KANNUR UNIVERSITY
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(Abstract)

FYUG - BSc Artificial Intelligence and Machine Learning Programme in Affiliated Colleges under Kannur University – Scheme and Syllabus of the Fifth semester - Approved and Implemented for 2024 admission -Orders Issued.

ACADEMIC C SECTION

ACAD C/ACAD C3/20774/2024 Dated: 26.09.2026

Read:-1.U.O No: ACAD C / ACAD C 3/ 21647/2024 , Dated: 29/11/2024

2.U.O No: ACAD C / ACAD C 3/ 20774 /2024 , Dated: 19/12/2024.

3.U.O No: ACAD C / ACAD C 3/ 20774 /2024 , Dated: 11/07/2025.

4.U.O No. ACAD/ACAD C3/8508/2019 dated: 04/07/2025

5.U.O No. ACAD/ACAD C3/8508/2019 dated: 30/04/2026

6.U.O No. ACAD/ACAD C3/8508/2019 dated: 09/06/2026

7.Minutes of the meeting of the Expert Committee held on 06/08/2026

8.Minutes of the online meeting of theBoard of studies in Computer science (UG) held on 03/09/2026

9.Email dated, 17.09.2026 of the Dean, Faculty of Technology

10.Orders of Vice Chancellor in the file No.ACAD /ACAD C 3/8508/2019 dated 18.09.2026

ORDER

1. The Scheme and Syllabus (I-VI semesters) of the FYUG B.Sc. Computer Science Programme were implemented in the affiliated colleges with effect from the 2024 admission, vide paper read as (1) above.
2. Vide paper read as (2) above, it was ordered to follow the Scheme and Syllabus of the FYUG B.Sc. Computer Science Programme for the First and Second Semesters of the FYUG B.Sc. Computer Science with Artificial Intelligence and Machine Learning and B.Sc. Artificial Intelligence and Machine Learning Programmes with effect from the 2024 admission onwards.
3. Vide paper read as (3) above, it was ordered to follow the Scheme and Syllabus of the FYUG B.Sc. Computer Science Programme for the Third and Fourth Semesters of the FYUG B.Sc. Computer Science with Artificial Intelligence and Machine Learning and B.Sc. Artificial Intelligence and Machine Learning Programmes with effect from the 2024 admission onwards.
4. Vide paper read as (4) above, an Expert Committee was constituted for the preparation of the Scheme and Syllabi and for fixing the eligibility criteria for the FYUGP B.Sc. Cyber Security and B.Sc. Data Analytics Programmes.
5. Vide paper read as (5) above, the Expert Committee constituted for the preparation of the Scheme and Syllabi and for fixing the eligibility criteria for the FYUGP B.Sc. Cyber Security and B.Sc. Data Analytics Programmes was reconstituted.
6. Vide paper read as (6) above, the Expert Committee constituted for the preparation of the Scheme and Syllabi and for fixing the eligibility criteria for the FYUGP B.Sc. Cyber Security and B.Sc. Data Analytics Programmes was again reconstituted, appointing Prof. Rajkumar K. K., Professor, Department of Information Technology, as Convenor.
7. As directed by the Vice Chancellor, the Scheme and Syllabus for the V–VIII Semesters of the FYUGP B.Sc. Artificial Intelligence and Machine Learning Programme, submitted by the Vice

Principal, Don Bosco Arts & Science College, were placed before the Expert Committee for consideration.

8. Vide paper read as (7) above, the Expert Committee recommended that the Scheme and Syllabus be placed before the Board of Studies in Computer Science (UG) for consideration.
9. The Board of Studies in Computer Science (UG), vide paper read as (8) above, recommended the acceptance of the Scheme and Syllabus for the Fifth Semester of the FYUGP B.Sc. Artificial Intelligence and Machine Learning Programme for the academic year 2026–2027.
10. The Scheme and Syllabus, along with the Minutes of the online meeting of the Board of Studies in Computer Science (UG) held on 03.09.2026, were forwarded to the Dean, Faculty of Technology, for remarks. The Dean recommended approval of the same vide paper read as (9) above.
11. The Vice Chancellor, after considering the recommendation of the Dean, Faculty of Technology, and in exercise of the powers of the Academic Council conferred under Section 11(1), Chapter III of the Kannur University Act, 1996, and all other enabling provisions read together, **has approved the Scheme and Syllabus for the Fifth Semester of the FYUGP B.Sc. Artificial Intelligence and Machine Learning Programme and accorded sanction to implement the same for the 2024 admission only,** subject to reporting the matter to the Academic Council.
12. The approved Scheme and Syllabus are appended to this U.O. and uploaded on the University website.
13. Orders are issued accordingly

Sd/-
Bindu K P G
Joint Registrar (Acad)
For REGISTRAR

To: The Principal , Don Bosco College of Arts & Science, Angadikadavu.

Copy To: 1.PA to CE (to circulate among the sections concerned under the Examination Branch)
2.The Chairperson, BOS in Computer Science (UG)
3.JR (Examination)
4.PS to VC / PA to Registrar
5.EX C I / EG I
6.IT ELL (to publish on the official website)
7.SF/DF/ FC

Forwarded / By Order

SECTION OFFICER

KANNUR UNIVERSITY
CIVIL STATION P.O.
KANNUR
Pin-670 002
THAVAKKARA

KANNUR UNIVERSITY

Re-accredited by NAAC with 'B++' Grade

KUFYUGP

BACHELOR OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CURRICULUM & SYLLABUS

Effective from 2024 Admission Onwards

www.kannuruniversity.ac.in

PREFACE

Welcome to the Four-year Integrated UG Artificial Intelligence and Machine Learning Programme of Kannur University. The Board of Studies of the University has designed this programme on the basis of the National Education Policy 2023 which critically envisions a brand-new holistic education system for the country, hinging on the effective adoption of modern teaching and training methods, application of technology, and imparting practical and contemporary skills, to shape the overall personality of students. Our programme is designed to equip students with a strong foundation in Artificial Intelligence and Machine Learning. In today's digital age, these technologies are at the forefront of technological advancements, driving innovation across various industries including healthcare, finance, transportation, and entertainment.

The Programme in Artificial Intelligence and Machine Learning is designed with the objective of equipping the students to cope with the emerging trends and challenges in the field of Artificial Intelligence and Machine Learning and interrelated disciplines data science, data analytics, big data and intelligent systems. This programme involves various courses such as Value-added courses, Skill enhancement courses, multi-disciplinary courses and ability enhancement courses with an attribution of discipline specific core, discipline specific electives and various scholastic and co scholastic domains. This programme aims at helping the students define and recharge their creative, analytical, problem-solving, and critical thinking abilities, topped by actively pursuing digital literacy.

The B.Sc.Artificial Intelligence and Machine Learning Honours program emphasizes a strong theoretical foundation complemented by extensive laboratory experience. Students will engage in hands-on experiments that reinforce classroom learning and develop critical technical skills. Through practical work, they will learn to design application programmes, softwares, and analyse data, thus bridging the gap between theory and practice. For those opting for the BSc Artificial Intelligence and Machine Learning Honours with Research track, the program offers an enriched experience with a significant focus on independent research. This track is designed for students who wish to delve deeper into specific areas of interest, culminating in a research thesis. Under the mentorship of faculty members, students will undertake original research projects, honing their ability to conduct scientific inquiries, think critically, and contribute to the body of knowledge in Computer Science. This rigorous training prepares graduates for careers in academia, research institutions, and industry. 2 The successful revision of this curriculum would not have been possible without the collective efforts and inputs from the BOS members, Ad hoc committee members, Computer Science academic council member, resource persons and the unwavering support of Computer Science faculty members from the

affiliated colleges. Their dedication and expertise have played an instrumental role in shaping a curriculum that is relevant, up-to-date, and consistent with international scholarly criteria.

We wish you to have a motivating atmosphere to make use of your extreme potential and caliber to complete this programme and to serve the nation by enriching yourself.

