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शिवाजी विद्यापीठ, कोल्हापूर ४१६ ००४, महाराष्ट्र
दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
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Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SU/BOS/Sci & Tech/ 315 **Date: 16/05/2025**

To,

The Principal / Director,
All Concerned Affiliated Colleges / Institutions,
Shivaji University, Kolhapur.

Subject: Regarding revised syllabus of **B. Tech. Part - II (Sem– III - IV)** degree **Programme (Affiliated College)** under the Faculty of Science and Technology as per NEP 2020.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, Nature of Question paper and equivalence of B. Tech. Part - II (Sem - III & IV) under the Faculty of Science & Technology as per NEP 2020.

No.	Course Syllabus
1	Civil Engineering
2	Mechanical Engineering
3	Mechanical and Mechatronic Engineering (Additive Manufacturing)
4	Electrical Engineering and Technology
5	Electrical and Computer Engineering
6	Electronics and Telecommunication Engineering
7	Electronics & Computer Science Engineering
8	Computer Science and Engineering
9	Artificial Intelligence & Machine Learning (AIML)
10	Data Science (DS)
11	Artificial Intelligence & Data Science (AIDS)

This Syllabus, shall be implemented from the academic year **2025-26** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website **www.unishivaji.ac.in NEP-2020@suk (Online Syllabus)**

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October/ November 2025 & March / April 2026. These chances are available for repeater students, if any

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dr. S. M. Kubal
Dy. Registrar

Copy to: for Information and necessary action

1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	7	Affiliation Section (T.1) (T.2)
3	The Chairpersan, Respective Board of Studies	8	P.G.Admission Section, /P.G Seminar Section
4	OE 4 Exam Section,	9	Computer Centre,/IT Cell
5	Eligibility Section,	10	Internal Quality Assorance Cell (IQAC)

Shivaji University
Kolhapur

Revised Syllabus
as per
National Education Policy-2020
(NEP-2.0)

S. Y. B. Tech.

Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

To be Implemented from
Academic Year 2025-26

First Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.1 Rule: Award of Degree

If a student passes all the courses of first year and earns the requisite number of credits, the student will become entitled to Undergraduate Certificate (One year or two semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Certificate. However, for the award of one year UG Certificate in Major with 44 credits, an additional 8 credits are required to earn.

[II] First Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.
3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant

industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from relevant industrial practices conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute.

The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

Direct Second Year Entry: Teaching Methodology, Assessment and Evaluation

[I] For the students admitted directly into the second year of a programme (at the entry level) from a different programme, earning of an additional 2 credits is mandatory.

[II] As per R. R. B. Tech. 13.3 Rule, For direct second year admitted students (at entry level) to concern programme, the earning of additional 2 credits is mandatory. It is required to conduct examination and evaluation for same at institute level at the time of third semester ESE examination. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

[III] Examination scheme:

Students admitted directly into the second year of a programme from another programme are required to complete a 2-credit entry-level course as per the prescribed curriculum. This course should be completed at their own pace to ensure alignment with the programme foundational requirements. End Semester Examination (ESE) of 100 marks will be conducted at the institute level. It is mandatory to organize the examination and evaluate the performance of such students at the institute level during the third semester ESE. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

Open Elective Courses: Teaching Methodology, Assessment and Evaluation

Open Elective (OE) courses other than faculty of Science and Technology through Massive Open Online Courses (MOOCs) allowing students to engage with a broad spectrum of ideas and knowledge areas. The OE courses are likely to be available online and can be completed at the student's own pace within a set timeframe. For OE course, students are required to visit to the website https://swayam.gov.in for registration and create an account. Afterward, students should Login the account and join the course assigned by the course coordinator and follow the instructions to compete the course. Minimum 25 students can register for one OE course in the concerned institute. There will be only one course coordinator for one OE course.

1. **For Semester-III,** OE theory course of 3 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.
2. **For Semester-III,** OE practical lab course of 1 credit consists of In Semester Evaluation/Continuous Assessment (ISE/CA) of 25 Marks and End Semester Examination-Practical Oral Examination (ESE-POE) of 25 Marks. Course Coordinator assigned by Institute should complete the selected course practical through expert of that course.
3. **For Semester-IV,** OE theory course of 2 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester

Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.

4. The Mid Semester Examination (MSE) of 30 Marks based on selected OE Course will be conducted by Concerned Departmental Course Coordinator. The course expert of concerned faculty should set question paper of MSE and evaluate the same.
5. Online submitted assignments by students using SWAYAM platform for concerned OE course will be used for In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks by Concerned Departmental Course Coordinator appointed for particular course by Principal of the Institute. Assignments may be of varied in nature for OE course.
6. The setting of ESE question paper of Concerned OE Course should be done through course expert of concerned faculty as per University rules and is responsibility of Institute/ Departmental Course Coordinator.
7. Student may get failure in the said OE course or the examination may get delayed by SWAYAM, in either cases, ESE of the said course will be conducted as per the University rules.

Note: One OE course is to be floated by the institute for 60 intake.

Second Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.2 Rule: Award of Degree

If a student passes all the courses of first year, second year and earns the requisite number of credits, the student will become entitled to Undergraduate Diploma (Two years or four semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Diploma certificate. However, for the award of two years UG Diploma Certificate in Major with 88 credits, an additional 8 credits from Exit Courses are required to earn.

[II] Second Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.

3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from

relevant industrial practices conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

शिवाजी विद्यापीठ, कोल्हापूर
SHIVAJI UNIVERSITY, KOLHAPUR

Exit Course for Computer Science and Engineering After 1st Year

- **As part of the NEP 2020 Revised Syllabus, for the First Year B. Tech Exit, students must earn a total of 8 additional credits. This includes 6 credits from online SWAYAM NPTEL courses and 2 credits from Virtual Lab performance.**
- **Students must complete two SWAYAM NPTEL courses (12-week duration) from the provided list and successfully perform two Virtual Labs from the specified list.**
- **Each SWAYAM NPTEL course carries 3 credits, while each Virtual Lab is worth 1 credit.**

Sr. No.	Name of NPTEL Course
1	Foundations of Cyber Physical Systems
2	Machine Learning for Engineering and Science applications

Sr. No.	Name of Virtual Lab
1	Programming in Modern C++
2	The Joy of Computing using Python

Earning of additional 2 mandatory credits for direct second year admitted students to Computer Science and Engineering (AIML) branch

Sr. No.	Semester	Subject	Credit
1	III	Basics of Python Programming	2

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (AIML)

Scheme of Instructions: Second Year B.Tech. in Computer Science and Engineering (AIML)

Semester – III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	AIML2101	Probability & Statistics	3	--	--	3	3	30	10	60	100
2	PCC	AIML2102	Data Structures	3	--	--	3	3	30	10	60	100
3	PCC	AIML2103	Computer Networks	3	--	--	3	3	30	10	60	100
4	EL	AIML2104	Data Structures Lab	--	--	4	4	2	--	50	25	75
5	MDM	AIML2105	Multi-disciplinary Minor – 01	2	--	--	2	2	30	10	60	100
6	OE	AIML2106	Open Elective -01	3	--	--	3	3	30	10	60	100
7	HSSM	AIML2107	Employability Enhancement Skills-I	2	--	--	2	2	--	50	--	50
8	PCC	AIML2108	Computer Networks Lab	--	--	2	2	1	--	50	25	75
9	HSSM	AIML2109	Cyber Laws & AI ethics	2	--	--	2	2	--	50	--	50
10	OE	AIML2110	Open Elective -01 Lab	--	--	2	2	1	--	25	25	50
			Total	**18**	--	**8**	**26**	**22**	**150**	**275**	**375**	**800**

L- Lecture T-Tutorial P-Practical

MSE- Mid Semester Examination ISE/CA- In Semester Evaluation/Continuous AssessmentESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular And Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	**16**	**16**	**--**	**--**	**--**	**06**	**04**	**--**	**02**
Semester Credits	**--**	**--**	**10**	**--**	**06**	**--**	**04**	**02**	**--**
Cumulative Sum	**16**	**16**	**10**	**--**	**06**	**06**	**08**	**02**	**02**

PROGRESSIVE TOTAL CREDITS: 44+22 =66

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (AIML)

Scheme of Instructions: Second Year B.Tech. in Computer Science and Engineering (AIML)

Semester – IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	AIML 2201	Operating Systems	3	--	--	3	3	30	10	60	100
2	PCC	AIML 2202	Object Oriented Programming Using Java	2	--	--	2	2	30	10	60	100
3	PCC	AIML 2203	Advanced Computer Graphics	3	1	--	4	4	30	10	60	100
4	MDM	AIML 2204	Multi-disciplinary Minor – 02	2	--	--	2	2	30	10	60	100
5	OE	AIML 2205	Open Elective -02	2	--	--	2	2	30	10	60	100
6	HSSM	AIML 2206	Community Services Using Technology	2	--	--	2	2	--	50	--	50
7	HSSM	AIML 2207	Employability Enhancement Skills-II	2	--	--	2	2	--	25	--	25
8	PCC	AIML 2208	Operating Systems Lab	--	--	2	2	1	--	50	25	75
9	PCC	AIML 2209	Object Oriented Programming Using Java Lab	--	--	4	4	2	--	25	25	50
10	VEC	AIML 2210	Mini Project Lab	--	--	2	2	1	--	25	25	50
11	BSC	AIML 2211	Environmental Science	2	--	--	2	Audit	30	10	60	100
12	VSEC	AIML 2212	Computer Peripherals and Hardware Maintenance	--	--	2	2	1	--	50	--	50
			Total	**18**	**1**	**10**	**29**	**22**	**180**	**285**	**435**	**800+100 (Audit)**

L- Lecture T-Tutorial P-Practical

MSE- Mid Semester Examination ISE/CA- In Semester Evaluation/Continuous AssessmentESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular program (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular And Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	**16**	**16**	**10**	**--**	**06**	**06**	**08**	**02**	**02**
Semester Credits	**--**	**--**	**12**	**--**	**04**	**01**	**05**	**--**	**--**
Cumulative Sum	**16**	**16**	**22**	**--**	**10**	**07**	**13**	**02**	**02**

PROGRESSIVE TOTAL CREDITS: 66+22 =88

[I] List of Electives: Verticals

Specialization	Hardware / Arch. / Network	Algorithms / Math's / ML	Image / Pattern / Security	Software / Data Management
Elective-I	Internet of Things	Compilers	Ethical Hacking	Project Management
Elective-II	Control Systems & Signal Processing	Applied Statistical Analysis with R	Cyber Security	Software Testing & Quality Assurance
Elective-III	Robotics Intelligent Systems	Data Mining	Speech Systems	Cloud Computing
Elective-IV	Adhoc Wireless Sensor Networks	Optimization Methods in AI and ML	Image and Video Processing	AI for Humanity
Elective-V	Blockchain Technology	Predictive Analysis	Surveillance Video Analytics	Business Intelligence Systems
Elective-VI	High Performance Computing	Game Theory	Cyber Forensics and Investigation	Augmented Reality & Virtual Reality

