

Course Content

Module	Unit	Description	Hours
1.0		**Communication Theory**	
1	1.1	Communication: Concept and Its Meaning, Process, Types: Verbal and Non-verbal Communication,	06
	1.2	Use of Body Language in Communication and Grooming.	
	1.3	Levels and Networks of Communication: Formal and Informal.	
	1.4	Flows of Communication, Barriers to Communication, ways to overcome different barriers, and Technology in Communication.	
2.0		**Listening Skills**	
2	2.1	Importance of effective Listening, Listening and Hearing.	06
	2.2	Process of Listening, Barriers to Effective Listening.	
	2.3	Types of Listening, Techniques of effective Listening.	
3.0		**Speaking Skills**	
3	3.1	Public Speaking styles: ceremonial, persuasive, demonstrative and informative speaking.	06
	3.2	Public Speaking Techniques, Elements of Public Speaking.	
	3.3	Extempore and Prepared Speech, Group Discussion: GD Types, Skills, Do‟s Don‟ts. Roles in GD, Debate.	
4.0		**Reading Skills**	
4	4.1	Types of reading.	06
	4.2	Techniques for effective Reading.	
	4.3	SQ3R Technique.	
5.0		**Writing Skills**	

5	5.1	Seven C‟s of Communication.	06
	5.2	Business Letters, Types of Business Letters.	
	5.3	Cover Letter & Résumé.	

Note: Practical and Tutorial will be conducted based on the above content.

Text Book:

1. Chadha, R.K., “Communication Techniques and Skills”, Dhanpat Rai Publications,2014

References:

1. Raymond Murphy, “Essential English Grammar: A Self-Study Reference and Practice Book for Elementary Students of English with Answers”, Cambridge University Press
2. Green, David. “Contemporary English Grammar –Structures and Composition”. MacMillan India. 2014
3. Fitikides, T. J. “Common Mistakes in English”. London: Orient Longman, 1984.
4. Thomas N. Huckin & Leslie A. Olsen, “Technical Writing & Professional Communication for non-native speakers of English”, McGraw –Hill.
5. Nicky Stanton, “Mastering Communication”, Palgrave Master Series
6. Meenakshi Raman & Sangita Sharma, “Technical Communication; Principles and Practice”, Oxford University Press.
7. M Ashraf Rizvi, “Effective Technical Communication”, Tata McGraw-Hill Education
8. Martin Hewings. “Advanced Grammar in Use”. Cambridge University Press, 2013.
9. Michael Swan. “Practical English Usage”. 3rd ed. OUP, 2005.
10. John Seely. “The Oxford Guide to Effective Writing and Speaking”. OUP, 2003

Websites

1. http://esl.about.com/od/englishtestsandquizzes/
2. https://learnenglish.britishcouncil.org/en/content
3. https://www.englishclub.com/grammar/quizzes.htm
4. https://englishdost.com/blog/language-learning-perfect-solution/

1. https://englishdost.com/blog/category/english-for-beginners/
2. http://www.selfgrowth.com/comm.html

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Sanjay Ghodawat University, Kolhapur
Established as a State Private University under Govt. of Maharashtra Act no. XL dated 3rd May 2017
Empowering Lives Globally !

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCAVS101	**Object Oriented Programming using C++ Lab**	-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (POE)		
		Term Work	Min pass %	Marks	Min pass %	Total (Marks)
UCAVS101	**Object Oriented Programming using C++ Lab**	25	40	25	40	50

Course Description:

The course covers the basic concepts of object oriented programming using C++ programming language.

Course Objective:

1. To discuss object oriented programming concepts-class and objects, functions
2. To elaborate Operator overloading and its various types.
3. To explain Polymorphism, inheritance and types of inheritance.
4. To illustrate Pointers, File handling, exception handling and templates.

Prerequisite: Knowledge of C programming

Course Outcomes: After the end of this course students will be able to

CO1	**Understand**[2]how to design programs through C++
CO2	**Solve**[3]programs based on overloading of different type of operators.
CO3	**Demonstrate**[3]polymorphism, various types of inheritance.
CO4	**Develop**[5]programs based on pointers, exception handling, templates: function and class

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Object Oriented Programming System**	
1	1.1	Procedure Languages, definition of OOP, Basic concept of OOP, Object Class, Data Abstraction, Data Encapsulation, Data Hiding. Member functions, Class member visibility: private, public, class conversions, Objects as arguments, returning objects from functions. Array of objects, function overloading, default argument, inline function.	6
	1.2	**Constructor & Destructor:** Definition and writing Constructors, Destructors, Default constructor, Constructor with argument, constructor with default arguments, copy constructor, Overloaded constructor.	
2.0		**Operator Overloading**	
2	2.1	Arithmetic operator overloading, Relational operator overloading, unary operator overloading, binary operator overloading.	6
3.0		**Inheritance**	
3	3.1	Definition, Simple inheritance, Base and Derived Class, the protected access specifier, Derived class constructor, Overriding member functions, public and private inheritance; Access Combinations	6
	3.2	More types of inheritance; Multilevel inheritance, Hybrid inheritance, Multiple inheritance; member functions multiple inheritance, constructors in multiple inheritance, virtual base class.	
4.0		**Pointers and File handling :**	

4	4	Pointer to class, pointer to base and derive class, virtual function, Polymorphism, Dynamic binding. Storing and retrieving values from file, Storing and retrieving objects from file, random access file.	6
5.0		**Templates and Exception handling:**	
5	5.1	Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters.	6
	5.2	Exception Handling: Basics, Exception Handling Mechanism, Throwing and handling.	

List of Experiments

1. Class with multiple objects and multiple member function with different access specifies.
2. Array of objects.
3. Function overloading, default argument.
4. Different Constructors, constructor overloading and destructor.
5. Arithmetic operator overloading.
6. Binary operator overloading.
7. Relational operator overloading.
8. Unary operator overloading.
9. Multiple inheritances.
10. Multilevel inheritance.
11. Hybrid Inheritance.
12. File handling.
13. Pointers.
14. Temples: function and class.

Text Books:

1. Robert Lafore, "Object Oriented Programming in C++", Fourth Edition, SAMS publications. Herbert Schildt, C++
2. "The Complete Reference", Fourth Edition, Tata McGraw Hill Publication.