BEST WISHES

INTRODUCTION

Kannur University - Four-Year Undergraduate Programme: Backdrop and Context

The implementation of the Four-Year Undergraduate Programme (FYUGP) has been driven by the pressing need to address contemporary challenges ensuring responsive changes to the evolving needs of students, industry, and society at large. Recognizing the curriculum as the cornerstone of any education system, it requires regular refinement to align with evolving socioeconomic factors. Higher education must provide students with practical and technical skills relevant to their fields of interest, necessitating the development of a job-oriented curriculum. Despite significant increases in access and expansion of higher education over the years, concerns persist regarding the quality and relevance of educational outcomes, particularly in terms of employability skills. As the world becomes increasingly interconnected, our education system must evolve to instil 21st-century skills, enabling students not only to survive but to thrive in this dynamic environment. Moreover, there is a growing need for higher education institutions to embrace social responsibility and contribute to the development of a knowledge society capable of driving sustainable development through innovation. With the central objective of fostering a robust knowledge society to support a knowledge economy, the Government of Kerala has initiated steps to reform higher education. Accordingly, three commissions were established to suggest reforms in higher education policy, legal and regulatory mechanisms, and evaluation and examination systems. It is within this context that a comprehensive reform of the undergraduate curriculum has been proposed, leading to the restructuring of the Four-Year Undergraduate Programme (FYUGP).

VISION AND MISSION OF KANNUR UNIVERSITY

Vision:

To establish a teaching, residential and affiliating University and to provide equitable and justaccess to quality higher education involving the generation, dissemination and a critical application of knowledge with special focus on the development of higher education in Kasargod and Kannur Revenue Districts and the Manandavady Taluk of Wayanad Revenue District.

Mission:

- To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher education and to cater to the modern notions of equity, social justice, and merit in all educational endeavours.
- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative, and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region’s intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as nongovernmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

PROGRAMME OUTCOME

PO1	**Critical Thinking and Problem-Solving**-Apply critical thinking skills to analyze information and develop effective problem-solving strategies for tackling complex challenges.
PO2	**Effective Communication and Social Interaction**-Proficiently express ideas and engage in collaborative practices, fostering effective interpersonal connections.
PO3	**Holistic Understanding**-Demonstrate a multidisciplinary approach by integrating knowledge across various domains for a comprehensive understanding of complex issues.
PO4	**Citizenship and Leadership**-Exhibit a sense of responsibility, actively contribute to the community, and showcase leadership qualities to shape a just and inclusive society
PO5	**Global Perspective**-Develop a broad awareness of global issues and an understanding of diverse perspectives, preparing for active participation in a globalized world.
PO6	**Ethics, Integrity and Environmental Sustainability**-Uphold high ethical standards in academic and professional endeavours, demonstrating integrity and ethical decision-making. Also acquire an understanding of environmental issues and sustainable practices, promoting responsibility towards ecological well-being

PROGRAMMESPECIFIC OUTCOMES

PSO1	**Strong Foundation in Computer Science**: Develop a solid understanding of core computer science concepts; including programming, algorithms, data structures, and software engineering, to establish a strong technical base for advanced learning.
PSO2	**Knowledge and Application of AI & ML**: Apply advanced concepts of artificial intelligence and machine learning to design effective solutions for real-world problems across diverse domains such as healthcare, finance, agriculture, and robotics.
PSO3	**Technical Skills and Tools:** Gain proficiency in modern programming languages (such as Python, R, and Java), software tools, and frameworks essential for developing and implementing both computer science and AI/ML applications
PSO4	**Analytical and Problem-Solving Skills**: Develop the ability to analyze complex problems, work with large and varied data sets, extract meaningful insights, and build predictive models to support intelligent, data-driven decision-making.
PSO5	**Research, Innovation, and Ethical Responsibilities**: Demonstrate the capacity to engage in research and innovation to address societal and industrial challenges using AI and ML, while upholding professional ethics, social responsibility, and legal standards.
PSO6	**Lifelong Learning and Teamwork**: Commit to continuous learning to stay updated with rapidly evolving technologies in computer science and AI, and develop the ability to work effectively both independently and collaboratively as a member or leader of multidisciplinary teams.

PSO-PO MAPPINGMATRIX

	PO1	PO2	PO3	PO4	PO5	PO6
PSO1	3	1	3	1	2	1
PSO2	3	1	3	1	2	3
PSO3	3	1	3	1	2	1
PSO4	3	1	3	1	2	1
PSO5	3	1	3	3	3	3
PSO6	3	1	3	3	3	3

STRUCTURE OF THE PROGRAMME

The Programme of instruction will consist of Lecture courses, Practical courses,comprehensive Viva-voce, Seminar, internship/ industrial visit, and Project work.

1. Lecture courses: Courses involving lectures relating to a field or discipline by a facultymember

2. Tutorial courses: Courses involving problem-solving and discussions relating to a fieldor discipline under the guidance of qualified personnel in a field of learning,

3. Laboratory work: A course requiring students to participate in a project or practical orlab activity that applies previously learned/studied principles/theory related to the chosen fieldof learning, work/vocation, or professional practice under the supervision of an instructor.

4. Comprehensive Viva-voce: This is an essential assessment included in the Programmeto evaluate the student's grasp of the subject matter and their ability to apply their knowledgeas defined in the course outcomes. It also provides an opportunity for the student to engage inacademic discussions and receive valuable feedback from experts in the field.

5. Seminar:A course requiring students to participate in structureddiscussion/conversation or debate focused on assigned tasks/readings, current or historicalevents, or shared experiences guided or led by an expert or qualified personnel in a field oflearning

6. Internship/ Institutional visit: All students shall undergo a Field Trip/SummerInternship/Apprenticeship in a Firm, Industry or Organization; or Training in labs with facultyand researchers or other Higher Education Institutions (HEIs) or research institutions.

Departments can actively promote internships that can eventually lead to research project work.Institutional visit incorporating institutional or industrial visits in the Programme bringsimmense value to the students, making their learning journey more enriching and preparingthem for successful careers in Computer science-related fields.

7. Research Project: These students who have opted for the honours with research shouldcomplete a research project under the guidance of the mentor and should submit a researchreport for evaluation. They need to successfully defend the research project to obtain 12 creditsunder a faculty member of the University/College. The research shall be in the Major discipline

COURSE STRUCTURE

Course and Credit Structure for Different Pathways

Course Distribution for Students in Semesters I – VI

(1) ***Single Major***: The 6 courses together in B and C can be in different disciplines.

(2) ***Major with Multiple Disciplines***: B and C represent two different disciplines.

(3) ***Major with Minor***: B and C represent the same Minor discipline.

Semester	Course Code	Course Title	Hours/ Week	Credit	Mark
1	KU1AECENGXXX	Ability Enhancement Course 1 (English)	4	3	75
	KU1AECXXXXXX	Ability Enhancement Course 2 (Additional Language)	3	3	75
	KU1MDCXXXXXX	Multi-Disciplinary Course 1	3	3	75
	KU1DSCCSCXXX	Major 1	5	4	100
	KU1DSCXXXXXX	Minor 1	4/5	4	100
	KU1DSCXXXXXX	Minor 2	4/5	4	100
		Total	**23/25**	**21**	**525**
2	KU2AECENGXXX	Ability Enhancement Course 3 (English)	4	3	75
	KU2AECXXXXXX	Ability Enhancement Course 4 (Additional Language)	3	3	75
	KU2MDCXXXXXX	Multi-Disciplinary Course 2	3	3	75
	KU2DSCCSCXXX	Major 2	5	4	100
	KU2DSCXXXXXX	Minor 3	4/5	4	100
	KU2DSCXXXXXX	Minor 4	4/5	4	100
		Total	**23/25**	**21**	**525**

3	KU3MDCXXXXXX	Multi-Disciplinary Course 3 (Kerala Studies)	3	3	75
	KU3VACXXXXXX	Value Added Course 1	3	3	75
	KU3DSCCSCXXX	Major 3	4	4	100
	KU3DSCCSCXXX	Major 4	5	4	100
	KU3DSCXXXXXX	Minor 5	4/5	4	100
	KU3DSCXXXXXX	Minor 6	4/5	4	100
		Total	**23/25**	**22**	**550**
4	KU4SECCSCXXX	Skill Enhancement Course 1	3/4	3	75
	KU4VACXXXXXX	Value Added Course 2	3	3	75
	KU4VACXXXXXX	Value Added Course 3	3	3	75
	KU4DSCCSC208	Major 5- Database Management System	5	4	100
	KU4DSCCSC209	Major 6- Data Structures	5	4	100
	KU4DSCCSC210	Major 7- Operating Systems	4	4	100
		Total	**23/24**	**21**	**550**
5	KU5SECAIMXXX	Skill Enhancement Course 2	3/4	3(2T+ 1P)	75
	KU5DSCAIM301	Major 8- Python Programming	5	4(3T+ 1P)	100
	KU5DSCAIM302	Major 9- Fundamentals of Artificial Intelligence	5	4(3T+ 1P)	100
	KU5DSCAIM303	Major 10- Natural Language Processing	4	4	100
	KU5DSEAIMXXX	Elective Course 1 in Major	4	4	100