[II] List of Open Electives:

Open Elective-I	1. Programming Fundamentals using C++ (PFC++) 2. Web Technologies
Open Elective-II	1. Advanced Computer Network 2. Software Development using Agile
Open Elective-III	1. Cloud Computing 2. AI Tools

[III] Minor in Emerging Areas basket of additional 18-20 credits starting from Sem-III

Basket No -01
(Artificial Intelligence)

Sr. No.	Semester	Subject	Credit
1	III	AI Ethics and Responsible AI	3
2	IV	Human Computer Interaction	3
3	V	Recommendation Systems	3
4	VI	Enhanced Natural Language Processing	3
5	VII	Reinforcement Learning and Autonomous Systems	3
6	VIII	Search Engine Design and Optimization	3

Basket No -02
(Data Intelligence & AI Integration)

Sr. No.	Semester	Subject	Credit
1	III	Decision Intelligence (DI)	3
2	IV	AI-Powered Cybersecurity	3
3	V	Video Analytics	3
4	VI	Big Data Mining	3
5	VII	AI in Healthcare	3
6	VIII	Advanced AI Tools	3

[IV] Basket of Multidisciplinary minor of 14 credits starting from Sem-III

Semester	Course Offered	L	P	Hrs.	Credits
III	Object Oriented Programming	02	--	02	02
IV	Introduction to AI	02	--	02	02
V	Database Management	03	01	04	04
VI	Internet of Things	02	--	02	02
VII	Machine Learning	02	--	02	02
VIII	Data Science using Python	02	--	02	02

Instructions regarding Examinations:

1. Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 %
2. Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units).
3. No compulsory passing for **MSE.**
4. ESE paper setting weightage will be, **25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).**
5. Passing percentage for ESE practical examination 40%.

Year and Semester	Second Year B. Tech - Semester III –CSE(AIML)				
Course Category	**Program Core Course**				
Title of Course	**Probability & Statistics**			**Course Code**	**AIML2101**
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	--	--	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Engineering Mathematics –I, Engineering Mathematics –II	
Course Objectives	1	To teach mathematical methodologies and models to develop mathematical skills and enhance thinking power of students.
	2	To expose the students to the topics in fuzzy set theory, probability and statistics with an emphasis on the application of solving engineering problems
	3	To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world
	4	Gain skills in hypothesis testing and large sample tests for data-based conclusions
	5	Solve real-world problems using assignment models and optimization techniques like the Hungarian Method.
	6	Gain different techniques of operation research.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	**Remember** the basic concepts of statistics
	CO2	**Describe** the statistical data numerically by using Lines of regression and Curve fittings.
	CO3	**Solve** basic problem sin probability theory, including problems involving the binomial, Poisson, and normal distributions.
	CO4	**Apply** the knowledge to test the correlation, to test hypothesis is, to do sample tests
	CO5	**Define** fuzzy sets and represent these sets by membership functions, convexity, Normality, support, etc
	CO6	**Solve** assignment problems by using different techniques of operation research.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2	2	2								
CO3	3	3		2								3
CO4	2	3	2	3								3
CO5	2	2	2	2		2	2					
CO6	2	3	3	3	3				3		3	2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Measures of central Tendency and Dispersion:** Arithmetic mean ,median ,mode, geometric mean, Harmonic mean Range, Quartile deviation, Mean deviation and Standard deviation.	6
2	**Correlation, Regression & Curve Fitting:** Introduction, Karl Pearson's Coefficient of Correlation, Lines of regression of bivariate data, Fitting of Curves by method of Least- squares: Fitting of Straight lines, Fitting of exponential curves, Fitting of second-degree Parabolic curves.	6
3	**Probability Distribution:** Random variables ,Discrete Probability distribution, Continuous probability distribution, Binomial Distribution, Poisson Distribution, Normal Distribution.	6
4	**Testing of Hypothesis and Large Sample Tests:** Statistical Hypothesis-Simple and Composite, Tests of Significance, Null Hypothesis, Alternative Hypothesis, Types of errors in Testing of Hypothesis, level of significance, Critical regions, one-tailed and two tailed tests, P-value or Probability value of Test Statistics. Large sample tests: sampling of attributes, sampling of variables	6
5	**Introduction to Fuzzy sets:** Crisp set and Fuzzyset, Basic concepts of fuzzysets, Basic operations on fuzzy sets ,Properties of fuzzy sets, Fuzzy cardinality	6
6	**Assignment Problem:** Definition, Balanced and Unbalanced assignment problem, Hungarian Method, Balanced assignment problems, Unbalanced assignment problems Traveling salesmen problem.	6

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Fundamentals of Statistics	S. C. Gupta	Himalaya Publishing House (Seventh Revised And Enlarged Edition)
02	Fuzzy Sets and Fuzzy Logic: Theory and Applications	George J. Klirand, Bo Yuan	Prentice Hall of India Private Limited
03	Operation Research	Prem Kumar Gupta, D.S. Hira	S. Chand (Fifth Edition)

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Higher Engineering Mathematics	B.S. Grewal	Khanna Publication Delhi (44^{th}Edition)
02	Advance Engineering Mathematics	Erwin Kreyszig	Wiley India
03	Advanced Engineering Mathematics	H. K. Das	S. Chand Publication

Year and Semester	**Second Year B. Tech - Semester III – CSE(AIML)**				
Course Category	**Program Core Course**				
Title of Course	**Data Structures**			**Course Code**	**AIML2102**
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	--	--	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Basics of algorithms and C Programming	
Course Objectives	1	To understand the need and significance of Data structures as a computer Professional.
	2	To teach various searching and sorting techniques.
	3	To teach concept and implementation of linear and nonlinear data structures.
	4	To analyze various data structures and select the appropriate one to solve a specific real-world problem.
	5	To introduce various techniques for representation of the data in the real world.
	6	To provide students with foundation in computer programming/problem.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Students will be able to implement linear and Non-Linear data structures.
	CO2	Students will be able to choose appropriate sorting and searching algorithms.
	CO3	Students will be able to explain various data structures, related terminologies and its types.
	CO4	Students will be able to choose appropriate data structure and apply it to solve problems in various domains.
	CO5	Students will be able to analyze and Implement appropriate searching techniques for a given problem.
	CO6	Students will be able to demonstrate the ability to analyze, design, apply and use data structures to solve engineering problems and evaluate their solutions.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									
CO2	3	3	3	2								
CO3	3											
CO4	3	3	3	3		2	2					
CO5	3	3	3	3								
CO6	3	3	3	3		2	2					
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Introduction to Data Structures** Data structure- Definition, Types of data structures, Data Structure Operations, Concept of ADT Algorithms: Complexity, Time and Space complexity.	05
2	**Searching and Sorting Techniques:** Linear search, Binary search, Hashing – Definition, hash functions, Collision resolution Techniques, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort, Complexity and analysis.	07
3	**Stacks and Queues** Stack: Definition, operations, Array representation of stack, applications Queue: Definition, operations, Array representation of queue, Circular queue, Priority queue, applications.	06
4	**Linked List** Introduction of Linked List v/s Array, Types of Linked List, Circular Linked List, Doubly Linked List, Operations on Doubly Linked List, Stack and Queue using Singly Linked List, Singly Linked List Application.	07
5	**Trees** Introduction, Tree Operations on Binary Search Tree, Applications of Binary Tree, Huffman Encoding, Search Trees-AVL, rotations in AVL Tree, operations on AVL Tree, Introduction of B Tree, B+ Tree.	06
6	**Graphs** Introduction of Graph Terminologies, Graph Traversals-Depth First Search (DFS) and Breadth First Search (BFS), Graph Application-Topological Sorting.	05

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Introduction to Data Structure and Its Applications	Jean Paul Tremblay, P. G. Sorenson	McGraw-Hill Higher Education
02	Data Structures	Seymour Lipschutz	McGraw-Hill Publication
03	Data Structures Using C	ISRD Group	2nd Edition, Tata McGraw-Hil

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Data Structure Using C	E. Balagurusamy	Tata McGraw-Hill Education India.
02	Data Structures and Program Design in C	Robert Kruse, C. L. Tondo, Bruce Leung	Pearson Edition
03	Data Structures using C and C++	Rajesh K Shukla	Wiley-India
04	Data Structures	GAV PAI	Schaum‟s Outlines

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	Program Core Course				
Title of Course	Computer Networks			Course Code	AIML2103
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	-	-	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Basics of Computer and communication concepts	
Course Objectives	1	To know the basics of network and identifying benefits of networks.
	2	To understand communication media.
	3	To Learn different types of Topology
	4	To learn and Compare different types of network devices.
	5	To Know OSI and TCP/IP protocol suite.
	6	Learn IPv6 concept
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Understand network & can identifying benefits of networks.
	CO2	Understand and describe communication media.
	CO3	Compare different types of Topology.
	CO4	Compare different types of network devices.
	CO5	Compare OSI and TCP/IP protocol suite.
	CO6	Understand IPv6 concepts

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3									3		3
CO4		3										3
CO5												
CO6			3									3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**BASIC NETWORK CONCEPTS** Fundamentals of Computer Network- Definition Need of Computer Network, Applications, Component of Computer Network. Network Benefits- Sharing Information(File Sharing, E-mail) - Sharing Resources (Printer Sharing, Application Services) - Facilitating Centralized Management- Managing Software, Maintaining the Network, Backing up data Computer Network Classifications- Classification of Network by their Geography.- LAN, MAN, WAN Classification of Network by their Component Role--Peer-to-Peer Network, Server-Based Network, Types of server.	5
2	**NETWORK TOPOLOGIES AND NETWORKING DEVICES** Topology Concepts, Different types of Topology, Network Control Devices. Network Topologies - i) Bus ii) Ring iii) Star iv) Mesh v) Tree vi) Hybrid. Network Control / Connecting Devices - Need of Network Control devices, Role of Network Control devices in a Network, Connectors, Hub, Repeater, Bridges, Switches, Router, Gateway, Modem	5
3	**TRANSMISSION MEDIA** Concept of Guided and Unguided Transmission Media. Types of Guided Media. Types of Unguided Media. Introduction - Need of Transmission Media, Selection Criteria. Types of Transmission Media- 1) Guided Media: Cable Characteristics, Types of Cable-Twisted Pair Cable, Co-axial Cable, Fiber Optic Cable. 2) Unguided media: Types of Communication Band-Microwave Communication, Radio wave Communication, Satellite Communication, Infrared Communication. Latest Technologies in Wireless Network-Bluetooth Architecture, Wi-Fi, Wi- Max. Cellular (Mobile) Telephone - Band in Cellular Telephony, Calls using Mobile Phones, Transmitting receiving / Handoff operations	7
4	**OSI REFERENCE MODEL** Concept of Reference Model. OSI Reference Model Concept. Layers of OSI Reference Model- Layered Architecture , Peer-to- Peer Processes- Interfaces between Layer, Protocols, Organization of the Layers, Encapsulation. Layers of the OSI Reference Model	7
5	**TCP / IP SUITE** TCP/ IP Model Concept. Defining/functioning of different Layers of TCP / IP suite. Introduction –Addressing mechanism in the Internet IP Addressing – IP Address classes, classless IP addressing, Subnetting, supernetting, Masking, Layered Structure of the TCP / IP Model – Host-to-Network, Internet, Transport, Application TCP / IP Protocol Suite : Host-to-Network-SLIP and PPP, Internet Layer- ARP,RARP and IP Transport Layer- TCP and UDP (Frame Format, port addresses) Application Layer- FTP, SMTP, DNS. Comparison between OSI and TCP / IP Network Model	7
6	**IP ADDRESSING** Physical address, Logical address, port address, IP Addressing: Concept, Notation, Address Space Unicast Broad cast multicast addresses, IPv6 address Comparison of IPv4 & IPv6	5