Reference Books:

1. Deitel and Deitel, "C++ How to Program", Third Edition, Pearson Publication.
2. Joyce Farrell, "Object-oriented programming using C++", Fourth Edition, Cengage Learning

- **Evaluation Scheme**

1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per „credit and grading system" manual and should be added and averaged.
3. Based on above scheme grading and Term work assessment should be done.
4. OE/POE shall be based on all Term work and work carried out during semester.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCASE101	**Web Technology**	-	04	-	-	2	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (POE)		
		Term work	Min pass %	Marks	Min pass %	Total (Marks)
UCASE101	**Web Technology**	25	40	25	40	50

Course Description:

The course aims to introduce a new programming paradigm called Web Technology is a versatile programming language, which supports a variety of programming styles, including procedural, object oriented, and functional programming.

Pre-requisites: Basic knowledge of computer

Course Objectives:

1. To give insight of internet programming and how to design and implement application over the web.
2. To create and publish HTML pages with the help of frames, scripting language and CSS.
3. To give good understanding of CSS and CSS3.
4. To understand and use Java Script and PHP.

Course Outcomes: after the end of this course students will able to

CO1	**Understand**[2] the Concepts of WWW including browser and Protocols.
CO2	**List**[1] the various HTML Tags and use them to develop the user-friendly web pages.
CO3	**Demonstrate**[3] the CSS with its types and use them to provide the styles to the web pages at various levels.
CO4	**Develop**[5] the dynamic web page by using the JavaScript and PHP.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction**	
1	1.1	Basics of Internet, World Wide Web, Web page, Home page, Web Servers, Web Browser, Types of web sites: Static, Dynamic and Active web page, Concept of client and server	6
	1.2	Overview of Protocols – Simple Mail Transfer Protocol, Telnet, Emails, Simple Network Management Protocol, Hyper Text Transfer Protocol, IP Address, Domain Name System	
2.0		**HTML**	
2	2.1	Introduction to HTML, Basic Tags and Attributes, Text Styles and Text Arrangements, Text Effects, Color and Background of Web Pages, Lists and their Types, Image &Image map, Alternative Text for Image map, Hypertext, Hyperlink, Anchor tag, Links to External Documents, Creating Table	6
	2.2	Introduction to Frames, Frames document, <FRAMESET> tag, Nesting <FRAMESET> tag, placing content in frames with the <FRAME> Tag, Targeting named Frames, Creating Floating Frames, Using Hidden Frames, Form Controls	
3.0		**Cascading Style Sheets**	
3	3.1	Introduction, Types of style sheets: Internal, External, Inline stylesheet, Style sheet specification formats, Selector forms, Property value forms, Border properties, text properties, margin properties, padding properties, Font properties, List properties, Color, Alignment of text, The box model, Background images, positioning properties, line/marker properties, outlines	6
	3.2	Introduction of CSS3: Gradients, Transitions, Animations, multiple columns, Colors, 2D Transform, 3D Transform	

4.0		**JavaScript**	
4	4.1	Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations and expressions, Screen output and keyboard input, Control statements	6
	4.2	Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts.	
5.0		**PHP**	
5	5.1	PHP Introduction, PHP Install, PHP Syntax, PHP Comments, PHP Variables, PHP Echo and Print, PHP Data Types, PHP Strings, PHP Numbers, PHP Constants, PHP Operators, PHP Control Statements (if, if-else, switch), PHP Loops, PHP Array, PHP Functions	6
	5.2	PHP Form Handling, PHP Form Validation, PHP Form Required, PHP Form Complete, PHP Cookies, PHP Sessions, PHP Filters	

Experiments based on the course contents

1. Demonstration of World Wide Web, Web page, Home page, Web Browser.
2. Demonstration of types of web sites.
3. Simple Mail Transfer Protocol, Simple Network Management Protocol, Hyper Text Transfer Protocol
4. IP Address, Domain Name System
5. Create a HTML page, which has properly aligned paragraphs with image along with it.
6. Create a HTML page to display list of items in different styles using List tag.
7. Create a HTML page to demonstrate the use of hyperlink, anchor tag and imagemap.
8. Create a HTML page to display time table using table tag and its properties.
9. Create a HTML page to demonstrate the use of Frameset tag.
10. Create registration form using html tags and controls.

11. Design a HTML page using CSS Border properties.
12. Design a HTML page using CSS Text properties.
13. Design a HTML page using CSS margin and padding properties.
14. Design a HTML page to demonstrate use of gradient effects in CSS3.
15. Design a HTML page to demonstrate use of 2D and 3D transform in CSS3.
16. Create forms using CSS.
17. Write a program to demonstrate operations and expressions in Java Script.
18. Write a program to demonstrate the use of decision statements in Java Script.
19. Write a program to demonstrate the use of looping statements in Java Script.
20. Write a program to create object in java Script.
21. Write a program to demonstrate the use of arrays.
22. Write a program to demonstrate the use of functions.
23. Write a program to demonstrate the use of constructors.
24. Write a program to demonstrate the use of pattern matching using regular expressions.
25. Write a program for calculator by using JavaScript.
26. PHP installation, syntax, comments, echo and print statement.
27. Demonstrate the use of PHP Variables, Datatypes, Numbers, Constants, Operators
28. Demonstrate the use of PHP Control Statements and Loops
29. Demonstrate the use of PHP Arrays and Functions
30. Apply form validation on registration form.

ferences:

1 bbins, J. N. “A beginner‟s guide to HTML, CSS, Javascript, and Web Graphics”.

2 eamtech Press. “Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX”. Dreamtech Press.

3 Nixon, R. “Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5”. O'Reilly Media.

4 Kogent Solutions Inc. “Web Technologies HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and AJAX, Black Book”. Wiley.

- **Evaluation Scheme**

1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per „credit and grading system“ manual and should be added and averaged.
3. Based on above scheme grading and Term work assessment should be done.
4. OE/POE shall be based on all Term work and work carried out during semester.

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Theory course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCAIK101	**Ancient Indian Knowledge System: Science and Technology Perspective**	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UCAIK101	**Ancient Indian Knowledge System: Science and Technology Perspective**	-	10	5	15	40%	35	40%	50

Course Description:
This course aims to provide a holistic understanding of Indian knowledge systems and their integration with computer science concepts, fostering critical thinking, cultural sensitivity, and ethical consideration among students.

Prerequisite: Basic knowledge of computer.