	KU5DSEAIMXXX	Elective Course 2 in Major	4	4	100
	KU5INTERN301	Internship		2	50
	Total		**25**	**25**	**625**

ASSESSMENT AND EVALUATION

- The assessment shall be a combination of Continuous Comprehensive Assessment (CCA) and an End Semester Evaluation (ESE)
- As per the regulation of Kannur University, one credit corresponds to 25 marks. Hence a 3-credit course must be evaluated for 75 marks and 4 credit courses for 100 marks. The ratio of continuous comprehensive assessment (CCA) to End semester examination (ESE) for theory/lecture courses is 30:70 and for the practical courses, it is 35:65
- The 4-credit courses (Major and Minor courses) and 3 credit (Foundational Courses) are of two types:

(i) Courses with only theory

(ii) Courses with 3-credit theory and 1-credit practical.

- In 4-credit courses with only theory component, out of the total 5 modules of the syllabus, one teacher specific module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated.
- In 4-credit courses with 3-credit theory and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical.
- The 3 credit courses (Foundational Courses) are of two types:

(i) Courses with only theory

(ii) Courses with 2-credit theory and 1-credit practical.

- In 3-credit courses with only theory component, out of the total 5 modules of the syllabus, one teacher specific module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated.
- In 3-credit courses with 2-credit theory and 1-credit practical components, out of the total5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical.
- Continuous Evaluation includes assignments, seminars, periodic written examinations, or other measures as proposed in the syllabus and approved by the university.

Practical Exams

- The end-semester practical examination and viva-voce, and the evaluation of practical records shall be conducted by the course in-charge and an internal examiner appointed by the Department Council. Duration of ESE may be 2 to 2.5 Hrs.
- There shall be a Continuous Evaluation of practical courses conducted by the Course- In-Charge.

- The process of continuous evaluation of practical courses shall be completed before 10 days from the commencement of the end-semester examination.
- Those who passed in continuous evaluation alone will be permitted to appear for the end semester examination and viva-voce.

Mark Distribution for Discipline Specific Courses and Foundation Courses

Course Credit	Credit		Mark		L		P		
	L	P	L	P	CCA (30%)	ESE (70%)	CCA (40%)	ESE (60%)	Total marks
4	4	0	100	0	30	70	0	0	100
	3	1	75	25	25	50	10	15	100
	L	P	L	P	CCA (30%)	ESE (70%)	CCA (60%)	ESE (40%)	Total marks
3	3	0	75	0	25	50	0	0	75
	2	1	50	25	15	35	15	10	75

L – Lecture/Theory , P – Practical/Practicum components, CCA – Continuous Comprehensive Assessment, ESE – End Semester Evaluation

The detailed distribution table with the components

- 4 Credit Course (Theory only)

Evaluation Type		Marks
ESE		70
CCA		30
a)	*Test Paper	10
b)	**Assignment/ Book- Article Review	10
c)	Seminar/ Viva –Voce	10
Total		100

- 4 Credit Course (3 credit theory + 1 credit practical)

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			75	Practical			25	100
a)	ESE		50	a)	ESE		15	
b)	CCA		25	b)	CCA		10	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/ Book-Article review	10		ii	Skill	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

- 3 Credit Course (Theory only)

Evaluation Type		**Marks**
ESE		50
CCA		25
a)	*Test Paper	10
b)	**Assignment/ Book- Article Review	5
c)	Seminar/ Viva –Voce	10
Total		75

- 3 Credit Course (2 credit theory + 1 credit practical)

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			50	Practical			25	100
a)	ESE		35	a)	ESE		10	
b)	CCA		15	b)	CCA		15	
	i	*Test Paper	8		i	Punctuality	5	
	ii	**Book-Article review/ Assignment	2		ii	Skill	5	
	iii	Seminar/ Viva-Voce	5		iii	Record	5	

* Best out of two test papers

** Or any other evaluation technique like quiz, open book exam, groupactivity

EXTERNAL EVALUATION

- Examinations will be conducted at the end of each semester. The students can write the external examinations in Computer science in both English and Malayalam languages.
- Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system.

Letter Grade	Grade Point(P)
O(Outstanding)	10
A+(Excellent)	9
A(Very Good)	8
B+(Good)	7
B(Above Average)	6
C(Average)	5
P(Pass)	4
F (Fail)	0
Ab(Absent)	0

- A minimum of grade point 4 (Grade P) is needed for the successful completion of a Course.
- A student who has failed in a Course can reappear for the End Semester Examination of the same Course along with the next batch without taking re-admission or choose another Course in the subsequent Semesters of the same programme to acquire the minimum credits needed for the completion of the programme.
- There shall not be provision for improvement of CE and ESE.
- A student who has successfully completed the CE requirements in a subsequent semester can also appear for the ESE subject to the maximum duration permitted.

Computation of SGPA and CGPA

The following method is recommended to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of

all the courses undergone by a student, i.e. SGPA (Si) = Σ(Ci x Gi) / ΣCi Where Ci is the number of credits of the course and Gi is the grade point scored by the student in the course.

Example:

Semester	**Course**	**Credit**	**Letter Grade**	**Grade point**	**Credit Point (Credit x Grade)**
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	B	6	3 X 6 = 18
I	Course 4	3	O	10	3 X 10 = 30
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	B	6	4 X 6 = 24
		20			139
SGPA					139/20=6.95

- The Cumulative Grade Point Average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e. CGPA = Σ(Ci x Si) / Σ Ci Where Si is the SGPA of the semester and Ci is the total number of credits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. Transcript (Format): Based on the above recommendations on Letter grades, grade points and SGPA and CCPA, the HEIs may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

Example:

Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI
Credit: 21 SGPA: 6.9	Credit: 21 SGPA: 7.8	Credit: 22 SGPA: 5.6	Credit: 24 SGPA: 6.0	Credit: 23 SGPA: 6.3	Credit: 22 SGPA: 8.0
CGPA=(21 x 6.9 + 21 x 7.8 + 22 x 5.6 + 24 x 6.0 + 23 x 6.3 + 22 x 8.0) / 133 = 6.74					

- The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of

all the courses undergone by a student, i.e. SGPA (Si) = Σ(Ci x Gi) / ΣCi Where Ci is the number of credits of the course and Gi is the grade point scored by the student in the course.

CGPA	Overall letter Grade
9.5 and above	O
8.5 and above but less than 9.5	A+
7.5 and above but less than 8.5	A
6.5 and above but less than 7.5	B+
5.5 and above but less than 6.5	B
4.5 and above but less than 5.5	C
4.0 and above but less than 4.5	D
Less than 4.0	F

Appearance for Continuous Evaluation (CE) and End Semester Examination (ESE) are compulsory, and no Grade shall be awarded to a candidate if the candidate is absent for CE or ESE or both.