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Data Communications and Network	Achyut S. Godbole	Tata McGraw Hill
02	Data Communications and Networking (Forth Edition)	Behrouz A. Forouzan	Tata McGraw Hill

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Complete Reference Networking	Craig Zacker	Tata McGraw Hill
02	Networking + Certification (Second Edition)	Microsoft Press	PHI

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	Experiential Learning				
Title of Course	Data Structures Lab			Course Code	AIML2104
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	--	--	4	4	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	50	25	75	

Course Pre-Requisite	Basics of algorithms and C Programming	
Course Objectives	1	To understand the need and significance of Data structures as a computer Professional.
	2	To teach various searching and sorting techniques.
	3	To teach concept and implementation of linear and nonlinear data structures.
	4	To analyze various data structures and select the appropriate one to solve a specific real-world problem.
	5	To introduce various techniques for representation of the data in the real world.
	6	To provide students with foundation in computer programming/problem.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Students will be able to implement linear and Non-Linear data structures.
	CO2	Students will be able to choose appropriate sorting and searching algorithms.
	CO3	Students will be able to explain various data structures, related terminologies and its types.
	CO4	Students will be able to choose appropriate data structure and apply it to solve problems in various domains.
	CO5	Students will be able to analyze and Implement appropriate searching techniques for a given problem.
	CO6	Students will be able to demonstrate the ability to analyze, design, apply and use data structures to solve engineering problems and evaluate their solutions.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									
CO2	3	3	3	2								
CO3	3											
CO4	3	3	3	3		2	2					
CO5	3	3	3	3								
CO6	3	3	3	3		2	2					
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. End Semester Evaluation has 25 Marks External Practical Examination with Performance and Oral Examination

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 10 to 12 Experiments should get performed.	
Exp. No.	Title of Experiment/ Problem Statement
1	Implement a 'C' program for performing the following operations on Array: Creation, Insertion, Deletion, and display
2	Implement a 'C' program to search a particular data from the given array using: (i) Linear Search, (ii) Binary Search
3	Implement a 'C' program to sort an array using the following methods: (i) Bubble sort, (ii) Selection sort, (iii) Insertion sort
4	Implement Stack ADT using array.
5	Write a C program to perform INSERT and DELETE operations on a queue using an array.
6	Implement Stack / Linear Queue ADT using Linked List.
7	Implement Priority Queue ADT using array.
8	Convert an Infix expression to postfix expression using stack ADT.
9	Evaluate Postfix Expression using Stack ADT.
10	Implement Singly Linked List ADT.
11	Implement Circular Singly Linked List ADT.
12	Implement Doubly Linked List ADT.
13	Write C Program to implement BST (Binary Search Tree) and traverse the tree (Inorder, Preorder, Postorder)
14	Implement Graph Traversal techniques: a)Depth First Search b) Breadth First Search

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Introduction to Data Structure and Its Applications	Jean Paul Tremblay, P. G. Sorenson	McGraw-Hill Higher Education
02	Data Structures	Seymour Lipschutz	McGraw-Hill Publication
03	Data Structures Using C	ISRD Group	2nd Edition, Tata McGraw-Hil
Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Data Structure Using C	E. Balagurusamy	Tata McGraw-Hill Education India.
02	Data Structures and Program Design in C	Robert Kruse, C. L. Tondo, Bruce Leung	Pearson Edition
03	Data Structures using C and C++	Rajesh K Shukla	Wiley-India
04	Data Structures	GAV PAI	Schaum‟s Outlines

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	Multi-Disciplinary Minor-01				
Title of Course	Object Oriented Programming			Course Code	AIML2105
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	-	-	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Basic understanding of Computer Programming Terminologies, Basics of C Programming Language.	
Course Objectives	1	To learn advanced features of the C++ programming language as a continuation of the previous course.
	2	To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
	3	To gain the ability to analyse and compare the features of different programming languages and their suitability for different types of software development tasks.
	4	To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
	5	To enhance problem solving and programming skills in C++ with extensive programming projects.
	6	To become familiar with the LINUX software development environment.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Differentiate object-oriented programming and procedural programming.
	CO2	Use the characteristics of an object-oriented programming language in a program.
	CO3	Construct the basic object-oriented design principles in computer problem-solving.
	CO4	Implement the basic principles of software engineering in managing complex software project.
	CO5	Write programs with advanced features of the C++programming language.
	CO6	Develop programs in the LINUX programming environment.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	2										
CO3	3	2	3	2								
CO4	3	2	3	2		3						
CO5	3	2	2	2		2			3			2
CO6	3	2	2	2		2			3			2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Introduction to Object Oriented Programming** Object oriented paradigm - Differences between Object Oriented Programming and Procedure Oriented Programming, Basic concepts of OOP, Benefits of OOP, Structure of a C++ program, Namespace, Data types, C++ tokens, Identifiers, Variables, Constants, Operators, Control structures, Branching Statement and Loops.	4
2	**Functions, Classes and Objects** **Functions:** Functions, Inline function, Call by reference and Call by Value **Classes and Objects:** Introduction of Classes, Objects, Access Control, Class Scope, Scope Resolution Operator, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions, Manipulating Strings.	4
3	**Constructors, Destructors** **Constructors, Destructors:** Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors, **Inheritance:** Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi-level Inheritance, Hierarchical Inheritance, Hybrid Inheritance.	4
4	**Pointers, Virtual Functions** **Pointers, Virtual Functions:** Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes, **Polymorphism:** Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading- Function Overloading, Operator overloading.	5

5	**Templates, Exception handling** **Templates:** Introduction to Templates, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Generic function & Classes. **Exception handling:** Basics of Exception Handling, Types of exceptions, Exception Handing Mechanism, Throwing and Catching Mechanism, Re-throwing an Exception, Specifying Exceptions. Introduction to STL.	6
6	**I/O System Basics, File I/O** **I/O System Basics, File I/O:** Managing console, I/O operations: C++stream, C++Predefined stream classes, Formatted and unformatted console I/O operations. File I/O: Classes of File Stream Operations, C++ file I/O modes, manipulators, File Pointers & their manipulators.	6

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Object-Oriented Programming with C++	E. Balaguruswamy	(Tata Mc Graw-Hill) 7thEdition onwards
02	The Complete Reference C++	Herbert Schild	Tata McGraw Hill 4thEditionandonwards

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	C++ Primer	S. B. Lippman and J. Lajoie	Pearson Education 3rd Edition
02	The C++Programming Language	B. Stroutstrup	Pearson Education 3rd Edition
03	Object-Oriented Programming with C++	Balaguruswamy	(Tata Mc Graw-Hill) 6thEdition and onwards
04	Object oriented Programming with C++	Sourav Sahay	(Oxford)2ndedition

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	**OPEN ELECTIVE (OE)-01**				
Title of Course	**Programming Fundamentals using C++**			**Course Code**	**AIML2106**
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	-	-	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Basic understanding of Computer Programming Terminologies, Basics of C Programming Language.	
Course Objectives	1	To learn advanced features of the C++ programming language as a continuation of the previous course.
	2	To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
	3	To gain the ability to analyse and compare the features of different programming languages and their suitability for different types of software development tasks.
	4	To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
	5	To enhance problem solving and programming skills in C++ with extensive programming projects.
	6	To become familiar with the LINUX software development environment.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Differentiate object-oriented programming and procedural programming.
	CO2	Use the characteristics of an object-oriented programming language in a program.
	CO3	Construct the basic object-oriented design principles in computer problem-solving.
	CO4	Implement the basic principles of software engineering in managing complex software project.
	CO5	Write programs with advanced features of the C++programming language.
	CO6	Develop programs in the LINUX programming environment.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	2										
CO3	3	2	3	2								
CO4	3	2	3	2		3						
CO5	3	2	2	2		2			3			2
CO63	3	2	2	2		2			3			2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Introduction to Object Oriented Programming** Object oriented paradigm - Differences between Object Oriented Programming and Procedure Oriented Programming, Basic concepts of OOP, Benefits of OOP, Structure of a C++ program, Namespace, Data types, C++ tokens, Identifiers, Variables, Constants, Operators, Control structures, Branching Statement and Loops.	6
2	**Functions, Classes and Objects** **Functions:** Functions, Inline function, Call by reference and Call by Value **Classes and Objects:** Introduction of Classes, Objects, Access Control, Class Scope, Scope Resolution Operator, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions, Manipulating Strings.	6
3	**Constructors, Destructors** **Constructors, Destructors:** Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors, **Inheritance:** Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi-level Inheritance, Hierarchical Inheritance, Hybrid Inheritance.	6
4	**Pointers, Virtual Functions** **Pointers, Virtual Functions:** Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes,	6

	Polymorphism: Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading- Function Overloading, Operator overloading.	
5	**Templates, Exception handling** **Templates:** Introduction to Templates, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Generic function & Classes. **Exception handling:** Basics of Exception Handling, Types of exceptions, Exception Handing Mechanism, Throwing and Catching Mechanism, Re-throwing an Exception, Specifying Exceptions. Introduction to STL.	6
6	**I/O System Basics, File I/O** **I/O System Basics, File I/O:** Managing console, I/O operations: C++stream, C++Predefined stream classes, Formatted and unformatted console I/O operations. File I/O: Classes of File Stream Operations, C++ file I/O modes, manipulators, File Pointers & their manipulators.	6

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Object-Oriented Programming with C++	E. Balaguruswamy	(Tata Mc Graw-Hill) 7thEdition onwards
02	The Complete Reference C++	Herbert Schild	Tata McGraw Hill 4thEditionandonwards