Course Objectives:

1. To provide comprehensive understanding of the Indian Knowledge System and it‟s applications in various areas of computer science.
2. To provide a unique perspective, combining the richness of Indian Knowledge Systems with core concepts in Computer Science.
3. To understand the importance of IKS in contemporary society through case studies.
4. To fostering an Appreciation for the rich heritage of the Indian Knowledge System and its relevance in modern contexts, particularly within the domain of computer science.

Course Outcomes: after the end of this course students will able to	
CLO1	**Demonstrate**[3] a deep understanding of key Indian philosophical systems and their relevance to the field of computer science.
CLO2	**Apply**[3] mathematical concepts from Indian traditions, such as Vedic mathematics, to solve computational problems effectively.
CLO3	**Use**[3] principles of Indian logic(Nyaya)to algorithmic thinking, improving problem- solving skills and promoting mindfulness in algorithm design.
CLO4	**Discuss**[2] Indian philosophical perspectives on artificial intelligence and ethics and discuss ethical considerations in AI from an Indian context.

Course Contents

Module	Unit	Description	ours
1.0		**Introduction to Indian Knowledge System**	
	1.1	Definition, Concept and Scope of IKS; IKS based approaches on knowledge paradigms; IKS in ancient India and in Modern India.	6
	1.2	Overview of Indian knowledge systems: Vedas, Upanishads, Purina‟s etc., Integration of Indian philosophy with Computer science concepts, Importance of IKS in contemporary society, Case studies in IKS-based problem solving.	
2.0		**Mathematical Foundations**	
	2.1	**Mathematical Foundations** Indian contributions to mathematics: Aryabhata, Brahmagupta, etc.; Number systems and arithmetic in ancient India; Geometry and trigonometry in Indian mathematics; Algebraic concepts and their historical context.	6
	2.2	**Algorithmic Thinking** Influence of Indian logic (Nyaya) on algorithmic thinking; Exploration of ancient Indian problem-solving techniques; Meditation and mindfulness for improved Algorithm design.	

3.0		**Programming Paradigms**	
3	3.1	**Programming Paradigms:** Introduction to Indian linguistics and Panini's grammar; Comparative analysis of Indian linguistic structures and programming languages; Sanskrit and programming languages: similarities and metaphors.	6
	3.2	**Data Structures** Traditional Indian methods of data organization; Hierarchical and network-based data Representation in ancient texts.	
4.0		**Databases and Information Retrieval**	
4	4.1	Concepts of knowledge organization in classical Indian texts; Yogic principles applied to information retrieval and organization.	6
	4.2	**Artificial Intelligence and Ethics** Insights from Indian philosophy on artificial intelligence and consciousness; Ethical considerations in AI and machine learning from Indian perspectives, role of IKS in shaping ethical AI practices.	
5.0		**Software Development Life cycle**	
5	5.1	**Software Development Life cycle** Indian wisdom on holistic approaches to software development; Integrating traditional practices with modern software development.	**6**

Text books:

1. John Keay ,"India: A History" , 2000
2. Sarvepalli Radhakrishnan,"Indian Philosophy", 1923
3. Dr. Radha Kumud Mookerji,"Ancient Indian Culture and Education", 1969
4. Kapila Vatsyayan, "The Cultural Heritage of India", 1982

References:

1. Kapoor, K., “Indian Knowledge Systems”, 2005
2. Radhakrishnan, S. “Indian Philosophy”, 1923
3. Karumanchi, N. “Data Structures and Algorithms Made Easy: Data Structure and Algorithmic

Puzzles", 2011

4. Manning, C. D., Raghavan, P., & Schütze, H. "Introduction to Information Retrieval.",2008
5. Kapoor, K. "Indian Knowledge Systems.", 2005

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Sanjay Ghodawat University, Kolhapur
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Empowering Lives Globally !

Semester II

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCAPC103	Operating System	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
UCAPC103	Operating System	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:

This course focuses on working of operating system and to understand the Computer operating system, its structures, functioning and algorithms. Also, this course covers various commands used in Linux operating system and knowledge of shell programming

Course Objectives:

1. Gain a comprehensive understanding of operating system structures, functions, and components.
2. Understand process creation, scheduling, concept.
3. Learn the concept of memory hierarchy, allocation, virtual memory.
4. To study about file management.

Course Outcome: At the end of this course students will able to:	
CLO1	**Classify**[2] different types of Operating System.
CLO2	**Summarize**[2] the operating system services, system structure and process concept.
CLO3	**Write**[3] the appropriate CPU scheduling algorithms on various processes.
CLO4	**Distinguish**[4] between various file access method, structure and memory allocation.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Operating System**:	
1	1.1	Concept of Operating System, Evaluation of O.S, Components & Services of OS, Functions of Operating System	9
	1.2	Types of Operating Systems - Batch operating system, Multi Programmed, Multitasking, Time Shared OS, Multiprocessor Systems, Distributed Systems, Cluster Systems, Real time systems	
2.0		**Operating System Structure and Process Management**	
2	2.1	Different Services of Operating System, User and Operating - System Interface (CLI, GUI, Touch Interface), System Calls - Concept, Types and Uses, Structure - Simple, Layered, Monolithic, Microkernel	9
	2.2	Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads	
	2.3	deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection and recovery from deadlocks	
3.0		**Process Scheduling**	
3	3.1	Concept , Objectives , CPU and I/O burst cycles, Pre-emptive, Non- Pre-emptive Scheduling, Scheduling criteria	9
	3.2	Types of Scheduling algorithms - First come first served (FCFS), Shortest Job First (SJF), Shortest Remaining Time (SRTN), Round Robin (RR) Priority scheduling, multilevel queue scheduling	
4.0		**Memory Management**	
4	4.1	Basic Memory Management - Partitioning, Fixed and Variable, Free Space Management Techniques - Bitmap, Linked List.	9

	4.2	Virtual Memory – Concept, logical address, physical address, address binding, Segmentation, Paging, Page table, Page fault	
5.0		**File Management**	
5	5.1	File - Concepts, Attributes, Operations, Types, and File System Structure	9
	5.2	Access Methods - Sequential, Direct, Swapping, File Allocation Methods - Contiguous, Linked, Indexed	
	5.3	Directory Structure –Concept of directory, Single level, Two levels	

Text Books:

1. Silberschatz, A., Galvin, P., Gagne, G."Operating System Concepts". 2021 Wiley.
2. Godbole, A. S., Kahate, A., "Operating Systems.", 2017, Tata McGraw Hill.