Credit Distribution of Course

Sl.No.	Categorization of Courses for all Programs	Minimum Number of Credit required	
		3Year UG	4Year UG
1	Major (Core)	68	88*
2	Minor	24	36
3	Multi-disciplinary	9	9
4	Skill Enhancement Courses(SEC)	9	9
5	Ability Enhancement Course(AEC)	12	12
6	Value Added Courses Common for all UG	9	9
7	Summer Internship, field based. Learning etc.	2	2
8	Research Project/Dissertation		12
	Total Credits	133	177

OURSES	**CREDITS**	**SEMESTERS**

Major / Minor Stream (DSC/DSE)	92 (4 credit courses)	Within all six semesters
Multidisciplinary Courses (MDC)	9 (3 credit three courses)	Semester 1 to 6
Skill Enhancement Courses (SEC)	9 (3 credits three courses)	Semester 1 to 6
Value Addition Courses (VAC)	9 (3 credits three courses)	Semester 1 to 6
Ability Enhancement Courses (AEC)	12 (3 Credits 4 courses)	Semester 1and 2
Internship / Field Visit	2 (2 credit courses)	Semester 1 to 6
Total credits for first six semesters	133	
COURSES	CREDITS	SEMESTERS
Major / Minor Stream (DSC/DSE)	24 (4 credit courses)	Semester 7
Additional DSC / DSE for Honours (in Major discipline)	12 Credits (2DSC and 1DSE in the Major)	Semester 8
Project	12 Credits	Semester 8
MOOC / ONLINE COURSES (Blended Mode)	8 (4 credits 2 courses)	Semester 7 and 8
Total credits for Semester 7 and 8	44*	

*For Honours with Research 12 Credits Project in Semester 8 and for Honours additional 12 credits DSC / DSE in Semester 8 which should include Capstone level courses

*AEC- Ability Enhancement Course, DSC- Discipline Specific Course, SEC- Skill Enhancement Course, VAC- Value Added Course, DSE- Discipline Specific Elective

LIST OF COURSES OFFERED

MULTIDISCIPLINARY COURSE (MDC)

Semester	Course Code	Title of the Course	Credit	Hours/ week	Hour Distribution/ week				Marks
					L	T	P	O	
1	KU1MDCCSC101	Essentials of Computing	3	3	3		0		75
	KU1MDCCSC102	Basics of Information Storage and Retrieval System	3	3	3		0		75
	KU1MDCCSC103	Digital Marketing	3	3	3		0		75
2	KU2MDCCSC104	Fundamentals of Web Technology	3	3	3		0		75
	KU2MDCCSC105	Digital Office Management	3	3	3		0		75
	KU2MDCCSC106	Introduction to Data Science	3	3	3		0		75

VALUE ADDED COURSE (VAC)

Semester	Course Code	Title of the Course	Credit	Hours/ week	Hour Distribution/ week				Marks
					L	T	P	O	
3	KU3VACCSC101	Cyber Laws and Rules	3	3	2		1		75
	KU3VACCSC102	Cyber Ethics	3	3	3		0		75
	KU3VACCSC103	Data Analytics Using R	3	3	2		1		75
4	KU4VACCSC104	Ethical Hacking	3	3	2		1		75
	KU4VACCSC105	Intellectual Property Rights	3	3	3		0		75
	KU4VACCSC106	Information Storage Management	3	3	3		0		75
	KU4VACCSC107	Information Security	3	3	3		0		75
	KU4VACCSC108	Social Media Management	3	3	3		0		75

SKILL ENHANCEMENT COURSE (SEC)

Semester	Course Code	Title of the Course	Credit	Hours/ week	Hour Distribution/ week				Marks
					L	T	P	O	
4	KU4SECCSC101	Computer hardware & networking	3	3	2		2		75
	KU4SECCSC102	Cyber ethics	3	3	3		0		75
	KU4SECCSC103	Data analytics using Excel	3	3	2		2		75
	KU4SECCSC104	Low-Code Application Development	3	3	2		2		75
	KU4SECCSC105	Basic Web Designing and Development	3	3	2		2		75
5	KU5SECAIM106	No-SQL Data Base	3(2T+ 1P)	3	2		2		75
	KU5SECAIM107	Linux and Shell Programming	3(2T+ 1P)	3	2		2		75

DISCIPLINE SPECIFIC COURSES (DSC)

Semester	Course Code	Title of the Course	Credit	Hours/ week	Hour Distribution/ week				Marks
					L	T	P	O	
1	KU1DSCCSC101	Fundamentals of Programming with C	4	5	4		1		100
	KU1DSCCSC102	Introduction to major trends in information technology	4	5	4		1		100
	KU1DSCCSC103	Fundamentals of Computers and Programming	4	5	4		1		100
	KU1DSCCSC104	Office Automation Software	4	5	4		1		100
	KU1DSCCSC105	Introduction to Web Programming	4	5	4		1		100

	KU1DSCCSC106	AI in Daily life	4	5	4		1		100
	KU1DSCCSC107	Essentials of Information Technology.	4	5	4		1		100
2	KU2DSCCSC108	Advanced Programming with C	4	5	4		1		100
	KU2DSCCSC109	Data Management Platform	4	5	4		1		100
	KU2DSCCSC110	Principles of programming using C	4	5	4		1		100
	KU2DSCCSC111	Multimedia and Graphics Designing	4	5	4		1		100
	KU2DSCCSC112	Basics of Data Analytics	4	5	4		1		100
3	KU3DSCCSC201	Object Oriented Programming Using Java	4	5	4		1		100
	KU3DSCCSC202	Digital Systems	4	4	4		0		100
	KU3DSCCSC203	Python for Data Analytics	4	5	4		1		100
	KU3DSCCSC204	Basics of object Oriented Programming using C++	4	5	4		1		100
	KU3DSCCSC205	RDBMS	4	5	4		1		100
	KU3DSCCSC206	Introduction to Machine Learning	4	5	4		1		100
	KU3DSCCSC207	Content management System	4	5	4		1		100
4	KU4DSCCSC208	Database Management System	4	5	4		1		100
	KU4DSCCSC209	Data Structures	4	5	4		1		100
	KU4DSCCSC210	Operating Systems	4	4	4		0		100
5	KU5DSCAIM301	Python Programming	4(3T+1P)	5	3		2		100
	KU5DSCAIM302	Fundamentals of Artificial Intelligence	4(3T+1P)	5	3		2		100
	KU5DSCAIM303	Natural Language Processing	4	4	4		0		100

DISCIPLINE SPECIFIC ELECTIVE (DSE)

Semester	**Course Code**	**Title of the Course**	**Credit**	**Hours/week**	**Hour Distribution/ week**				**Marks**
					L	**T**	**P**	**O**	

5	KU5DSEAIM301	Software Engineering	4	4	4		0		100
	KU5DSEAIM302	Digital Image Processing	4	4	4		0		100
	KU5DSEAIM303	Fundamentals of Cloud Computing	4	4	4		0		100

SKILL ENHANCEMENT COURSE

KU5SECAIM106: NO-SQL DATA BASE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	100-199	KU5SECAIM106	3(2+1)	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	2		25	50	75	1.5 Hrs

Course Description:

The course will provide students with an introduction, overview and history of NoSQL databases (non-relational databases). The four types of NoSQL databases (e.g. Document-oriented, Key-Value Pair, Column-oriented and Graph) will be explored in detail.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain and compare different types of NoSQL Databases	U
2	Compare and contrast RDBMS with different NoSQL database	An
3	Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases	U/A
4	Explain performance tune of Key-Value Pair NoSQL databases	U

Remember(R), Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3			
CO2	3	2	3			
CO3	3	2	3			
CO4	3	2	3			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	Introduction to NoSQL		12
	1	Overview and history of NoSQL databases, definition of the four types of NoSQL databases,	
	2	Value of Relational Databases, Getting at Persistent Data-Concurrency, Integration, Impedance Mismatch	
	3	Application and Integration Databases, Emergence of NoSQL ,Key points	
2	NoSQL and Relational Databases		12
	1	Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j.Use and deployment	
	2	Application, RDBMS approach, Challenges, NoSQLapproach – Key Value and Document Data Models , Column-Family Stores, Aggregate-Oriented Database	
	3	Replication and sharing, MapReduce on databases. Distribution Models, Single Server, Sharing	
	4	Master-Slave Replication, Peer-to-Peer Replication, Combining Sharing and Replication	
3	NoSQL Key/Value Column oriented databases		12
	1	NoSQL Key/Value databases using MongoDB , Document Databases, Features, Consistency, Transactions, Availability.	

	2	Query Features, Scaling, Complex transactions, Suitable Use Cases, Event Logging	
	3	Spanning different operations, queries against varying aggregate structures	
4	Column-oriented NoSQL databases using Apache HBASE		12
	1	Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE	
	2	Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, scaling	
	3	Content Management Systems, BloggingPlatforms	
5	Teacher Specific Module		
	Use various NoSql databases for data processing		12

Essential Readings:

1. Sadalage P.& Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1stEdition ,2019.
2. Redmond, E. & Wilson, Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement Edition. 1st Edition.