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	C++ Primer	S. B. Lippman and J. Lajoie	Pearson Education 3rd Edition
02	The C++Programming Language	B. Stroutstrup	Pearson Education 3rd Edition
03	Object-Oriented Programming with C++	Balaguruswamy	(Tata Mc Graw-Hill) 6thEdition and onwards
04	Object oriented Programming with C++	Sourav Sahay	(Oxford)2ndedition

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	OPEN ELECTIVE (OE)-01				
Title of Course	Web Technologies			Course Code	AIML2206
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	--	--	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite		Object oriented Programming, Basics of HTML and CSS, Basics of Computer Network
Course Objectives	1	To comprehend and analyze the basic concepts of web programming and internet protocols.
	2	To describe how the client-server model of Internet programming works.
	3	To demonstrate the uses of scripting languages
	4	To write simple scripts for the creation of web sites
	5	To demonstrate the uses of scripting languages
	6	To write simple scripts for the creation of web sites
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Demonstrate the concept web programming and internet protocols.
	CO2	Construct a basic website using HTML and Cascading Style Sheets
	CO3	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
	CO4	Develop server side programs and construct simple web pages in PHP
	CO5	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
	CO6	Develop server side programs and construct simple web pages in PHP

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2	3	2								
CO3	3	3	3	3	2	2	2				2	3
CO4	3	3	3	3	2	2	2				2	3
CO5	3	3	3	3	2	2	2				2	3
CO6	3	3	3	3	2	2	2				2	3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme

- Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 %
- Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units).
- ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**WEBSITE BASICS** Internet Overview - Fundamental computer network concepts - Web Protocols - URL – Domain Name- Web Browsers and Web Servers- Working principle of a Website –Creating a Website - Client-side and server-side scripting	03
2	**WEB DESIGNING** Introduction, Why HTML5? HTML Design Patterns: HTML Structure, XHTML, DOCTYPE, Header Elements, Conditional Style Sheet, Structural Block Elements, Terminal Block Elements, Multipurpose Block Elements, Inline Elements, Class and ID Attributes, HTML Whitespaces, Page layout and navigation CSS Selector and Inheritance: Type, Class and ID Selector, Position and Group Selectors, Attribute Selectors, Pseudo-element Selectors, Pseudo-class Selectors, Subclass Selector, Inheritance	06
3	**CLIENT-SIDE PROCESSING AND SCRIPTING** JavaScript Introduction –Basic program of javascript, variables, functions, conditions, loops and repetition, Function, Arrays – DOM, Built-in Objects, Regular Expression, Exceptions, Event handling In Javascript, Validating HTML form data using javascript,	06
4	**SERVER SIDE PROCESSING AND SCRIPTING – PHP** Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, super global arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems	05
5	**CLIENT-SIDE PROCESSING AND SCRIPTING** JavaScript Introduction –Basic program of javascript, variables, functions, conditions, loops and repetition, Function, Arrays – DOM, Built-in Objects, Regular Expression, Exceptions, Event handling In Javascript, Validating HTML form data using javascript,	05
6	**SERVER SIDE PROCESSING AND SCRIPTING – PHP** Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, super global arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems	05

Textbooks

Sr. no.	Title	Author	Edition/Publication
01	Pro HTML5 and CSS3 Design Patterns	Michael Bowers, DionysiosSynodinos and Victor Sumner	Apress edition
02	Web Design The Complete Reference	Thomas Powell	Tata McGraw Hill
03	Learning PHP, MySQL, JavaScript, CSS & HTML5	Robin Nixon	O'Reilly publishers
04	PHP Project for Beginners	Sharanam Shah, Vaishali Shah	SPD

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Pro HTML5 and CSS3 Design Patterns	Michael Bowers, Dionysios Synodinos and Victor Sumner	Apress edition
02	Head First HTML 5 programming	Eric Freeman	O'Reilly
03	JavaScript 2.0 : The Complete Reference	Thomas Powell and Fritz Schneider	Tata McGraw Hill
04	PHP – The Complete Reference	Steven Holzener	Mc-Graw Hill
05	Developing Web Applications	Bates	Wiley Publishers

Year and Semester	Second Year B. Tech - Semester III –CSE(AIML)				
Course Category	Humanities Social Science and Management				
Title of Course	Employability Enhancement Skills-I			Course Code	AIML 2107
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	-	-	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	50	-	50	

Course Pre-Requisite		
Course Objectives	1	To develop verbal and non-verbal communication abilities essential for professional interactions
	2	To train students in presenting technical and non-technical content clearly and confidently
	3	To focus on teamwork and problem-solving approach to meet industry expectations.
	4	To prepare students for interviews by improving their self-presentation and answering techniques.
	5	To help students articulate ideas clearly in written format, including emails, reports, and other technical documentation.
	6	To effectively manage time and complete goals by the deadline.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Effectively communicate and present ideas in both professional and technical environments
	CO2	Deliver structured, effective, and confident presentations
	CO3	Work efficiently in teams and handle interpersonal issues in a professional manner.
	CO4	Confidently face interviews and improve their chances of employability.
	CO5	Produce technical and professional written materials such as reports, emails, and resumes
	CO6	Adopt time management techniques to improve their productivity in both academic and professional settings.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2				2				3		
CO2										3		
CO3									3		2	
CO4	2	2		2								3
CO5			2							3		
CO6											3	3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic.

Unit No.	Title and Content of Unit	Hours
1	**Communication Skills** Verbal communication: Effective speaking and listening skills, Non-verbal communication: Body language, gestures, and expressions, Barriers to communication and overcoming them, Professional email writing and etiquette.	4
2	**Presentation Skills** Basics of presentation: Structure, flow, and delivery, Presentation tools: PowerPoint, Canva, and others, Handling Q&A sessions effectively, Giving technical presentations to a non-technical audience.	4
3	**Interpersonal Skills** Teamwork and collaboration in projects, Conflict resolution and problem-solving, Adaptability and flexibility in a professional environment, Building professional relationships and networks.	4
4	**Interview Preparation** Self-introduction and resume preparation, Mock interviews: HR and technical rounds, Behavioral questions and STAR method (Situation, Task, Action, Result), Technical interview strategies (specific to AIML domain).	4
5	**Professional and Technical Writing** Writing professional emails, Report writing: Lab reports, project documentation, etc. Technical proposals and abstracts, Writing resumes and cover letters.	4
6	**Time Management and Productivity Skills** Prioritization techniques (Eisenhower Matrix, Pomodoro Technique), Setting SMART goals, Managing deadlines in academic and work-life balance, Tools for productivity: Trello, Asana, etc.	4

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Business Communication: Process and Product	Mary Ellen Guffey and Dana Loewy	Cengage Learning, 9th Edition (2018)
02	The Exceptional Presenter: A Proven Formula to Open Up! and Own the Room	Timothy J. Koegel	Greenleaf Book Group Press, Revised Edition (2007)
03	Soft Skills: The Software Developer's Life Manual	John Sonmez	Manning Publications, 1st Edition (2015)
04	Cracking the Coding Interview: 189 Programming Questions and Solutions	Gayle Laakmann McDowell	CareerCup, 6th Edition (2015)
05	Technical Writing: Process and Product	Sharon Gerson and Steven Gerson	Pearson, 8th Edition (2017)
06	Getting Things Done: The Art of Stress-Free Productivity	David Allen	Penguin Books, Revised Edition (2015)

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Effective Communication Skills	MTD Training	MTD Training & Ventus Publishing, 2010
02	Presentation Zen: Simple Ideas on Presentation Design and Delivery	Garr Reynolds	New Riders Press, 3rd Edition (2019)
03	The 7 Habits of Highly Effective People	Stephen R. Covey	Simon & Schuster, 25th Anniversary Edition (2013)
04	How to Answer Interview Questions: 101 Tough Interview Questions	Peggy McKee	Career Confidential, 2012
05	Handbook of Technical Writing	Gerald J. Alred, Charles T. Brusaw, and Walter E. Oliu	Bedford/St. Martin’s, 12th Edition (2018)
06	The Pomodoro Technique: The Life-Changing Time-Management System	Francesco Cirillo	Random House, 1st Edition (2018)

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	Program Core Course				
Title of Course	Computer Networks Lab			Course Code	AIML2108
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
			2	2	1
Examination Scheme	MSE	ISE/CA	ESE	Total	
		50	25	75	

Course Pre-Requisite		
Course Objectives	1	To know the basics of network and identifying benefits of networks.
	2	To understand communication media.
	3	To Learn different types of Topology.
	4	To learn and Compare different types of network devices.
	5	To Know OSI and TCP/IP protocol suite.
	6	Learn IPv6 concept
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Understand network & can identifying benefits of networks.
	CO2	Understand and describe communication media.
	CO3	Compare different types of Topology.
	CO4	Compare different types of network devices.
	CO5	Compare OSI and TCP/IP protocol suite.
	CO6	Understand IPv6 concepts

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3									3		3
CO4		3										3
CO5												
CO6			3									3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. End Semester Evaluation has 25 Marks External Practical Examination with Performance and Oral Examination

Guidelines for Lab Performance	
Minimum 10 Experiments should get performed.	
Exp. No.	Title of Experiment/ Problem Statement
1	To observe Components of Network in your Computer Network Lab. (To know your Network Lab.)
2	To understand network features
3	To connect and understand different Transmission Media and Network Control devices.
4	To Prepare a Straight Cable and Network Cross over Cable and test by Line Tester.
5	To install a network interface card
6	To Connect Computers in Star Topology using Wired Media and any Network control Device.
7	To connect two hubs/switch by creating crossover connection
8	To Share Printer and Folder in Network
9	To Install TCP/IP Protocols (Version 4 and version 6) and configure advanced features of TCP/IP Protocols.
10	To Run Basic TCP/IP Utilities and Network Commands with all options.(Ping, ipconfig, Tracert, Netstat, ARP,capture TCP, UDP,IP, ARP, ICMP, Telnet
11	To understand Subnet Masking and create two subnets
12	To visit server room and prepare report on 1. Proxy Server 2. Server Configuration 3. Router Configuration 4. Firewall Configuration Network setup details (Topology, Back up, IP range, network software, UPS)

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	Humanities Social Science and Management				
Title of Course	Cyber Laws & AI Ethics			Course Code	AIML2109
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	2			2	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	50	-	50	