References:

1. Chauhan, N. "Principles of Operating Systems", 2014, Oxford Press.
2. Tanenbaum, A. S., & Bos, H. "Modern Operating Systems", Fourth Edition, 2014, Pearson

- **Internal Assessment (T1, T2 and FET):**

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
2. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 5 questions, each carrying 10 marks.
2. The duration of end semester examination shall be 2/3/4 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCAPC104	Database Management System	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Mark)
UCAPC104	Database Management System	10	10	5	25	40%	50	40%	75

Course Description:

This course introduces students to the fundamental and practices of Database Management Systems (DBMS). The emphasis is on understanding the design, implementation, and management of databases to handle efficiently and to manipulate data. This course covers both theoretical concepts and practical applications to equip students with the skills necessary for effective database development and administration.

Pre-requisites: Fundamental of Computer Organization

Course Objectives:

1. To design and implementation of a database system.
2. To acquire the knowledge of physical and logical database designs, database modelling, relational, hierarchical, and network models.
3. To learn about using data manipulation language to query, update, and manage a database.
4. To present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve information from a DBMS

Course Outcomes: after the end of this course students will able to

CO1	**Understand**[2] various database concepts
CO2	**Develop**[3] various entity-relationship diagrams for relational tables.
CO3	**Apply**[3] SQL queries to interact with database
CO4	**Build**[3] application using PL/SQL
CO5	**Analyze**[3] database transaction and can control them by applying ACID properties

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Database Management System**	
1	1.1	Overview of databases and their importance in organizations, definition and characteristics of a database, Advantages and disadvantages of using a database, role of database management systems	9
	1.2	Evolution of database systems, Early file-based systems and their limitations, need for a structured and centralized approach to data management, introduction to relational databases and SQL	
2.0		**Relational Database Design**	
2	2.1	Relational model and normalization, Relational algebra and calculus, Normal forms (1NF, 2NF, 3NF, BCNF), functional dependencies and Transactional dependencies	9
	2.2	Entity-Relationship (ER) modelling, concepts of entities, attributes, and relationships, entity-Relationship diagrams (ERDs)	
3.0		**Structured Query Language**	
3	3.1	Basics of SQL, Creating a Database and Tables - DDL, DML, DCL, TCL Commands, Constraints – primary key, foreign key, unique key, not null key, check, Clauses- Order by, where and group by, Functions in MySQL - Aggregate functions (avg, count, min, max, sum), String Functions (concat, instr, mid, length, strcmp, trim, ltrim, rtrim) , Math Functions(abs, ceil, floor, mod, pow, sqrt), Date and Time Functions (adddate, datediff, day, month, year, hour, min, sec)	9
	3.2	Subqueries, Concepts of Join, Types of Join, Views - creating, altering dropping, renaming and manipulating views	
4.0		**Database Storage, Indexing, and Procedural SQL**	
4	4.1	Database storage and indexing techniques, Storage hierarchy and file organization	9
	4.2	Introduction to PL/SQL, PL/SQL block, conditional and looping statements, Triggers- Create, show and drop trigger, Types of trigger, Cursors - Declare, open, fetch, close, Stored procedures – Creating and executing procedures with and without parameters,	

5.0		**Database Administration and Emerging Trends**	
5	5.1	Transaction management and Concurrency Control: Transaction management: ACID properties, serialization and concurrency control	9
	5.2	Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management	
	5.3	Emerging trends in database management - Big data and NoSQL databases, cloud databases and database as a service (DBaaS), Data analytics and business intelligence	

Text Books:

1. Silberschatz, A., Korth, H. F., & Sudarshan, S. "Database System Concepts"
2. Garcia-Molina, H., Ullman, J. D., & Widom, J. "Database Systems: The Complete Book."
3. Ramakrishnan, R., & Gehrke, J. "Database Management Systems."

References:

1. Date, C. J., Kannan, A., & Swamynathan, S. "An Introduction to Database Systems."

- **Internal Assessment (T1, T2 and FET):**
  1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  2. Fifth module will be assessed for 5 marks separately.
- **Semester End Examination:**
  1. Question paper will comprise of 5 questions, each carrying 10 marks.
  2. The duration of end semester examination shall be 2 /3/ 4 hours.
  3. The students need to solve all 5 questions.
  4. Question No.1 will be compulsory and based on entire syllabus.
  5. Remaining question (Q.2 to Q.5) will be selected from all the modules

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCAOE021	**Python Programming**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		02	-	-	02	-	-

Evaluation Scheme

Course Code	**Course Name**	**Evaluation Scheme (In Semester)**					**Semester End Exam (SEE)**		
UCAOE021	**Python Programming**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Mark)
		-	10	5	15	40%	35	40%	50

Course Description:

This course is aims at introducing one of the fastest growing programming languages of current time and enables learners to understand the fundamentals of programming with Python. Learners will be able to write programs to solve real-world problems, and produce quality code.

Pre-requisites: Basic Programming Knowledge

Course Objectives:

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications.
3. To learn how to design object-oriented programs with Python classes.

Course Outcomes: after the end of this course students will able to

CO1	**Illustrate**[3] the process of structuring the data using lists, tuples and dictionaries.
CO2	**Demonstrate**[3] the use of control statements, function, array and OOPs concepts.
CO3	**Appraise**[4] the need for working on web scraping.
CO4	**Develop**[5] GUI application with database.

Course Contents

Module	Unit	Description	Hours
1.0		**Overview and Environment of Python**	
1	1.1	An Overview of Python, what is Python? Interpreted languages, Advantages and disadvantages, Downloading and installing, which version of Python, where to find documentation.	6
	1.2	The Python Environment, Structure of a Python script, operators and expressions. Using List, Tuple, Set, Dictionary and Operations on them, String and String operations, reading different types of data from the keyboard	
2.0		**Control Statements**	
2	2.1	if, if-else statement, significance of Indenting, the if and elif statements,.	6
	2.2	the range () function in loop, for loop, while loops, for each loop for list, tuple, set, dictionary.	
3.0		**Function in python programming**	
3	3.1	Introduction to function, passing value to the function, Returning value from function, Default, keyword, Arbitrary parameters, Multiple functions,	6
	3.2	Function call within function. Array: What is NumPy? 1D and 2D Array using NumPy, Operations on array, Array slicing, list, tuple, string slicing	
4.0		**OOP's Concept**	
4	4.1	OOPS concepts, access specifiers, method overloading, method overriding.	6
	4.2	Constructor, destructor, Inheritance in python.	
5.0		**GUI Programming in Python**	

5	5.1	What is GUI, Advantages of GUI, Introduction to GUI library. Layout management, events and bindings, fonts, colors, drawing on canvas (line, oval, rectangle, etc.)	6
	5.2	Widgets such as: frame, label, button, check button, entry, list box, message, radio button, text, spin box etc.	