Assessment Rubrics

EVALUATION TYPE		**MARKS**
End Semester Evaluation		50
Theory		35
Practical		15
a)	Code Writing	8
b)	Execution without error	5
c)	Viva	2
Continuous Evaluation		25
Theory		15
	Test Paper-1	5
	Model Examination	5
	Assignment/Viva	5
Practical		10

	Model Exam	5
	Record	2
	Punctuality and lab performance	3
TOTAL		75

KU5SECAIM107: LINUX AND SHELL PROGRAMMING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	100-199	KU5SECAIM107	3(2+1)	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	2		25	50	75	1.5 Hrs

Course Description:

The Linux and Shell Programming course is designed to familiarize students with the free and open source software, specially Linux operating system, service configuration management, application software, and development tools..

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand various open source softwares	U
2	Understand the features of Linux OS	U
3	Use various Linux commands	U/A
4	Execution of shell programming	A

**Remember(R), Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2		3			
CO2	2		3			
CO3	2		3			
CO4	2		3			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	Introduction to Open source software		12
	1	Concepts, Features, benefits over proprietary software, examples	
	2	Free software: concepts, features, advantages, Free software Vs Open Source software	
	3	Free and Open Source Software (FOSS), Four essential freedoms, Free software movements, free software foundation (FSF) ,history, Policies ,GPL, free operating systems	
2	Introduction to Linux Operating System		12
	1	Features , History, Various Linux distributions	
	2	Linux architecture, kernel and shell- Linux desktop environments- GNOME and KDE,	
	3	Linux File System and Directories, types of files, Installing and Configuring Linux, File access permissions	
3	Linux Commands		12
	1	Date, time, who, echo, man, info, cal, pwd, more, less, head, tail, chmod	
	2	mkdir, cd, cp, mv, rm, touch, sort, wc, cut, cat with options, ls with options , grep with options,	
	3	Mounting the file system, command line processing etc. Types of editors, in Linux, Introduction to vi editor, modes in vi editor, common vi editor	
	4	Commands for open a file, save a file, delete a file, quit a file etc	

4	Shell Programming		12
	1	Introduction to Linux Shell and Shell Scripting, types of shells in Linux, steps in creating a shell script, write and run shell scripts	
	2	Shell variables and printing, deleting shell variable	
	3	Script permissions and names, scripting guidelines, adding shell comments, shell variables	
	4	Constants, operators, conditional statements, looping statements	
5	Teacher Specific Module		
	Familiarize commands in Linux Shell scripts for simple operations		12

Essential Readings:

1. Christopher Negus, Red Hat Linux 9 Bible, WILEY-Dream tech,New Delhi,
2. Thomas Schenk, Red Hat Linux System Administration, Tech media, New Delhi, 2003
3. Raymond, E. S. (2009). The Art of UNIX Programming, 3rd Edition, Pearson Education.
4. Wood, P., Kochan, S. G. (2016), Shell Programming in Unix, Linux and OS X, 4th edition, Pearson Education. .
5. Kanetkar, Y. P. (2003), UNIX Shell Programming, 1st Edition, BPB Publications.
6. Forouzan, B. A., Gilberg, R. F. (2003), UNIX and Shell Programming, 1st Edition, Cengage Learning India

Assessment Rubrics

EVALUATION TYPE		**MARKS**
End Semester Evaluation		50
Theory		35
Practical		15
a)	Code Writing	8
b)	Execution without error	5
c)	Viva	2
Continuous Evaluation		25
Theory		15
	Test Paper-1	5
	Model Examination	5
	Assignment/Viva	5
Practical		10

	Model Exam	5
	Record	2
	Punctuality and lab performance	3
TOTAL		75

INTERNSHIP

KU5INTERN301: INTERNSHIP

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	INTERNSHIP	300-399	KU5INTERN301	2	90-120

Learning Approach(Hours/ Week)			Marks Distribution			Duration ofESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
	90-120	-	15	35	50	-

Course Description:

Internship is a practical, hands-on program designed to bridge the gap between academiclearning and real-world business operations, focusing on applying theoretical concepts,developing essential skills like teamwork and problem-solving and providing exposure toindustry functions, structures, and activities. Students gain practical experience throughspecific projects and are expected to produce a final report and presentation on theirexperiences and contributions.

Guidelines for Internship

- All students should undergo Internship of 2-credits during the first six semesters in a firm, industry or organization, or training in labs with faculty and researchers of their own institution or other Higher Educational Institutions (HEIs) or research institutions.

- Internship can be for enhancing the employability of the student or for developing the research aptitude.
- Internship can involve hands-on training on a particular skill/ equipment/ software. It can be a short project on a specific problem or area. Attending seminars or workshops related to an area of learning or skill can be a component of Internship.
- A faculty member/ scientist/ instructor of the respective institution, where the student does the Internship, should be the supervisor of the Internship.
- Internship can be in Artificial Intelligence or allied disciplines.
- There should be minimum 120 hrs. of engagement from the student in the Internship.
- Summer vacations and other holidays can be used for completing the Internship.
- In BSc. Artificial Intelligence and Machine Learning Honours programme, institute/ industry visit or study tour can be part of Internship. Visit to national research institute, research laboratory and place of scientific importance should be part of the study tour. A brief report of the study tour has to be submitted with photos.
- The students should make regular and detailed entries in to a personal log book through the period of Internship. The log book will be a record of the progress of the Internship and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Internship supervisor should periodically examine and countersign the log book.
- The log book and the report must be submitted at the end of the Internship.
- The institution at which the Internship will be carried out should be prior-approved by the Department Council of the College where the student has enrolled for the UG Honours programme.

Internship Duration and Completion

a. Students may secure internships through the Internship Kerala Portal, managed by the Kerala State Higher Education Council (KSHEC). Internships offered through Central/State Govt. portals for offering internship/ apprenticeship/ skill development/ training programmes shall also be considered as equivalent to internship courses

b. Private Sector Requirements: If the Internship Provider Organization (IPO) is from the private sector, the following conditions must be met.

i. Experience: Private organizations must have a minimum of 10 years of operational experience in their respective fields.

ii. Documentation: To ensure academic standards, colleges are advised to establish a Memorandum of Understanding (MoU) with these organizations, clearly outlining the scope and details of the internship.

c. Following conditions shall be followed for research-focused internship

i. Host Institution: Research internships may be undertaken at any recognized higher education institution (not their parent institute), university department (not their parent department), research laboratory, or industry facility, provided the host possesses the requisite infrastructure for the proposed study.

ii. Students are also permitted to utilize Centers of Excellence or laboratories facilitated by State or Central Government agencies, including those within their parent institution.

d. There should be a minimum 120 hrs. of engagement for the students of BSc. Artificial Intelligence and Machine Learningin the Internship.

e. Summer vacations and other holidays can be used for completing the Internship.

f. In the BSc Artificial Intelligence & Machine Learning Honours program, institute/ industry visit or study tour can be part of Internship. Visit to national research institutes, research laboratories and places of scientific importance should be part of the study tour. A brief report of the study tour has to be submitted with photos.

g. Extensions and Deadline Compliance: While the standard requirement is to complete the internship before the end of the Fifth Semester, the following exceptions apply

i. Extensions: In unavoidable circumstances, a student may be permitted to complete the internship before the end of the Sixth Semester, subject to prior formal permission from the University.

ii. Mandatory Registration: Regardless of when the internship is physically completed, all students must register for the internship course during the Fifth Semester course registration period. Failure to register during this window may result in a delay in credit awarding.

Nature and Continuity of Work

a. The internship should be relevant to the field of Computer Applications / IT. The institution at which the Internship will be carried out should be prior-approved by the Department Council of the College where the student has enrolled for the UG Honours program.

b. Students are encouraged to select work that can be extended into their final year project.

c. The work undertaken should demonstrate practical application of technical skills such as programming, data analysis, web development, cybersecurity, etc.

d. If deemed necessary, the Internship Supervisor is authorized to visit the internship sites to physically verify the nature of the work and monitor student performance.