Course Pre-Requisite	Basics of Computer concepts	
Course Objectives	1	Understand Cyber Space, Cyber Crime, Cyber Laws, Information Technology, Internet, Internet Services
	2	Know Legal Aspects of Regulation concerned with Cyber Space, Technology and Forms of Cyber Crimes
	3	Understand Computer Crimes and Cyber Crimes, Cyber Crime in Global and Indian Response.
	4	Understand Criminal Liability, Cyber Crime implications and challenges
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Understand Cyber Space, Cyber Crime, Information Technology, and Internet & Services.
	CO2	List and discuss various forms of Cyber Crimes
	CO3	Explain Computer and Cyber Crimes
	CO4	Understand Cyber Crime at Global and Indian Perspective

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3									3		3
CO2												
CO3	3			3						3		
CO4			3									3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 %

Unit No.	Title and Content of Unit	Hours
1	**Information Technology & Cyber Crimes** Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers **Information Technology:** Definition & Perspective, Growth & Future, Various Facets & Dimensions. **Regulatory Perspective on Technology:** Impact of Information and Technology, Regulation of Cyber Space, Legal Aspects of Regulation.	6
2	**Technology & Forms of Cyber Crimes** Influence of Technology on Criminality, Forms of Cyber Crimes. **Computer Crimes & Cyber Crimes: A Criminological Analysis** Computer Crimes and Cyber Crimes: Terminological Aspects, Opportunities to Cyber Criminals, Motives of Offenders, Problems Affecting Prosecution, Cyber Crimes: Challenges of Prevention and Control, Need and Prospects	6
3	**Cyber Crimes 'and Global Response** Global Perspective, Country wise Legal Response, Country wise Analysis. **Cyber Crimes and Indian Response:** Introduction, The Indian Information Technology Act 2000, Preamble & Coverage, Nature of Offences and Penalties, Miscellaneous and Subsidiary Provisions Certain Shortcomings, Future Prospects and Needs	6
4	**Mens Rea & Criminal Liability** Introduction, Historical Perspectives, Mens Rea in Indian Criminal Law, Mens Rea in English Criminal Law, Abetment of Offence, Criminal Liability and Role of Mens Rea in Indian Information Technology Act, 2000 **Investigation in Cyber Crimes: Implications and Challenges: :** Introduction, Procedural Aspects, Issues, Complications and Challenges Concerning Cyber Crimes, Problems and Precautionary measures for Investigation	6

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	"Laws on Cyber Crimes [Along with IT Act and Relevant Rules]"	Dr Pramod Kr.Singh	Book Enclave Jaipur India.
02	"Cyber Law: The Law of the Internet and Information Technology"	Craig B	Pearson Education

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	“Guide to Cyber Laws”, Second Edition,	Rodney D. Ryder	Wadhwa And Company, New Delhi
02	"Handbook of Cyber Laws" Macmillan India Ltd, Second Edition	Vakul Sharma	PHI

Year and Semester	Second Year B. Tech - Semester III – CSE(AIML)				
Course Category	OPEN ELECTIVE (OE) -01				
Title of Course	Programming Fundamentals using C++ - Lab			Course Code	AIML2110
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	-	-	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	25	25	50	

Course Pre-Requisite	Basic understanding of Computer Programming Terminologies, Basics of C Programming Language.	
Course Objectives	1	To learn advanced features of the C++ programming language as a continuation of the previous course.
	2	To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
	3	To gain the ability to analyse and compare the features of different programming languages and their suitability for different types of software development tasks.
	4	To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
	5	To enhance problem solving and programming skills in C++ with extensive programming projects.
	6	To become familiar with the LINUX software development environment.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Differentiate object-oriented programming and procedural programming.
	CO2	Use the characteristics of an object-oriented programming language in a program.
	CO3	Construct the basic object-oriented design principles in computer problem-solving.
	CO4	Implement the basic principles of software engineering in managing complex software project.
	CO5	Write programs with advanced features of the C++programming language.
	CO6	Develop programs in the LINUX programming environment.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	2										
CO3	3	2	3	2								
CO4	3	2	3	2		3						
CO5	3	2	2	2		2			3			2
CO6	3	2	2	2		2			3			2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 25 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. End Semester Evaluation has 25 Marks External Practical Examination with Performance and Oral Examination

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 12 to 15 Experiments should get performed.	
Exp. No.	Title of Experiment/ Problem Statement
1	Study and comparison of Procedure Oriented Programming and Object Oriented Programming features with an example.
2	Basic Introduction about C++ Programming Language.
3	Study of Branching Statement, Looping Statement, Control Flow Statement in C++.
4	Implementation of Array in C++.
5	Study to use of Function and Types of Functions.
6	Study and Implementation of Classes and Object in C++.
7	Study and use of constructor its types and Destructor.
8	Study and use of Friend Function and Friend Class.
9	Study and Implement concept of Inheritance and Types of Inheritance.
10	Study and Implement concept of compile Time Polymorphism- Function and Operator Overloading.
11	Study and Implement concept of Run Time Polymorphism- Function Overriding, Virtual Function.
12	Study and Implementation of Exception Handling.
13	Study and Implementation of File I/O Operations.

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Object-Oriented Programming with C++	E. Balaguruswamy	(Tata Mc Graw-Hill) 7thEdition onwards
02	The Complete Reference C++	Herbert Schild	Tata McGraw Hill 4thEditionandonwards

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	C++ Primer	S. B. Lippman and J. Lajoie	Pearson Education 3rd Edition
02	The C++Programming Language	B. Stroutstrup	Pearson Education 3rd Edition
03	Object-Oriented Programming with C++	Balaguruswamy	(Tata Mc Graw-Hill) 6thEdition and onwards
04	Object oriented Programming with C++	Sourav Sahay	(Oxford)2ndedition

Semester- IV

Year and Semester	Second Year B. Tech - Semester IV –CSE(AIML)				
Course Category	Programme Core Course				
Title of Course	Operating Systems			Course Code	AIML2201
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	03	-	-	03	03
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Fundamental knowledge of computer, C programming, Data Structure.	
Course Objectives	1	To learn the basic concepts of operating system, services and operations in the operating system.
	2	To expose the students to various functions of the operating system and their usage
	3	To familiarize students with process scheduling techniques and strategies for handling deadlocks in resource management.
	4	To make the students understand process management, memory management and I/O device Management.
	5	To familiarize students with strategies for handling deadlocks in resource management.
	6	To provide knowledge to the students about the fundamental architecture of UNIX and operating system kernel.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Understand the structure, functions and services of an operating system.
	CO2	Describe the methods of process management, process synchronization and deadlocks.
	CO3	Demonstrate the various memory management and I/O management techniques in effective execution of programs.
	CO4	Analyze the process scheduling, memory management and I/O management techniques.
	CO5	Evaluate file system structures and their role in efficient data storage and retrieval.
	CO6	Understand the structure, functions and services of an operating system.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	2	-	-	-	-	2	2
CO2	3	1	2	2	3	2	-	-	-	-	2	3
CO3	3	1	3	2	3	3	-	-	-	-	1	3
CO4	3	2	1	2	3	2	-	-	-	-	2	2
CO5	2	1	3	1	3	2	-	-	-	-	2	3
CO6	3	2	2	2	3	2	-	-	-	-	2	2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Introduction** Evolution of operating systems, Types of operating systems, Different views of the operating system, The journey of a command execution, Overview of design and implementation of operating systems.	5
2	**Process Management & Synchronization** Process Concept, Operations on Processes, Inter process Communication, Threads, Process Synchronization – Race Conditions, Critical Sections, Synchronization Approaches, Classic Process Synchronization Problems, Semaphores, and Monitors**.**	6
3	**Process Scheduling & Deadlock** Scheduling Terminology and Concepts, Non preemptive Scheduling Policies, Pre-emptive Scheduling Policies, Process Scheduling- Case Studies, Deadlocks - Deadlocks in Resource Allocation, Handling Deadlocks, Deadlock Detection and Resolution, Deadlock Prevention, Deadlock Avoidance.	7
4	**Memory Management** Managing the Memory Hierarchy, Static and Dynamic Memory Allocation, Memory Allocation to a Process, Contiguous Memory Allocation, Non-contiguous Memory Allocation, Paging ,Segmentation, Virtual Memory-Demand Paging, Page Replacement Policies.	6
5	**File Systems and I/O Management** Overview of File Processing, Files and File Operations, Fundamental File Organizations and Access Methods, Directories, Layers of the Input-Output Control System, Overview of I/O Organization, I/O Devices, Device Drivers.	7
6	**Unix Operating System (Case Study)** System structure, User perspective, Architecture of the UNIX operating system, Introduction to system concepts, Kernel data structures, system administration, System calls for the file system- introduction, Network based Operating Systems.	5

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Operating systems concepts and design	Milan Milenkovic	McGraw-Hill,
02	Operating system concept	Silberschatz, Galvin, Gagne	Wiley India, 8th edition
03	Operating systems - A Concept Based approach	Dhananjay M Dhamdhere	McGraw Hill, 3rd Edition
04	The design of Unix Operating System	Maurice J. Bach	PHI

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Operating Systems: Internals and Design Principles	William Stallings	Pearson,7th edition
02	Modern Operating Systems	Andrew S. Tanenbaum	Pearson Education International,4th edition
03	Operating System with case studies in UNIX, Netware and Windows NT	Achyut S. Godbole	TMGH

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	Program Core Course				
Title of Course	Object Oriented Programming Using Java			Course Code	AIML2202
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02			02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Basic knowledge of C programming and object-oriented programming	
Course Objectives	1	To expose the students with the object-oriented concepts.
	2	To learn Inheritance Concepts in programming
	3	To learn how to implement reliable and secure application using exception handling and the ability to write program to perform file operations
	4	To understand how to Develop reliable and user-friendly applications using exception handling.
	5	To understand how to Develop reliable and user-friendly applications using file handling.
	6	To understand how to write programs using Multithreading and Collection framework.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Articulate the principle of object-oriented problem solving & programming
	CO2	Illustrate code reusability using inheritance
	CO3	Illustrate code security and abstraction using package and interface
	CO4	Develop reliable and user-friendly applications using exception handling
	CO5	Develop reliable and user-friendly applications using file handling
	CO6	Use and also illustrate multithreading concepts & collection framework

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2										
CO2		2										
CO3			2									
CO4	3											
CO5		2										
CO6				2								