Textbook & References:

1. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley, 2013
2. James Payne , “Beginning Python: Using Python 2.6 and Python 3”, Wiley India, 2010 .
3. “Introduction to Computer Science Using Python 3”, Pragmatic Bookshelf, 2/E , 2014.

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCAMM011	Basics of Data Science	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UCAMM011	Basics of Data Science	-	10	5	15	40%	35	40%	50

Course Description:

The course will help the students to understand the basics of data science and various related techniques which they can use to develop their data science applications for solving real world problems.

Pre-requisites: Basic Programming

Course Objectives:

1. To understand the basics of data science and various related techniques.
2. To give the insights of different types of data bases like structured and unstructured.
3. To give the basic knowledge of R programming to implement real world applications.
4. To understand how to use the real world data science applications.

Course Outcomes: after the end of this course students will able to

CO1	**Design**[4] the real world data science applications.
CO2	**List**[2] the various types of data bases for utilization.
CO3	**Demonstrate**[1] the concepts of basic data sciences.
CO4	**Develop**[3] the basic data science applications using R programming.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction**	
1	1.1	Data science definition. Data science benefit our society, Data science relation to other domains, Data science application areas, Data science challenges, Various Data science tools and programming platforms for developing data science applications, Role of data scientist, Data science growing market.	6
	1.2	Various types of databases and datasets such as structured, unstructured, graph, etc., Data related challenges today. Multimedia data, social media data, biological data, sensor data, etc. Different dataset with different challenges.	
2.0		R Programming – I	
2	2	Introduction to R and its history. Advantages of R, Install R Programming Language & R Studio, Various data science packages (machine learning, string manipulation, data visualization) in R and their application area. Various domain-specific datasets available in R, Various data repositories, public and private data repositories.	6
3.0		R Programming – II	
3	3	Companies Using the R Programming language, Commercial market of R programming, In-memory computation in R and its benefits, Parallel and distributed programming computation using R,	6
4.0		R Programming – III	
4	4.	Package inclusion and industry programming practices. CRAN and various benefits of it, Future prospects of R programming.	6
5.0		Machine Learning	

5	5.1	Machine learning, Supervised and unsupervised machine learning, semi-supervised machine learning, reinforcement learning. Various sub branches of supervised (classification, regression) and unsupervised machine learning (clustering and dimensionality reduction), Training and testing data, Differences between machine learning and statistics	6

Text and References:

1. Hadley Wickham, and Garrett Grolemund. “R for Data Science: Import, Tidy, Transform, Visualize, and Model Data”, 1st Edition. O'Rielley
2. Brett Lantz. “Machine Learning with R: Expert techniques for predictive modeling”, 3rd Edition. Packt Publishing.

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCAMM012	Introduction to Data Communication	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UCAMM012	Introduction to Data Communication	-	10	5	15	40%	35	40%	50

Course Description:

The course will help the students to understand the basics of data science and various related techniques which they can use to develop their data science applications for solving real world problems.

Pre-requisites: Knowledge of Computer System.

Course Objectives:

1. To understand the basics of data communication
2. To learn the insights of different types of topologies
3. To gain the basic knowledge of different transmission media‟s.
4. To evaluate the data coding methods.

Course Outcomes: after the end of this course students will able to

CO1	**Explain**[2] the fundamental of data communication..
CO2	**Summarize**[2]the layered architecture of network models with topologies and itstypes.
CO3	**Identify**[1] different transmission media.
CO4	**Apply**[3] the data encoding methods.

Course Contents

Module	Unit	Description	Hours
1.0		**Data Communication Basics**	
1	1.1	Data Communication–Definition, Components, Data representation, Data Flow, Networks– Definition, Uses.	6
	1.2	Guided Media: Twisted pair cable, Coaxial cable, Optical Fibre cable. Underlying technologies: For LANs, WANs, and Switched WANs.	
2.0		**Network Models**	
2	2.1	Network topologies, Categories of Networks, Layered Tasks	6
	2.2	The OSI model, Layers in the OSI model, TCP/IP protocol suit.	
3.0		**Multiple Access Protocols**	
3	3.1	Random Access Protocols: - ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled	6
	3.2	Access Protocols: - Reservation, Polling, and Token Passing. Channelization Protocols:-FDMA, TDMA, CDMA.	
4.0		**Internet and Web Application Protocols**	
4	4.1	Internet Protocol: IP Datagram format, Fragmentation and reassembly models, ARP,RARP, ICMP, IGMP	6
	4.2	Web Applications Service Protocols: HTTP: Architecture, Web Documents, HTTP Transaction, Request and Response, HTTP Headers and Examples Electronic Mail: Architecture, User agent, addresses, Delayed delivery, SMTP commands and responses, Mail transfer phases, MIME, POP3.	

5.0		**Wireless Transmission (Standards and Specification)**	
5	5.1	Microwave transmission, Infrared transmission, Laser transmission, Radio transmission and Satellite transmission and Blue Tooth, Frequency Spectrum.	6
	5.2	Communication Switching Techniques: Circuit Switching, Message Switching, Packet Switching.	

Text Books:

1. Behrouz A Forouzan, "Data Communications and Networking", TataMcGraw-Hill
2. Andrew S.Tanenbaum, "Computer Networks", PrenticeHall, 5th Edition, 2011
3. Michael A Gallo, "Computer communications And Networking Technologies", Cengage Learning, 1st Edition 2001

References:

1. William Stallings, "Data &computer communications", Pearson Education, 8th Edition,2011
2. Ajit Pal, "Data communication and Computer Networks", PHI Learning, 1st Edition, 2014

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCAMM013	Basics of Artificial Intelligence	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UCAMM013	Basics of Artificial Intelligence	-	10	5	15	40%	35	40%	50

Course Description:

This course provides an introduction to artificial intelligence. This course covers core topics of knowledge representation, reasoning, and learning, heuristic search techniques and expert systems.

Pre-requisites: Knowledge of Computer System.

Course Objectives:

1. To learn the advantages, disadvantages, challenges and search algorithm of AI.
2. To learn Nature of Environments, Structure of Agents in AI.
3. To design user interfaces to improve human–AI interaction and real-time decision making.
4. To learn passive and active Reinforcement Learning.