Weekly Reporting and Guidance

a. A faculty member in the department shall be assigned as an Internship Supervisor for each student at the beginning of the academic year by the Department for monitoring and supervising the student during the internship. In exceptional cases, a full time Post Doctoral Fellow in the department can also be the Internship Supervisor. Their duties include:

i. Mentorship: Guiding students in identifying interest areas and suitable internship placements.

ii. Monitoring: Supervise and monitor student progress throughout the internship period.

iii. Documentation: Maintaining records of the organization's consent, the Internship Mentor's evaluation report, and the student's final report.

iv. Evaluation: Conducting internal assessments and arranging examiners for the Viva Voce examination.

v. Coordination: It is recommended that the Supervisor conduct at least one formal meeting (online or offline) with the external Internship Mentor during the program

b. Each student must report to their assigned faculty guide on a weekly basis to update on the progress of the work. Updates should include:- skills/tools learnt/implemented, tasks completed during the week, challenges faced and learning outcomes. Regular interaction with the guide is mandatory to ensure proper direction and progress

Work Documentation (Log Book)

a. There shall be a designated Internship Mentor at the institute/organisation where the Internship is offered, who should monitor the regularity and performance of the student.

b. The students should make regular and detailed entries, Daily activities, Hours worked Skills acquired etc., into a personal log book/work book throughout the period of Internship. The log book/work book must be regularly signed and verified by the internship mentor/ authority at the organization.

c. The log book/work book will be a record of the progress of the Internship and the time spent on the work, and it will be useful in writing the final report. Refer the appendix for the format of the register

Log Bok/ Work Book Format

Maintain a 100 page notebook for the Log book/Work book

First Page

- Student Name
- Register Number
- Year & Semester
- Internship Title

- Organization Name, Address
- Duration (From – To)
- Internship Supervisor in the College
- Internship Mentor in the Organization, Name, designation and Contact

Second Page: Internship Details

- Organization short profile - one paragraph
- Department and work assigned for you
- Internship objectives
- Technologies/tools learnt/used
- Scope of work

Daily Work Log Format

Use the following structure for each day in a separate page:

Date :

Task Assigned :

Work Done - Description:

Tools / Technologies Used/Learnt:

Learning Outcome:

External Guide/Authority Signature:

Example Entries

Date: 06-04-2026

Task Assigned: Develop user input module for database

Work Done - Description: Created a Python script to accept user input (ID, name, age, course) and insert data into MySQL table. Implemented input validation and exception handling.

Tools/Technologies Used/Learnt: Python, MySQL, MySQL Connector

Learning Outcome: Learned dynamic user input handling, validation, and database insertion using Python

External Guide/Authority Signature:

Last Page - After completing the internship

1. Description about the technical skills gained

- Programming languages used/learnt
- DBMS used/learnt
- Tools used/learnt
- Frameworks used/learnt

2. Description about the soft skills developed

- Communication and Teamwork
- Time management
- Meeting the Deanlines
- Timely Submission of the work

3. Brief Report about the work

Final Submission Requirements

a. Students must submit the following upon completion:

i. Internship Report (well-documented and structured)

1. The report must include the following components:

a. Cover Page:

Title of the internship, Student's Name, University Register Number, Academic Year, and the names of the College and Department.

b. Declaration: A signed statement of authenticity by the student.

c. Official Certificate: The original certificate signed by the Head of the Internship Institution.

d. Table of Contents

e. Content Body: A detailed account of the work performed, total duration of the engagement, and the specific learning outcomes achieved.

ii. Internship Log book/Workbook register (day-wise) duly signed by the authority

iii. Completion Certificate (provided by the organization)

Evaluation Criteria

a. The internship will be evaluated based on:

i. Completion of required hours

ii. Quality and relevance of work

iii. Regular reporting and discipline

iv. Documentation and record maintenance

v. Report and work/project presentation and demonstration

b. The credits and marks for the Internship will be awarded only at the end of sixth semester

c. The evaluation of Internship shall be done internally through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours program.

d. There shall be no provision for improvement of marks once the internship evaluation is finalized

e. To be valid for university records, the Internship Report must be formally signed by the Internship Supervisor and the Head of the Department.

f. The internship shall be evaluated internally by a committee constituted by the Head of the Department (HoD), employing assessment methods appropriate to the nature of the internship.

g. The Internship supervisor shall provide a performance rating on a scale of A (Excellent), B (Good), C (Average), and D (Poor), which will serve as the basis for awarding marks and credits. Marks and credits shall be assigned based on this grading scale. The official award of credits and marks shall be recorded only upon the conclusion of the Fifth Semester.

General Instructions

a. Students must maintain professional conduct throughout the internship and adhere to the rules and policies of the organization.

b. Must ensure originality in work, plagiarism or misconduct will lead to disqualification.

c. Any issues or changes must be immediately reported to the internal supervisor

Evaluation of Internship

- The evaluation of Internship shall be done internally through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours programme.
- The credits and marks for the Internship will be awarded only at the end of semester 6.

The scheme of CCA and ESE is given below:

Components of Evaluationof Internship	Weightage	Marks for Internship 2 Credit/50 Marks
Continuous ComprehensiveAssessment (CCA)	30%	15
End Semester Evaluation	70%	35

The detailed distribution table with the components

Evaluation Type		**Marks**
ESE		35
a)	Acquisition of skill	20
b)	Report	15
CCA		15
a)	Punctuality	5
c)	Logbook	10

Total	75

DISCIPLINE SPECIFIC COURSES

KU5DSCAIM301: PYTHON PROGRAMMING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCAIM301	4(3+1)	75

Learning Approach(Hours/ Week)			Marks Distribution			Duration of ESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5 hrs

Course Description:

This course introduces students to the fundamentals of Python programming and its applications in software development, data analysis, and visualization. The course also emphasizes scientific and data-oriented programming using NumPy, Pandas etc. This course includes an overview of the various tools available for writing and running Python, and gets students coding quickly. It also provides hands-on coding exercises using commonly used data structures, writing custom functions, and reading and writing to files

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
CO1	Understand and apply the fundamentals of Python programming including data types, control structures, and data structures to develop basic programs.	U
CO2	Apply object-oriented programming concepts, and concepts of functions modules and packages to develop Python applications.	A
CO3	Apply exception handling, file handling, and array concepts for problem solving	A
CO4	Use data visualization tools , create connect programs with database and GUI programs	A

****Remember(R),Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)***

Mapping of Course Outcomes to PSOs

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**3**	**3**			
CO2	**3**	**3**	**3**	**3**		
CO3	**3**	**3**	**3**	**3**		
CO4	3	3	3	3		

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Introduction to Python**		**15**
	1	Features of python, Running python programs	

	2	Basics of Python-Variables and Data Types, Keywords, Mutable and Immutable objects, Operators and Expressions, Comments, Input and Output in Python, Working with strings , Formatting output.	
	3	Data Structures in Python-Lists, Tuples, Sets and Dictionaries.	
	4	Conditional statements-Branching (if, else, elif) Iteration (while, for) , Range and enumerate functions	
2	**Functions and OOP Concepts**		**15**
	1	Functions- Definition, Function Calling, Function Arguments and Types Return statements, scope and lifetime, Lambda functions	
	2	Modules and packages.	
	3	Object-Oriented Programming (OOP) Basics-Classes ,Objects - Constructors and destructors, Inheritance, Polymorphism, Encapsulation and abstraction, Method overriding, Operator overloading.	
3	**Exception Handling. File Handling and Numpy Arrays**		15
	1	Exception Handling- Types of errors, Built-in Exceptions –Index Error, Overflow Error, Zero Division Error, Runtime Error, try, except, else, finally, raise statement, User-defined exceptions, Assertions	
	2	File handling-Text files,CSV files-Open, Close, Read and write only, with statement, File Handling exceptions.	
	3	Arrays in Python, Numpy Module, Creating Arrays, Two-Dimensional Array ,Indexing, Slicing, Iterating, Copying, Splitting, Shape Manipulation(reshape, transpose, resize)	
4	**Data Visualization, Database Connection and GUI Programming**		15
	1	Data Visualization in Python matplotlib Module, pyplot, plot(), scatter, barcharts, Formatting, figure(), subplot(), text(), xlabel(), ylabel(), title(), Plotting Simple Mathematical Functions($\sin x, x^2$)	
	2	Connecting to a Database, Basic Operations on Database (Create, Insert, Update, Delete), Fetching Data from a Database	
	3	GUI Programming using Tkinter, Tkinter Widgets (Label, Message, Entry, Text, Button, tkMessagebox, RadioButton, Checkbutton, Listbox, Menu, Menubutton, Scale, Scrollbar, Canvas),	