Level of Mapping as: Low 1, Moderate 2, High 3

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Fundamental Programming in Java** The Java Buzzwords, The Java Programming Environment- JVM, JIT Compiler, Byte Code Concept, A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, exploring the string class, Input and Output, Big Numbers, Arrays, use of command line arguments Objects and Classes: Object-Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing Information to a Method or a Constructor, Creating and using objects, Access control, Static Fields and Methods, this keyword	4
2	**Inheritance** **Inheritance**: Definition, Super classes, and Subclasses, Overriding and Hiding Methods, Polymorphism, Inheritance Hierarchies, Super keyword, Final Classes and Methods, Abstract Classes and Methods, Inner Classes, garbage collection.	4
3	**Interface and Package** **Interfaces**: Defining an Interface, implementing an Interface **Packages**: Class importing, creating a Package, naming a Package, Using Package Members, Managing Source and Class Files.	4
4	**Exception** **Exception**: Definition, dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, finally clause.	4
5	**I/O Streams** **I/O Streams:** Byte Stream – Input Stream, Output Stream, Data Input Stream, Data Output Stream, File Input Stream, File Output Stream, Character Streams, Buffered Stream, Scanner class options, Catching Multiple Exceptions, Re-throwing and Chaining	5
6	Multithreading, Collections **Multithreading**: Processes and Threads, Runnable Interface and Thread Class, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Thread States, Thread Properties **Collections**: Collection Interfaces, Concrete Collections-List, Queue, Set, Map, the Collections Framework Types	6

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Core Java- Volume I	Horstmann	Pearson
02	Core Java- Volume II	Horstmann	Pearson

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	JAVA-The Complete Reference	Herbert Schildt	McGraw Hill, Oracle Press Ninth edition
02	Head First Java	Eric Freeman Elisabeth Robson Bert Bates Kathy Sierra	O'Reilly Publication 3rd edition

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	Program Core Course				
Title of Course	Advanced Computer Graphics			Course Code	AIML2203
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	3	1		4	4
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Basics of Computer concepts	
Course Objectives	1	Converting screen text mode to graphics mode
	2	Developing programs to draw shapes using algorithms
	3	To expose students to the various transformation techniques and projections
	4	To make students understand different algorithms concerned with scanning, filling, windowing and clipping on graphical objects
	5	To make the students aware of generation of curves and surfaces
	6	Converting screen text mode to graphics mode
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Implement standard algorithms to draw various graphics objects using C program
	CO2	Manipulate visual and geometric information of images.
	CO3	Develop programs for 2-D and 3-D Transformations.
	CO4	Use projections to visualize objects on view plane.
	CO5	Implement various clipping algorithms.
	CO6	Develop programs to create curves using algorithms

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3									3		3
CO2	3											3
CO3		3										
CO4								3		3		3
CO5			3							3		
CO6	3	3						3				3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Basics of Computer Graphics** Image and Objects, Pixel and Resolution, Text Mode and Graphics mode, Basic graphics pipeline, Bitmap and Vector based graphics, Application of Computer Graphics, Latest trends in Computer Graphics: Virtual reality and Augmented reality.	5
2	**Raster Scan Graphics** Basics Concepts in line drawing, Digital Differential Analyzer (DDA), Bresenham's algorithms, Circle Generating algorithms: Symmetry of Circle, Bresenham's circle drawing algorithm. Polygon: Types of polygon, inside-outside test, Polygon filling: Seed fill algorithm, Flood fill , boundary fill algorithm	7
3	**Overview of Transformation** Two Dimensional Transformation: Translation, Scaling, Rotation, Reflection, Two Dimensional Transformation : Shearing, Three dimensional transformation :Translation, scaling, rotation, Types of projections: Perspective , Parallel projection	7
4	**Windowing and Clipping** Windowing and clipping concepts, Window to viewport transformation. Line Clipping: Cohen Sutherland Clipping algorithms, Cyrusbeck clipping algorithm, Liang Barsky clipping algorithm, Midpoint subdivision, Polygon Clipping, Text clipping	7
5	**Introduction to Curves Generation** Arc generation using DDA algorithm, Interpolation, Types of Curves: Hilbert's Curve, Koch Curve, B-spline Curve, Bezier Curve	5
6	**Computer Animation** Introduction, Key frame animation, Construction of an animation sequence, Motion control methods, Procedural animation, Key-frame animation vs. Procedural animation, Introduction to Morphing, Warping techniques	5

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Computer Graphics	Atul P. Godse, Dr. DeepaliA. Godse	Technical Publications
02	Procedural elements for Computer Graphics	David F. Rogers	MGH International

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Computer Graphics	Donald Hearn, Baker	Pearson Education, New Delhi M.Pauline
02	Computer Graphics	Dr.Chopra Rajiv	S. Chand New Delhi

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	Multi-disciplinary Minor-2				
Title of Course	Introduction to AI			Course Code	AIML2204
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	02	-	-	02	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Knowledge of Basic Computer Algorithm	
Course Objectives	1	Understand AI Fundamentals.
	2	To Explore Search and Optimization Techniques.
	3	To Understand Knowledge Representation.
	4	To understand statistical data numerically by using correlation, regression and curve fittings
	5	To handle uncertainty management in rule based expert system
	6	To understand the use of TensorFlow
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Understand AI Fundamentals.
	CO2	Use Search and Optimization Techniques
	CO3	Use predicate calculus and propositional logic for knowledge representation.
	CO4	Describe the statistical data numerically by using correlation, regression and curve fittings.
	CO5	Understand uncertainty management in rule based expert system
	CO6	Understand the use of TensorFlow

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3									3		3
CO2	3											3
CO3		3										
CO4												3
CO5								3				
CO6										3		3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**AI- Its Root and Scope** Early history and applications, Attitude towards intelligence, knowledge and human artifices, Overview of AI application areas, AI- A summary	4
2	**Representation and Search** The proportional calculus, The predicate calculus, Using inference rules to produce predicate calculus expression, Graph theory, Strategies for state space search, Introduction to heuristic search, Hill climbing and dynamic programming, Best first search algorithm, Using heuristics in games	4
3	**Representation and intelligence** Issues in knowledge representation, Brief history of AI representational schemes, Introduction to conceptual graphs, Type, individuals and names, Generalization & specialization	4
4	**Rule based expert system** Introduction, K rules as knowledge, representation, schemes, Expert system development teams, Structure, Characteristics, Forward chaining and backward chaining inference techniques., Media Advisor: A Demonstration, Conflict resolution, Advantages and disadvantages Basic probability theory, Bayesian reasoning, Forecast, Certainty factors theory and evidential reasoning, Comparison of Bayesian reasoning and certainty factors	6
5	**Uncertainty management in rule based expert system** Introduction, Basic probability theory, Bayesian reasoning, Forecast, Certainty factors theory and evidential reasoning, Comparison of Bayesian reasoning and certainty factors	5
6	**TensorFlow- Basic Concept** Machine learning and deep learning concepts, TensorFlow- general overview, Installing TensorFlow, first working session, Data Flow graph, TensorFlow Programming model, How to use TensorBoard	5

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Artificial Intelligence; structures and strategies for complex problem solving	Gorge F Luger	Pearson Education 5th Edition
02	Artificial Intelligence: A guide to intelligent systems	Michael Negnevistsky	Person Education, 2nd edition
03	Getting started with TensorFlow	Giancarlo Zaccone	Packt Publishing, 2016

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Introduction to Artificial Intelligence	Dan W. Patterson	Pearson Education India,

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	OPEN ELECTIVE (OE)-02				
Title of Course	Advanced Computer Network			Course Code	AIML2205
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	2			2	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Pre-Requisite	Basics of Computer Network concepts	
Course Objectives	1	To review the computer networking Concepts
	2	To impart concepts of advanced computer networking.
	3	To introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking
	4	To facilitate students in gaining expertise in some specific areas of networking such as the design and maintenance of individual networks
	5	To Understand various transport layer protocols
	6	To Understand application layer protocols
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Apply Data Communications System and its components.
	CO2	Identify the different types of network topologies and protocols.
	CO3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer
	CO4	Identify the different types of network devices and their functions within a network
	CO5	Compare features, formats, and applications of various transport layer protocols.
	CO6	Use various application layer protocols in the network configuration.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3									3		
CO2		3										3
CO3												
CO4	3					3						3
CO5		3				3						3
CO6	3	3								3		
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Computer Networks and the Internet:** History of Computer Networking and the Internet, Networking Devices, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones. Networking Models: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing, Equal- Sized Packets Model: ATM.	4
2	**Network Routing and its concepts:** Structure of a Router, Basic Router Configuration, Building a Routing Table, Static Routing, Dynamic Routing Distance Vector Routing Protocol (RIPv1, RIPv2, EIGRP), Link State Routing Protocols (OSPF).	5
3	**LAN Switching: Switching and its concepts:** Structure of a Switch, Basic Switch Configuration, Virtual LANs (VLANs), VLAN Trunking Protocol (VTP), Spanning Tree Protocol (STP), Inter-VLAN Routing.	5
4	**Wide Area Networks (WANs):** Introduction to WANs, Point-to-Point Protocol (PPP) concepts, Frame Relay concepts, Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT), IPv6.	5
5	**Transport Layer Protocols** Introduction-Services, Port Numbers, User Datagram Protocol-User Datagram, UDP Services, UDP Applications, Transmission Control Protocol-TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, SCTP-SCTP Services, SCTP Features, Packet Format.	5
6	**Application Layer Protocols** World Wide Web and HTTP , FTP-Two connections, Control Connections, Data Connection, Security for FTP Electronic Mail-Architecture (SMTP, POP, IMAP, Introduction of MIME), Domain Name System-Name Space, DNS in the internet, Resolution, Caching, Resource Records	5

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Computer Networking: A Top-Down Approach Featuring the Internet	James F. Kurose, Keith W.Ross	Pearson Education
02	Network Fundamentals	Mark Dye	Pearson Education

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Software Defined Networking (SDN): Anatomy of OpenFlow Volume 1.	Marschke D, Doyle J, Moyer P	Lulu.com
02	Network Functions Virtualization (NFV) with a Touch of SDN	Chayapathi R, Hassan SF, Shah P	Addison-Wesley Professional

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	OPEN ELECTIVE (OE)-02				
Title of Course	Software Development using Agile			Course Code	AIML2205
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	2	-	-	2	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30 Marks	10 Marks	60 Marks	100 Marks	

Course Pre-Requisite	Basic concepts of Software Engineering.	
Course Objectives	1	To familiarize the students with the features of agile development.
	2	To determine the role of design principles in agile software design
	3	To facilitate students in understanding the Tracking Agile Projects.
	4	To facilitate students in differentiating tools.
	5	To Explore advanced Agile practices like Extreme Programming (XP), Kanban, CI/CD, and Test Automation in Agile environment
	6	To Analyze Agile metrics, testing strategies, and quality assurance measures while understanding Agile adoption challenges through case studies.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Define the common characteristics of an agile development process.
	CO2	List and contrast state of the practice agile methodologies.
	CO3	Contrast agile software development process models and plan driven process models
	CO4	Identify software project characteristics that would be suitable for an agile process.
	CO5	Adopt advanced Agile techniques such as Extreme Programming (XP), Kanban, CI/CD pipelines, and test automation.
	CO6	**Evaluate Agile performance metrics, testing strategies, and best practices** to ensure software quality and continuous improvement