Course Outcomes: after the end of this course students will able to

CO1	**Identify**[1] the informed and uninformed problems types and apply search strategies to solve them.
CO2	**Distinguish**[2] a problem using first order and predicate logic.
CO3	**Use**[3] software agent to solve a problem.
CO4	**Solve**[3] problems and to provide decision-making ability using Reinforcement Learning.

Course Contents

Module	Unit	Description	Hours
1.0		**Basics of Artificial Intelligence**	
1	1.1	What Is AI: Foundations, Acting Humanly, Categorization of Intelligent Systems, Thinking Rationally, Acting Rationally, History and State of the Art of AI	6
	1.2	Problem Solving with Artificial Intelligence Data Communication– Definition, Components, Data representation, Data Flow, Networks– Definition, Uses.	
2.0		**Intelligent Agent**	
2	2.1	Objective, Introduction, Agents and Environments.	6
	2.2	Types of agent, Nature of Environments, Structure of Agents.	
3.0		**Problem Solving By Searching**	
3	3.1	Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.	6
	3.2	**Learning Probabilistic Models:** Statistical Learning, learning with Complete Data, Learning with Hidden Variables: The EM Algorithm	
4.0		**Learning Form Examples**	
4	4.1	Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models,	6
	4.2	Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning	
5.0		**Reinforcement Learning**	

5	5.1	Passive Reinforcement Learning, Active Reinforcement Learning	6
	5.2	Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning	

References:

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", II Edition TMH
2. V S Janakiraman, K Sarukesi, P Gopalakrishan, "Foundations of Artificial Intelligence and Expert Systems", Macmillan India Ltd.
3. Dan W. Patterson, "Introduction to AI and Expert System", PHI

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Lab course (Without POE)

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCAPC106	Operating System Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		
UCAPC106	Operating System Lab	**Term Work**	**Min pass**	**Marks**	**Min pass**	**Total (Marks)**
		25	40%	-	-	25

Experiments:

Experiments based on course content of **Operating System (**UCAPC103**)**

Evaluation Scheme:

- FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
- The grades will be converted to marks as per „credit and grading system" manual and should be added and averaged.
- Based on above scheme grading and FEP assessment should be done.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCAPC105	**Database Management System Lab**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
UCAPC105	**Database Management System Lab**	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	-	-	25

Course Outcomes: after the end of this course students will able to

CO1	**Memorize**[1] knowledge about designing and creating relational database systems.
CO2	**Understand**[2] various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
CO3	**Design**[5] and implement database applications on their own.

Experiments based on the course contents of **Database Management System (**UCAPC106**)**

- **Evaluation Scheme**
    1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
    2. The grades will be converted to marks as per „credit and grading system" manual and should be added and averaged.
    3. Based on above scheme grading and Term work assessment should be done.
    4. OE/POE shall be based on all Term work and work carried out during semester.

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCAVS102	**Power BI**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (POE)		
UCAVS102	**Power BI**	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Description:

A Power BI course teaches you to the fundamentals of data analysis, data visualization, and the specific functionalities of Power BI. Students shall learn how to import, clean, and create interactive reports and dashboards. The course covers data preparation, report creation, and sharing insights securely. Ideal for students interested in data analysis and business intelligence.

Prerequisite: Basic knowledge of data analysis, Understanding of basic data concepts and operations.

Familiarity with spreadsheets: Experience with tools like Excel will be helpful for data manipulation.

Course Outcomes: After the end of this course students will be able to

CO1	**Understand BI Concepts**: Understand the role of Business Intelligence and Power BI in data analysis and decision-making.
CO2	**Data Connectivity**: Be proficient in connecting Power BI to multiple data sources (Excel, databases, etc.) and transforming the data for analysis.
CO3	**Data Modeling**: Know how to create data models, relationships, and use DAX to calculate meaningful metrics.
CO4	**Data Visualization**: Create insightful and visually appealing reports and dashboards using standard and advanced Power BI visualizations.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Power BI**	
1	1.1	Introduction and Definition of BI and its role in data-driven decision-making, types of BI tools and their purpose, Overview of BI lifecycle (Data collection, analysis, visualization, reporting), What is Power BI?	6
	1.2	Power BI Components – Desktop (for creating reports), Service (for sharing and collaborating online), Mobile (for accessing reports on the go), Key Features - Data connectivity, transformation, visualization, sharing, Installing and Setting Up Power BI Desktop - System requirements and installation process, Navigating the Power BI Desktop interface, Basic introduction to the ribbon, panes, and fields.	
2.0		**Data Loading & Modeling**	
2	2.1	Data Sources used for Loading and Connecting Data - Data Connectors, Importing data from Excel and CSV files, Databases, Power Query Editor for Data Transformation - role in data cleaning and transformation, Transformation Techniques - Filtering rows, removing duplicates, sorting data, Handling missing or null data. Data Exploration - Previewing and analyzing imported data, Basic steps for data exploration - Column profiling, data summarization, and identifying issues, Introduction to applying simple transformations (split columns, text to columns, etc.),	6
	2.2	Data Modeling - Key Components: Tables, Relationships, and it‟s Measures, Relational Vs. Dimensional models (Star Schema), Types of relationships (one-to-one, one-to-many, many-to-many), Creating and managing relationships, visualizing data relationships using Diagram View.	
3.0		**Data Analysis Expressions (DAX)**	
3	3.1	Introduction to DAX, What is DAX and its role, Difference between DAX and Excel formulas, Basic DAX Syntax and Structure, Basic DAX Functions - Mathematical Functions: SUM, AVERAGE, MIN, MAX, Aggregation Functions: COUNT, DISTINCTCOUNT, Logical Functions: IF, AND, OR etc.	6
	3.2	Creating Simple Measures and Calculated Columns, Difference between Measures and Calculated Columns, Writing simple DAX expressions for aggregation and filtering, Using DAX to create meaningful metrics (e.g., Total Sales, Average Profit).	