		LayoutManagers	
5	**Teacher Specific Module** Perform following programs in lab		15
	1. Write a program to perform basic arithmetic operations (addition, subtraction, multiplication, division)on two numbers. 2. Develop a function that determines if a given year is a leap year. 3. Write a program that reverses a number and calculates the sum of its digits. 4. Develop a function to check if a given string is a palindrome. 5. Perform operations like removing duplicates, finding the second-Largest element, and reversing a list without using the reverse() method. 6. Implement a class to calculate the area and perimeter of a rectangle. 7. Write programs to perform linear and binary search on a list of numbers. 8. Write a program to read from and write to text files. 9. Develop a program to perform matrix multiplication. 10. Develop a class to simulate a bank account with methods to deposit, withdraw, and check balance		

Essential Readings:

1. Taming Python By Programming, Dr.Jeeva Jose, Khanna Publishing
2. Introduction to Computation and Programming Using Python with Application to Understanding Data - John V. Guttag, PHI (2016).
3. IntroductiontoComputerScienceusingPython-CharlesDierbach,Wiley(2015)

Assessment Rubrics

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		75	Practical		25	100
a)	ESE	50	a)	ESE	15	
				Program code and execution	8	
				Output	3	
				Viva	2	

					Modification		2	
b)	CCA		25	b)	CCA		10	
	i	*Test Paper	5		i	Punctuality	3	
	ii	Model Exam	10					
	iii	**Assignment/Book Article Review	5		ii	Model Exam	4	
	iv	Seminar/Viva-Voce	5		iii	Record	3	

KU5DSCAIM302: FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Semester	**Course Type**	**Course Level**	**Course Code**	**Credits**	**Total Hours**
5	DSC	300-399	KU5DSCAIM302	4(3+1)	75

Learning Approach (Hours/ Week)			**Marks Distribution**			**Duration of ESE (Hours)**
Lecture	**Practical/ Internship**	**Tutorial**	**CE**	**ESE**	**Total**	
3	2		35	65	100	1.5 Hrs

Course Description:

This course focuses on intelligent agents, Search algorithms, CSP and Knowledge representation. Search algorithms are fundamental for problem-solving, allowing AI agents to explore potential paths to a goal. CSPs are a specialized search problem where the objective is to assign values to variables within strict limits, or constraints. KR involves structuring information about the real world in a format that computers can use to solve complex tasks

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the concept of intelligent agents and environments.	U

2	Implement various searching algorithms to find the solutions	A
3	Understand the concepts of CSP and model real world problems as CSP	U/A
4	Understand and apply different knowledge representation techniques and perform reasoning using resolution in propositional logic	U/A

**Remember(R), Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1		3				
CO2	3	3				
CO3		3		2		
CO4		3	3	2		

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	Artificial Intelligence		15
	1	Introduction: AI problems, foundation of AI and history of AI	
	2	Intelligent agents: Agents and Environments, the concept of rationality, the nature of environments	
	3	Structure of agents, problem solving agents, problem formulation	

2	Searching		15
	1	Searching for solutions, uniformed search strategies - Breadth first search, depth limited Search.	
	2	Search with partial information (Heuristic search) Greedy best first search, A* search, Memory -bounded heuristic search	
	3	Local search algorithms- Hill climbing, Simulated annealing search, Local beam search, Genetic algorithms	
3	Constraint Satisfaction Problems		15
	1	Backtracking search for 's, Local search for CSP	
	2	Game Playing: Adversial search, Games, Minimax algorithm, optimal decisions in multiplayer games,	
	3	Alpha-Beta pruning, Evaluation functions, cutting of search.	
4	Knowledge Representation		15
	1	Procedural Versus Declarative knowledge, using predicate logic, representing facts in logic	
	2	Functions and predicates, Conversion to clause form	
	3	Resolution in propositional logic, Resolution in predicate logic, Unification.	
5	Teacher Specific Module		
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics. Perform following programs in lab 1. Write a program to solve any problem using depth first search. 2.Write a program to solve any problem using best first search algorithm 3. Write a program to implement depth limit search 4.Write a program to implement heuristic approach 5.Write a program to implement tic_tac_toe with minimax algorithm 6.Write a program to implement A*algorithm 7. Illustrate Knowledge representation using online tools		15

Essential Readings:

1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education
2. Artificial Intelligence, Kevin Knight, Elaine Rich, B. Shivashankar Nair, 2nd Edition, 2008
3. Artificial intelligence, Patrick Henny Winston, 3rd Edition, Pearson Education
4. PROLOG Programming for Artificial Intelligence, Ivan Bratka, 3rd Edition, Pearson Education

Assessment Rubrics

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			75	Practical			25	
a)	ESE		50	a)	ESE		15	
					Program code and execution		8	
					Output		3	
					Viva		2	
					Modification		2	
b)	CCA		25	b)	CCA		10	100
	i	*Test Paper	5		I	Punctuality	3	
	ii	Model Exam	10					
	iii	**Assignment/ Book Article Review	5		Ii	Model Exam	4	
	iv	Seminar/Viva-Voce	5		Iii	Record	3	

KU5DSCAIM303: NATURAL LANGUAGE PROCESSING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCAIM303	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2 Hrs

Course Description:

This course introduces the fundamentals of natural language processing, covering linguistic concepts, morphology, N-gram models, POS tagging, grammar and parsing techniques, semantic analysis, discourse processing, knowledge representation and machine translation. The course enables students to understand and apply computational methods for natural language understanding , analysis and generation.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains

1	Understand the fundamental concepts of Natural Language Processing.	U
2	Understand the concept of N-grams and their role in language modeling and text processing	U
3	Apply grammar based and statistical parsing techniques for syntactic and semantic analysis	A
4	Apply knowledge representation ,semantic analysis, discourse processing and machine translation techniques for natural language understanding and generation	A

**Remember(R), Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1		3				
CO2		3			2	
CO3		3		2	2	
CO4		3		2	2	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	Introduction to Language		12
	1	Linguistic Knowledge, Grammar, Language and Thought, computational linguistics vs NLP, applications of NLP, Components of NLP, Steps in NLP	
	2	Words of Language, Content Words and Function Words, Lexical categories, Regular expressions and automata	

	3	Morphology: Morphemes, Rules of Word Formation, Morphological parsing and Finite state transducers	
2	N-grams		12
	1	Simple N-grams, Applications, language modelling	
	2	Word classes and POS tagging: tag sets, techniques: rule based, stochastic and transformation based	
	3	Introduction to Natural Language Understanding-Levels of language analysis- Syntax, Semantics, Pragmatics..	
3	Grammars and Parsing		12
	1	Grammars for Natural Language: CFG, Probabilistic Context Free Grammar,	
	2	Parsing methods-top down and bottom up parsing and Efficient Parsing, statistical parsing	
	3	Ambiguity Resolution- Statistical Methods. Features and Unification: Feature structures and Unification of feature structures.	
	4	Lexical semantics, formal semantics and discourse, WSD	
4	Knowledge Representation and Reasoning.		12
	1	FOPC, Elements of FOPC	
	2	Discourse processing: monologue, dialogue, reference resolution. Text coherence. Dialogue acts: Interpretation of dialogue acts, plan inference model, clue-based mode	
	3	Semantics: Representing meaning, Semantic analysis. Applications: Natural Language Generation: surface realization and discourse planning. Machine translation.	
5	Teacher Specific Module		
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.		12

Essential Readings:

1. Jurafsky and Martin, Speech and Language Processing, Pearson, 2013

2. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995
3. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
4. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press
5. Kao, Natural Language Processing and Text Mining, Springer

Assessment Rubrics

Evaluation Type		Marks
End Semester Evaluation		70
Continuous Evaluation		30
a)	Test Paper	5
b)	Model examination	10
c)	Assignment-2 Numbers	10
d)	Seminar	5
e)	Book/Article Review	
f)	Viva -Voce	
g)	Field Report	
Total		100

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KU5DSEAIM301: SOFTWARE ENGINEERING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSEAIM301	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2 Hrs

Course Description:

The course provides experience on various processes used in Software industry for the development of a software product. The course enable attain knowledge in testing and maintenance of software products.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains