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3	3								3		
CO3	3		3									
CO4	3	3		3							3	
CO5	3	3	3	3	3				2		3	3
CO6	3	3	3	3	3	2			2	2	3	3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	**Introduction to Software Development Life Cycle (SDLC)** Overview of SDLC, Phases of SDLC: Requirement Analysis, Design, Development, Testing, Deployment, Maintenance. Types of SDLC, Benefits and Challenges of SDLC.	4
2	**Introduction to Agile Software Development** What is Agile? Key Agile Methodologies: Scrum, Kanban, Extreme Programming (XP), Lean Software Development, Feature-Driven Development (FDD), Key Agile Concepts: Iterations and Increments, Continuous Improvement, Cross-functional teams, Customer collaboration, Differences between Agile and Waterfall models, Principles Agile Manifesto,	5
3	**Agile Scrum Framework** Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.	5
4	**Tools for Agile Development** **Jira Overview:** Introduction to Jira software, Setting up Jira for Agile projects, Creating and managing backlogs in Jira, Jira workflows (Scrum, Kanban, etc.), Creating and managing Epics, Stories, Tasks, and Bugs **Jira for Scrum:** Managing sprints and boards, Creating and tracking issues in Jira, User story mapping **Reporting in Jira:** Using Jira's reporting features (Burndown charts, Velocity charts, etc.), Customizing reports	5
5	**Extreme Programming (XP), Kanban** XP Practices (TDD, Pair Programming, Refactoring, Simple Design, Continuous Integration), DevOps & Agile, CI/CD Pipelines, Test Automation in Agile. Introduction to Kanban: Kanban principles and workflow, Comparing Kanban with Scrum.	5
6	**Agile Metrics, Quality Assurance, and Agile Adoption Challenges:** Agile Metrics (Lead Time, Cycle Time, Cumulative Flow Diagram), Agile Testing Strategies, Quality Assurance in Agile, Managing Agile Teams, Agile Best Practices and Anti-patterns, Overcoming challenges in Agile Transformation, Case Studies of Agile Implementation.	**5**

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Agile Development with Scrum	Ken Schwaber & Mike Beedle	Prentice Hall, 2001
02	Integrating Agile Development in the Real World	Peter Schuh	Charles River Media, 2005

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Agile Software Development.	Alistair Cockburn	The Cooperative Game (2nd Edition), 2007
02	Succeeding With Agile, Software Development Using Scrum	Mike Cohn	Addison Wesley, 2010

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	HUMANITIES SOCIAL SCIENCE AND MANAGEMENT (HSSM)				
Title of Course	Community Services using Technology			Course Code	AIML2206
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	2 Hrs/ Week	-	-	2	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	50	-	50	

Course Objectives	1	To create an awareness among the common man of Western Maharashtra region and area coming under jurisdiction of the Shivaji University regarding the e-services provided by various public sector organization
	2	To promote the use of technological services in day-to-day activities.
	3	To understand the problems of the locality.
	4	To make the student aware of the various engineering tools and techniques used in eservices.
	5	To create awareness of RTI (Right to Information) among general public for procuring public documents and it's appropriate use.
	6	To Assess the Impact of Technology-Driven Community Service Initiatives
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Ability to Apply Technology to Address Community Needs:
	CO2	Collaboration and Teamwork in Technology-Driven Projects:
	CO3	Effective Communication and Advocacy through Technology
	CO4	Ability to Evaluate the Effectiveness of Technology-Based Initiatives
	CO5	Enhanced Awareness of Global and Local Social Issues
	CO6	Empowerment of Community Members through Technology

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										3
CO2	3	3	3						3			3
CO3	3	3	3	3							3	3
CO4	3	3	3									3
CO5	3	3						3				3
CO6	3	3	3	3	3							3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
• Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 % • Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units). • No compulsory passing for MSE. • ESE paper setting weightage will be, 25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units).

Unit No.	Title and Content of Unit	Hours
1	With the prior written permission from the Head of the Institute the project group should visit any Public Sector / Government/ Semi government organization like – Zilha Parishad, Collector Office, Municipal Corporation, Tahasildar Office, RTO, MSEB, Court, Railway station , Tourism Services, agricultural service sector, Banks where the facilities of e- governance and e-services available for public purposes.	
2	The project group should understand the public related services and identify the required services for the common man.	
3	Two/Three groups should plan awareness programs/camps to be carried out in the nearby villages/Talukaplaces/residentialcolonies/localitiesandvisitthesuitable areas along with the staff to create awareness among the common man about various eservices available in public domain.	
4	They should prepare a presentation simulating the services that are being exposed to common man and give a demonstration during their visit to the concerned area.	
5	Further group should take the feedback from the concerned locality on a pre-designed format that may be provided by the Head of the Institute	
6	Group should prepare a report detailing: a. The kind of services chosen. b. The office/ organization visited mentioning the authorities meet. c. The facilities provided by the chosen service. d. Preparations for the visit. e. Presentation Techniques & Tools used f. Analysis of the Feedback Form filled during visit g. Observations and conclusions during the entire work	
7	Submission of the above report duly signed by the concerned staff and Head of the department is to be done to the department at the end of semester.	

Year and Semester	Second Year B. Tech - Semester IV –CSE(AIML)				
Course Category	Humanities Social Science and Management				
Title of Course	Employability Enhancement Skills-II			Course Code	AIML2207
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	2	-	-	2	2
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	25	-	50	

Course Pre-Requisite		
Course Objectives	1	To develop verbal and non-verbal communication abilities essential for professional interactions
	2	To train students in presenting technical and non-technical content clearly and confidently
	3	To focus on teamwork and problem-solving approach to meet industry expectations.
	4	To prepare students for interviews by improving their self-presentation and answering techniques.
	5	To help students articulate ideas clearly in written format, including emails, reports, and other technical documentation.
	6	To effectively manage time and complete goals by the deadline.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	effectively communicate and present ideas in both professional and technical environments
	CO2	deliver structured, effective, and confident presentations
	CO3	work efficiently in teams and handle interpersonal issues in a professional manner.
	CO4	confidently face interviews and improve their chances of employability.
	CO5	produce technical and professional written materials such as reports, emails, and resumes
	CO6	adopt time management techniques to improve their productivity in both academic and professional settings.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2				2				3		
CO2										3		
CO3									3		2	
CO4	2	2		2								3
CO5			2							3		
CO6											3	3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic.

Unit No.	Title and Content of Unit	Hours
1	**Communication Skills** Verbal communication: Effective speaking and listening skills, Non-verbal communication: Body language, gestures, and expressions, Barriers to communication and overcoming them, Professional email writing and etiquette.	4
2	**Presentation Skills** Basics of presentation: Structure, flow, and delivery, Presentation tools: PowerPoint, Canva, and others, Handling Q&A sessions effectively, Giving technical presentations to a non-technical audience.	4
3	**Interpersonal Skills** Teamwork and collaboration in projects, Conflict resolution and problem-solving, Adaptability and flexibility in a professional environment, Building professional relationships and networks.	4
4	**Interview Preparation** Self-introduction and resume preparation, Mock interviews: HR and technical rounds, Behavioral questions and STAR method (Situation, Task, Action, Result), Technical interview strategies (specific to AIML domain).	4
5	**Professional and Technical Writing** Writing professional emails, Report writing: Lab reports, project documentation, etc. Technical proposals and abstracts, Writing resumes and cover letters.	4
6	**Time Management and Productivity Skills** Prioritization techniques (Eisenhower Matrix, Pomodoro Technique), Setting SMART goals, Managing deadlines in academic and work-life balance, Tools for productivity: Trello, Asana, etc.	4

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Business Communication: Process and Product	Mary Ellen Guffey and Dana Loewy	Cengage Learning, 9th Edition (2018)
02	The Exceptional Presenter: A Proven Formula to Open Up! and Own the Room	Timothy J. Koegel	Greenleaf Book Group Press, Revised Edition (2007)
03	Soft Skills: The Software Developer's Life Manual	John Sonmez	Manning Publications, 1st Edition (2015)
04	Cracking the Coding Interview: 189 Programming Questions and Solutions	Gayle Laakmann McDowell	CareerCup, 6th Edition (2015)
05	Technical Writing: Process and Product	Sharon Gerson and Steven Gerson	Pearson, 8th Edition (2017)
06	Getting Things Done: The Art of Stress-Free Productivity	David Allen	Penguin Books, Revised Edition (2015)

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Effective Communication Skills	MTD Training	MTD Training & Ventus Publishing, 2010
02	Presentation Zen: Simple Ideas on Presentation Design and Delivery	Garr Reynolds	New Riders Press, 3rd Edition (2019)
03	The 7 Habits of Highly Effective People	Stephen R. Covey	Simon & Schuster, 25th Anniversary Edition (2013)
04	How to Answer Interview Questions: 101 Tough Interview Questions	Peggy McKee	Career Confidential, 2012
05	Handbook of Technical Writing	Gerald J. Alred, Charles T. Brusaw, and Walter E. Oliu	Bedford/St. Martin’s, 12th Edition (2018)
06	The Pomodoro Technique: The Life-Changing Time-Management System	Francesco Cirillo	Random House, 1st Edition (2018)

Year and Semester	Second Year B. Tech - Semester IV –CSE(AIML)				
Course Category	Programme Core Course				
Title of Course	Operating Systems Lab			Course Code	AIML2208
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	-	-	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	50	25	75	

Course Pre-Requisite	Fundamental knowledge of computer, C programming, Data Structure	
Course Objectives	1	To learn the basic concepts of operating system, services and operations in the operating system.
	2	To expose the students to various functions of the operating system and their usage
	3	To familiarize students with process scheduling techniques and strategies for handling deadlocks in resource management.
	4	To make the students understand process management, memory management and I/O device Management.
	5	To familiarize students with strategies for handling deadlocks in resource management.
	6	To provide knowledge to the students about the fundamental architecture of UNIX and operating system kernel.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Understand the structure, functions and services of an operating system.
	CO2	Describe the methods of process management, process synchronization and deadlocks.
	CO3	Demonstrate the various memory management and I/O management techniques in effective execution of programs.
	CO4	Analyze the process scheduling, memory management and I/O management techniques.
	CO5	Evaluate file system structures and their role in efficient data storage and retrieval.
	CO6	Understand the structure, functions and services of an operating system.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	2	-	-	-	-	2	2
CO2	3	1	2	2	3	2	-	-	-	-	2	3
CO3	3	1	3	2	3	3	-	-	-	-	1	3
CO4	3	2	1	2	3	2	-	-	-	-	2	2
CO5	2	1	3	1	3	2	-	-	-	-	2	3
CO6	3	2	2	2	3	2	-	-	-	-	2	2
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. End Semester Evaluation has 25 Marks External Practical Examination with Performance and Oral Examination

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 12 to 15 Experiments should get performed.	
Exp. No.	Title of Experiment/ Problem Statement
1	Fundamentals of Linux system programming and programmers overview of the Linux System (Ref : Introduction and Essential Concepts)
2	Study & demonstration of how the Linux Kernel implements and Manages files.(Ref Chapter : File I/O)
3	Study & demonstration of User Buffer me /O- Observe practically by writing program. (Ref: Buffer I/O).
4	Study and demonstration of Advanced File I/O and system calls (Refer : Advanced File I/O).
5	Study and demonstration of Unix Process. Management – from process creation to process termination (Ref : Process Management).
6	Implement and compare different process scheduling algorithms such as First-Come-First-Serve (FCFS), Shortest Job Next (SJN), and Round Robin (RR).
7	Observe and analyze the average turnaround time, waiting time, and throughput for different scheduling scenarios.
8	Write a program to simulate resource allocation and implement algorithms for deadlock detection and prevention.
9	Study and Demonstration of the File and Directory Management(Refer: File and Directory Management).
10	Study and demonstration of Memory Management (Refer: Memory Management)
11	Implementation of Page replacement policies like FCFS, LRU, Optimal
12	Implement a program to demonstrate how page faults occur and compare page replacement algorithms (e.g., FIFO, LRU, Optimal) with respect to the number of page faults.