4.0		**Data Visualization and Reporting**	
4	4.1	Creating Basic Visuals and Dashboards, Types of Visuals in Power BI, Overview of standard visualizations - Bar Charts, Column Charts, Line Charts, Pie Charts, Tables, and Maps,	6
	4.2	Building Interactive Reports - Adding visuals to reports and arranging them on report pages, Configuring data labels, titles, and tooltips, Introduction to Filters and Slicers, Using Slicers to enable user-driven exploration of data, Formatting Visuals for Better Insight Delivery - Using themes and colors, Formatting Tips - Axis formatting, label positioning, gridlines, and font styles	
5.0		**Publishing, Sharing, and Advanced Features**	
5	5.1	Sharing and Collaborating in Power BI, Power BI Service Overview - Introduction to Power BI Service, Differences between Power BI Desktop and Power BI Service, Creating a Workspace and using Apps in Power BI Service	6
	5.2	Publishing and Sharing Reports - Publishing Power BI reports from Desktop to Power BI Service, Sharing reports with users and controlling permissions, Creating Dashboards in Power BI Service from published reports, Setting up automatic data refresh in Power BI Service, Exporting Reports - Exporting reports to PDF, Excel, and PowerPoint for offline sharing, Printing reports and visualizations.	

List of Experiments

Exercise 1: Import Data from Excel and Create Table Visualization

1. **Objective**: Learn how to import data from Excel and create simple table visualization.
2. **Instructions**:
    1. Download or create a sample Excel file with sales data (e.g., product name, sales amount, date, and region).
    2. Import the Excel file into Power BI Desktop.
    3. Create a **Table** visualization to display all columns of data (product, sales, date, and region).
    4. Format the table for better readability (e.g., adjusting column widths, font size).

Exercise 2: Clean and Transform Data using Power Query Editor

1. **Objective**: Practice cleaning and transforming data using Power Query.
2. **Instructions**:
    1. Import a dataset with some issues (e.g., missing values, inconsistent formatting).Open **Power Query**

Editor and perform the following tasks:

2. Remove unnecessary columns.
3. Replace null or missing values with a default value (e.g., "0" for sales).
4. Change the data type of a column (e.g., from text to date).
5. Close and apply the changes to return to Power BI Desktop.

Exercise 3: Create a Simple Bar Chart

1. **Objective**: Learn to visualize data with basic charts.
2. **Instructions**:
    1. Use the data from Exercise 1.
    2. Create a **Bar Chart** to show total sales by region.
    3. Sort the bars in descending order and format the chart to display the sales values on the bars.
    4. Add a title to the chart (e.g., "Sales by Region").

Exercise 4: Create a Line Chart to Show Trends over Time

1. **Objective**: Create a line chart to visualize trends over time.
2. **Instructions**:
    1. Use the data from Exercise 1.
    2. Create a **Line Chart** to show sales over time (by month or day).
    3. Format the chart to display sales as a line and the X-axis as a time-based field (e.g., Date).
    4. Add a trend-line to the chart for better trend visualization.

Exercise 5: Add Slicers to Report for Interactivity

1. **Objective**: Add interactivity with slicers.
2. **Instructions**:
    1. Use the data from Exercise 1.
    2. Create a **Slicer** for the "Region" column.
    3. Make sure that the slicer filters the other visualizations on the report page (e.g., bar chart, line chart).
    4. Try selecting different regions from the slicer and observe how the visualizations update.

Exercise 6: Create a Calculated Column Using DAX

1. **Objective**: Use DAX to create a calculated column.
2. **Instructions**:
    1. Use the data from Exercise 1.
    2. Create a calculated column to show the profit for each sale (e.g., Profit = Sales Amount - Cost).
    3. Add the new column to a table or bar chart to display the profit for each record.

Exercise 7: Create a Measure Using DAX

1. **Objective**: Use DAX to create a measure for aggregating data.

2. **Instructions**:
    1. Use the data from Exercise 1.
    2. Create a **Measure** to calculate the total sales (e.g., Total Sales = SUM (Sales Amount)).
    3. Add the measure to visualization such as a card, showing the total sales across all records.

Exercise 8: Create a Pie Chart for Sales Distribution

1. **Objective**: Create a pie chart to show the proportion of sales by region.
2. **Instructions**:
    1. Use the data from Exercise 1.
    2. Create a **Pie Chart** to visualize the proportion of total sales by region.
    3. Format the pie chart to display percentages and labels for each region.
    4. Add a title to the pie chart (e.g., "Sales Distribution by Region").

Exercise 9: Create a Drill-Down Report

1 **Objective**: Learn how to create a drill-down report for deeper analysis.
2 **Instructions**:
    1. Use the data from Exercise 1.
    2. Create a **Bar Chart** showing sales by region.
    3. Add a **Drill-Down** feature by adding another field (e.g., "Product Name") to the chart‟s axis.
    4. Enable drill-down by selecting the down-arrow icon on the chart.
    5. Click on a region to drill down into the products sold in that region.

Exercise 10: Publish a Report to Power BI Service

1 **Objective**: Learn how to publish and share reports via Power BI Service.
2 **Instructions**:
    1. After completing the report in Power BI Desktop (using any of the exercises above), save the report.
    2. Click on **Publish** and sign in to your Power BI account.
    3. Choose a workspace in Power BI Service to publish the report.
    4. After publishing, log into Power BI Service (app.powerbi.com) and verify that your report appears in the workspace.

Share the report with a colleague or group by selecting Share and granting access.

Text Books :

1 Microsoft Power BI Step by Step" – By Curt Frye - Microsoft Press, 2019

2 Power BI Made Simple" – By Boris P. Krumrey, 2020

3 Mastering Power BI" – By Chandraish S. Raj, Shubham K. Srivastava, Packt Publishing, 2017

4 Power BI Data Analysis and Visualization", By Pradeep Gohil, Packt Publishing, 2018

Online References :

1 Microsoft Power BI Documentation - Website: https://learn.microsoft.com/en-us/power-bi

2 Power BI Community and Forums - Website: https://community.fabric.microsoft.com/t5/Power-BI-forums/ct-p/powerbi

- **Evaluation Scheme**

1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per „credit and grading system‟ manual and should be added and averaged.
3. Based on above scheme grading and Term work assessment should be done.
4. OE/POE shall be based on all Term work and work carried out during semester.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UCASE102	**Python Programming**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (POE)		
UCASE102	**Python Programming**	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Outcomes: After the end of this course students will be able to

CO1	**Understand**[2] the steps involved in compiling, linking and debugging C code, feel more confident about writing the C functions, write some complex programs
CO2	**Develop**[3] the logic for the given problem, recognize and understand the syntax and construction of C code, gains experience of C
CO3	**Apply**[3] the alternate ways to provide the solution to a given problem.