1	Identify various phases of software development	U
2	Select appropriate process model depending on the user requirements.	A
3	Identify various processes used in all the phases of the product.	U
4	Design software projects	A

**Remember(R), Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3		3			2
CO2	3		3			2
CO3	3		3			2
CO4	3		3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	INTRODUCTION TO SOFTWARE ENGINEERING		12
	1	Program And Software , Definition, Program Versus Software Software Process ,Software Characteristics	
	2	Product And Process Software Process and Product Matrices	
	3	Software Life Cycle Models – Definition, Selection of the Life Cycle Model , Waterfall Model, Increment Process Model, Evolutionary Process Model, Agile development Models, Basic idea of Extreme Programming Model, Basic idea of Scrum Model.	
2	SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION		12
	1	Requirements engineering, Types of requirements	
	2	Feasibility studies	

	3	Requirement elicitation, various steps of requirement analysis	
	4	Requirement documentation, Requirement validation	
3	SOFTWARE DESIGN		12
	1	Definition and various types of design, Objectives and importance of design phase	
	2	Modularity, Strategy of design, Module Coupling, Cohesion	
	3	Function oriented design, Object oriented design- Design notations and specificatios,UML Diagrams(Sequence,Activity,Use Case, Class diagrams)	
4	SOFTWARE TESTING		12
	1	Definition, Importance, Who should do testing, Test case and Test suit	
	2	Verification and validation definition and comparison, Alpha, Beta and Acceptance testing, Functional testing, Techniques to design test cases, Boundary value analysis, equivalence class testing.	
	3	Structural testing, Path testing, Cyclomatic complexity, Regression testing, Levels of testing, Unit testing, Integration testing, System testing, Validation testing	
5	Teacher Specific Module		
	Assignment to implement various software development life cycle to develop a sample software model		12

Essential Readings:

1. Software Engineering (Third Edition), K K Aggarwal, Yogesh Singh, New age International Publication
2. An integrated approach to software Engineering (Second Edition), Pankaj Jalote, Narosa Publishing House
3. Software Engineering (Seventh edition), Ian Sommerville – Addison Wesley

Assessment Rubrics

Evaluation Type	Marks
End Semester Evaluation	70

Continuous Evaluation		30
a)	Test Paper	5
b)	Model examination	10
c)	Assignment-2 Numbers	10
d)	Seminar	5
e)	Book/Article Review	
f)	Viva -Voce	
g)	Field Report	
Total		100

KU5DSEAIM302: DIGITAL IMAGE PROCESSING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSEAIM302	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2 Hrs

Course Description:

This course provides an introduction to the principles and techniques of digital image processing. It covers the basics of digital images, including their representation and types, as well as fundamental steps in image processing such as acquisition, enhancement, restoration, and compression. The course also explores digital image fundamentals, including visual perception, sampling, quantization, and pixel representation. Additionally, students will learn about basic mathematical tools used in image

processing, such as matrix operations, arithmetic operations, logical operations, and geometric operations Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify fundamental steps in digital image processing, including image acquisition, enhancement, restoration, and compression.	U/A
2	Identify various image enhancement techniques	A
3	Understand and apply the concepts of image transformation and restoration	U/A
4	Understand and apply image compression methods	U/A

**Remember(R), Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1		3		3		
CO2		3		3	2	
CO3		3		3	2	
CO4		3		3	2	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	INTRODUCTION TO IMAGE PROCESSING		12
	1	Basics of Digital Images -Definition and representation of digital images ,Types of images, image file format.	

	2	Fundamental Steps in Digital Image Processing -Image Acquisition, image enhancement, image restoration, image compression.	
	3	Digital Image Fundamentals - Elements of visual perception, Image Sampling and Quantization, Pixel representation and intensity values .	
	4	Basic Mathematical Tools Used in Image Processing -Matrix operations: Addition, Subtraction. Arithmetic operations, Logical operations ,Geometric operations (translation, scaling, rotation)	
2	IMAGE ENHANCEMENT TECHNIQUES		12
	1	Spatial Domain Methods: Point processing, Histogram-based techniques	
	2	Spatial Filtering: Smoothing ,Sharpening	
	3	Frequency Domain Methods: Fourier transform and its properties	
	4	Noise Reduction: Types of noise, Techniques for noise reduction	
3	IMAGE TRANSFORMATION AND RESTORATION		12
	1	Image Transformations: Discrete Fourier Transform (DFT),Discrete Cosine Transform (DCT),Wavelet Transform	
	2	Image Compression – Lossless compression, Lossy compression, performance metrics	
	3	Image Restoration, Morphological Processing	
4	IMAGE COMPRESSION		12
	1	Image Segmentation And Representation -Segmentation Techniques	
	2	Feature Extraction -Texture analysis , Shape descriptors	
	3	Image Representation -Boundary representation, Region representation, Segmentation based representation	

5	Teacher Specific Module	
	Discussion on application s of image processing in healthcare and its pros and corns	12

Essential Readings:

1. Gonzalez, R. C., & Woods, R. E. Digital Image Processing. Pearson Education.

2. Pratt, W. K. (2007). Digital Image Processing: PIKS Scientific Inside. WileyInter science.

3. Jain, A. K. (1989). Fundamentals of Digital Image Processing. Prentice-Hall.

4. Russ, J. C. (2011). The Image Processing Handbook. CRC Press.

Suggested Readings:

1. Sonka, M., Hlavac, V., & Boyle, R. (2014). Image Processing, Analysis, and Machine Vision. Cengage Learning.

2. Umbaugh, S. E. (2010). Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools. CRC Press.

Assessment Rubrics

Evaluation Type		Marks
End Semester Evaluation		70
Continuous Evaluation		30
a)	Test Paper	5
b)	Model examination	10
c)	Assignment-2 Numbers	5
d)	Seminar	10
e)	Group project: data collection, analytics	
f)	Viva -Voce	
g)	Report/Presentation	
Total		100

KU5DSEAIM303: FUNDAMENTALS OF CLOUD COMPUTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSEAIM303	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2 Hrs

Course Description:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

urse Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basics of cloud computing	U
2	Understand the designing principles of cloud	U/A
3	Understand the role of virtualization in cloud computing	U/A
4	Implementation of security in cloud computing	U/A

**Remember(R), Understand(U),Apply(A),Analyse(An),Evaluate(E),Create(C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1		2	3			2
CO2		2	3			2
CO3		2	3			2
CO4		2	3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	Cloud Computing Fundamentals		12
	1	Introduction to Cloud Computing- Basics, History, importance, Characteristics, Pros and Cons of Cloud computing	
	2	Types of Cloud – Public and Private Cloud. Cloud Computing infrastructure	
	3	Cloud Services SaaS, DaaS, IaaS, PaaS	
2	Cloud Computing Architecture		12
	1	Cloud Computing Technology- Cloud Life Cycle Model. Cloud System Architecture	
	2	Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits,Platform as a Service (PaaS), features of PaaS and	

		benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits	
	3	Service providers, challenges and risks in cloud adoption.	
	4	Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing	
3	Virtualization		12
	1	Definition, Adopting Virtualization, Application , Types	
	2	Virtualization and Software , Virtual Clustering, Virtualization applications	
	3	Pitfalls of Virtualization , Tools and Products available for Virtualization	
4	Data Storage & Security		12
	1	Introduction to Enterprise Data Storage, Data Storage Management	
	2	File Systems, Cloud Data Stores ,Cloud Computing and Security – Risks in Cloud Computing, Types of Risks	
	3	Security as a Service	
5	Teacher Specific Module		
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.		12

Essential Readings:

1. Cloud Computing: Principles and Paradigms, edited by Rajkumar Buyya, James Broberg, Andrzej, Wiley India Publications, 2011

2. Barrie Sosinsky, “Cloud Computing Bible”, 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2011.

3. Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill Edition, Fourth Reprint, 2010

4. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, “Virtualization, Business Models, Mobile, Security and more, Jones & Bartlett Learning Company, 2013

Assessment Rubrics

Evaluation Type	Marks
End Semester Evaluation	70

Continuous Evaluation		30
a)	Test Paper	5
b)	Model examination	10
c)	Assignment-2 Numbers	5
d)	Seminar	10
e)	Group project: data collection, analytics	
f)	Viva -Voce	
g)	Report/Presentation	
Total		100