List of Experiments

1. Installing python and setting up environment. Simple statements like printing the names, numbers, mathematical calculations, etc.
2. Simple programs containing variable declaration and arithmetic operations
3. Programs based on conditional constructs
4. Programs based on loops
5. Programs related to string manipulation
6. Programs related to Lists, Tuples
7. Programs related to dictionaries
8. Programs to read & write file.
9. Programs to do searching and sorting
10. Program to demonstrate use of class methods
11. Program to demonstrate method overloading.
12. Program to implement stack
13. Program to implement of Circular Queue.

14. Program to demonstrate constructor.
15. Program to demonstrate destructor.
16. Program to implement inheritance.

Text Book:

1 Dierbach, Introduction to Computer Science using Python, Wiley, 2013

2 Payne , Beginning Python: Using Python 2.6 and Python 3, Wiley India, 2010

3 Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014

References:

1. Pandey, Programming Languages – Principles and Paradigms, Narosa, 2008

Lukaszewski, MySQL for Python: Database Access Made Easy, Pact Publisher, 2010

2 Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to ComterScience Using Python 3, Pragmatic Bookshelf, 2/E 2014

Evaluation Scheme

1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per „credit and grading system" manual and should be added and averaged.
3. Based on above scheme grading and Term work assessment should be done.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
UHSAE004	English	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		01	02	-	01	01	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Term work		
UHSAE004	English	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Mark)
		10	10	5	25	40%	25	40%	50

Course Description:

This course is designed to develop the English language competency required in professional life. The students will excel in English language and it‟s usage that will help them in the academia and professional world.

Course Objectives:

1. To acquaint learners with the importance of English language in their personal and professional life.
2. To train students in constructing grammatically correct and meaningful sentences.

Course Outcomes: At the end of this course students will be able to:

C**O1**	**Identify**[1] importance of English Language in personal and professional life.
CO2	**Construct**[3]grammatically correct and meaningful sentences in English.

Course Contents

Module	Unit	Description	Hours
1.0		**English Language**	
1	1.1	Language and Its Characteristics	06
	1.2	LSRW Skills	
	1.3	Language Acquisition & Learning	
	1.4	English Language, Importance and scope	
2.0		**English Grammar-I**	
2	2.1	Parts of speech, Syntax	06
	2.2	Morphology, Word formation	
	2.3	Sentences in English and Types , Tenses	
3.0		**English Grammar-II**	
3	3.1	Transformation: Active and Passive Voices,	06
	3.2	Direct and Indirect Speech	
	3.3	Identifying and rectifying Common Errors, Subject Verb Agreement,	
4.0		**Vocabulary Building**	
4	4.1	Synonyms, Antonyms,	06
	4.2	Idioms, Phrasal Verbs	
	4.3	Homonyms, Homophones and One Word Substitution.	
5.0		**Introduction to English for Specific Purposes**	
5	5.1	English for Academic Purpose, English For Business Purpose,	06
	5.2	English For Technical and Scientific Purpose	
	5.3	English for Medical and Allied Health Purpose	

Note: This course will be taught in PBL mode; hence, the focus will be on teaching applications of content in the syllabus in real life situations.

References:

1. Leech, Geoffrey, Deucher, Margaret, Hoogenraad, Robert, "English Grammar for Today, A New Introduction"
2. Raymond Murphy, "Essential English Grammar: A Self-Study Reference and Practice Book for Elementary Students of English with Answers", Cambridge University Press
3. Green, David. "Contemporary English Grammar –Structures and Composition". MacMillan India. 2014 (Print)
4. Fitikides, T. J. "Common Mistakes in English". London: Orient Longman, 1984.
5. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill.

Websites

1. http://esl.about.com/od/englishtestsandquizzes/
2. https://learnenglish.britishcouncil.org/en/content
3. https://www.englishclub.com/grammar/quizzes.htm
4. https://englishdost.com/blog/language-learning-perfect-solution/
5. https://englishdost.com/blog/category/english-for-beginners/
6. http://www.selfgrowth.com/comm.html

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UHSVE001	**Constitution of India**	02	-	-	02	-	-

Evaluation Scheme

Course Code	**Course Name**	**Evaluation Scheme (In Semester)**					**Semester End Exam (SEE)**		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Mark)
UHSVE001	**Constitution of India**	-	10	5	15	40%	35	40%	50

Course Description:

A course on the Constitution of India typically covers its historical background, key features, structure, fundamental rights and duties, directive principles of state policy, separation of powers, federalism, and the role of various institutions like the President, Parliament, Judiciary, and Executive. It also delves into constitutional amendments, judicial review, and the evolution of Indian constitutional law.Overall, a course on the Constitution of India provides a comprehensive understanding of the foundational document of Indian democracy and its significance in shaping the nation's political, social, and legal landscape.

Course Objectives:

1. Students explore advanced concepts and principles of constitutional law, including separation of powers, federalism, judicial review, and the rule of law. They analyze how these principles interact and shape the functioning of constitutional democracies.

2. The course examines fundamental rights and liberties guaranteed by the constitution, such as freedom of speech, religion, and association, as well as the right to privacy, equal protection, and due process. Students analyze landmark cases and debates surrounding these rights.

3. Students study various methods and approaches to constitutional interpretation, including textualism, originalism, living constitutionalism, and balancing tests. They explore how different interpretive methodologies influence judicial decision-making.

Course Outcomes: At the end of this course students will be able to:

C**O1**	**Realise**[2] the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
CO2	**Identify**[2] the importance of fundamental rights as well as fundamental duties.

CO3	**Describe**[1] the roles of Union and State Executives.
CO4	**Explain**[2] the special provisions for special category of people.

Course Contents

Module	Unit	Description	Hours
1.0			
1	1.1	Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.	08
2.0			
2	2.1	Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.	08
3.0			
3	3.1	State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court. Local Government- Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to 74th Amendment	08
4.0			
4	4.1	Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights –Meaning and Definitions, Working of National Human Rights Commission in India Powers and functions of Municipalities, Penchants and Co – Operative Societies	08

Text Books:

1. Durga Das Basu: “Introduction to the Constitution on India”, (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn, 2001 2.
2. Charles E. Haries, Michael S Pritchard and Michael J. Robins “Engineering Ethics” Thompson

Asia, 2003-08-05.

3. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
4. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 2004
5. Brij Kishore Sharma,"Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.

Reference Book:

1. Merunandan, "Multiple Choice Questions on Constitution of India", 2nd Edition,Meraga publication,2007.

Evaluation:

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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