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Operating systems concepts and design	Milan Milenkovic	McGraw-Hill,
02	Operating system concept	Silberschatz, Galvin, Gagne	Wiley India, 8th edition
03	Operating systems - A Concept Based approach	Dhananjay M Dhamdhere	McGraw Hill, 3rd Edition
04	The design of Unix Operating System	Maurice J. Bach	PHI

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	Operating Systems: Internals and Design Principles	William Stallings	Pearson,7th edition
02	Modern Operating Systems	Andrew S. Tanenbaum	Pearson Education International,4th edition
03	Operating System with case studies in UNIX, Netware and Windows NT	Achyut S. Godbole	TMGH

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	Program Core Course				
Title of Course	Object Oriented Programming Using Java - Lab			Course Code	AIML2209
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	-	-	04	04	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	25	25	50	

Course Pre-Requisite	C, C++	
Course Objectives	1	To expose the students with the object-oriented concepts.
	2	To learn how to implement reliable and secure application using exception handling and the ability to write program to perform file operations.
	3	To understand how to Develop reliable and user-friendly applications using exception handling and file handling.
	4	To understand how to write programs using Multithreading and Collection framework.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Articulate the principle of object-oriented problem solving & programming
	CO2	Illustrate code reusability, security and abstraction using inheritance, package and interface
	CO3	Develop reliable and user-friendly applications using exception handling and file handling
	CO4	Use and also illustrate multithreading concepts & collection framework

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2										
CO2		2	2									
CO3	3	2										
CO4				2								
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 25 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. End Semester Evaluation has 25 Marks External Practical Examination with Performance and Oral Examination

Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 12 to 15 Experiments should get performed.	
Exp. No.	Title of Experiment/ Problem Statement
1	Implementation of class, object and constructor
2	Write a program to implement static variables and static methods.
3	Write a program to illustrate the concept Abstract class
4	Write a java program to implement Interface
5	Write a program to illustrate the concept of package
6	Write a program to illustrate the Exception handling
7	Write a program to illustrate the File handling
8	Write a program to illustrate the File handling.(Implement FileInputStream, DataInputSteram, FileOuputStream, DataOuputSteram)
9	Write a GUI based program
10	Write a program to demonstrate collection and generics
11	Write a java program that implements a multi-thread application
12	Write a program for handling databases in java

Textbooks			
Sr. no.	Title	Author	Edition/Publication
01	Core Java- Volume I	Horstmann	Pearson
02	Core Java- Volume II	Horstmann	Pearson

Reference Books			
Sr. no.	Title	Author	Edition/Publication
01	JAVA-The Complete Reference	Herbert Schildt	McGraw Hill, Oracle Press Ninth edition
02	Head First Java	Eric Freeman Elisabeth Robson Bert Bates Kathy Sierra	O'Reilly Publication 3rd edition

Year and Semester	Second Year B. Tech - Semester IV – CSE(AIML)				
Course Category	**Value Education Course**				
Title of Course	**Mini Project Lab**			**Course Code**	**AIML2210**
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	-	-	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	25	25	50	

Course Pre-Requisite	Knowledge of software engineering and C/C++	
Course Objectives	1	To expose the students to solve the real world problems.
	2	To utilize the techniques Skills and modern Engineering tools for building the project.
	3	To follow the methods and tasks as per SDLC Approach
	4	To provide students with the opportunity to apply theoretical knowledge gained.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Define the problem statement.
	CO2	Organize, Plan and prepare the detailed project activities.
	CO3	Construct Flowchart, System Architecture based on the project description
	CO4	Implement the solution for their problem.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2				2				3		
CO2										3		
CO3									3		2	
CO4	2	2		2								3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
In Semester Evaluation/ Continuous Assessment has 25 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic. End Semester Evaluation has 25 Marks External Practical Examination with Performance and Oral Examination

Course Contents / Description
The Mini Project should be undertaken preferably by a group of 3-4 students who will jointly work together and implement the project. The Mini Project topic should be based on the any one subject concepts that students have studied for their Academic Year. The group will select the project with the approval of the guide and submit the name of the project with a synopsis of the proposed work not more than 04 to 05 pages. In the Synopsis they have to state Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution. They have to implement project using C, C++languages.

Year and Semester	Second Year B. Tech - Semester IV (Common to all branches of Engineering)				
Course Category	Basic Science Courses (BSC)				
Title of Course	**Environmental Science**			Contact Hrs/Week	Credits
Teaching Scheme	L	T	P		
	02	--	--	02	Audit
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Objectives: The objectives of the course is to

1. Understand the scope & multidisciplinary nature of Environmental Studies.
2. Get acquainted with the problems associated with natural resources and their conservation.
3. Familiarize the environmental & social problems with global concern.
4. Recognize the importance of Biodiversity with respect to Western Ghats.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Understand the importance of Environmental Studies and recognize significance of ecosystem.	II
CO2	Classify the values of natural resources with associated problems for sustainable lifestyles.	II
CO3	Describe the social and global environmental issues	II
CO4	Make aware of Pollution issues with its mitigation measures.	II
CO5	Familiarize the basics of Biodiversity and concerned issues in the context of Western Ghats.	II
CO6	Acquaint with the role of environmental laws and regulations in conservation efforts.	I

SYLLABUS

Unit No	Content	Hours
Unit 1	**Nature of Environmental Studies and Importance of ecosystems.**	
	• Definition, scope and importance. • Multidisciplinary nature of environmental studies • Need for public awareness. **Ecosystem** • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Food chains, food webs and ecological pyramids • Introduction, types, characteristics features, structure and function of the following ecosystem a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) • Degradation of the ecosystems and it's impacts.	**06 Hrs**
Unit 2	**Natural Resources and Associated Problems.**	
	• Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. • Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. • Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. • Food resources: World food problem, changes caused by agriculture, effect of modern agriculture, fertilizer-pesticide problems. • Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy. • Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of individuals in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	**06 Hrs**
Unit 3	• **Social Issues and the Environment**	
	• Human population growth and impact on environment. • Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment. • Environmental movements- Chipko Movement, Appiko Movement, Silent Valley Movement. • Resettlement and rehabilitation of people; its problems and concerns. • Water conservation, rain water harvesting.	**04 Hrs**

	• Disaster management: floods, earthquake, cyclone, tsunami and landslides, Case studies.	
Unit 4	• **Environmental Pollution**	
	• Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Global warming, acid rain, ozone layer depletion. • Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Solid waste management, control & rules, • Role of an individual in prevention of pollution	**04 Hrs**
Unit 5	• **Biodiversity and its conservation:**	
	• Introduction- Definition: genetic, species and ecosystem diversity. • Bio-geographical classification of India. • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. • India as a mega- diversity nation. • Western Ghat as a biodiversity region. Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts, • Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity.	**04 Hrs**
Unit 6	• **Environmental Protection-Policies and practices**	
	• Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • National and International Conventions and agreements on environment.	**04 Hrs**

Field work: (Field work is equal to 4 lectures) **10 marks**

Note - The ISE/CA is carried out through the Field work and Report writing.

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

References:

Reference Books	
1	Raut P.D., Environmental Studies, Shivaji University Press, 2021
2	Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p
3	Hawkins R.e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
4	Heywood, V.H. & Watson, R.T.1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
5	Jadhav, H. & Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
6	McKinney, M.L. & School. R.M.1196, Environmental Science Systems & Solutions, Web enhanced edition, 639p
7	Mhaskar A.K., Master Hazardous, Techno-Science Publications (TB)

Year and Semester	Second Year B. Tech - Semester IV –CSE(AIML)				
Course Category	**Vocational and Skill Enhancement Course**				
Title of Course	**Computer Peripherals and Hardware Maintenance**			**Course Code**	**AIML2212**
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	-	-	02	02	01
Examination Scheme	MSE	ISE/CA	ESE	Total	
	-	50	-	50	

Course Pre-Requisite	Knowledge of basics of computer hardware, electronics and electrical Fundamentals.	
Course Objective	1	To introduce the fundamentals of computer systems and their classifications
	2	To develop the ability to diagnose and troubleshoot hardware issues
	3	To provide knowledge of processor selection for various computing needs
	4	To impart skills for managing storage devices.
	5	To enable the troubleshooting of peripheral devices and network-related issues.
	6	To ensure understanding of power supply testing and maintenance.
Course Outcomes	After competition of this course Students will be able to ….	
	CO1	Identify different types of computer systems.
	CO2	Troubleshoot common motherboard problems.
	CO3	Select processors required for relevant systems.
	CO4	Partition/format hard disk drives.
	CO5	Troubleshoot peripherals and networks.
	CO6	Test power supplies.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	2	3	2	-	-	-	-	-	3
CO2	3	3	2	2	2	-	-	-	-	-	-	2
CO3	3	2	3	2	3	2	-	-	-	-	2	3
CO4	3	2	1	2	2	2	-	-	-	-	1	3
C05	2	3	3	2	3	1	-	-	-	-	2	2
CO6	3	2	3	2	3	2	-	-	-	-	1	3
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme	
In Semester Evaluation/ Continuous Assessment has 50 Marks Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc. Lab File should be prepared and should be assessed continuously during academic.	
Guidelines for Lab Performance	
Faculty can create Experiment list based on following listed topics. Minimum 12 to 15 Experiments should get performed.	
Exp. No.	Title of Experiment/ Problem Statement
1	Identify type of Desktop, laptop and verify its Specification and hardware components on motherboard. Troubleshoot common problems of motherboard.
2	Configure BIOS settings.
3	Partition and manage hard disk: format hard drives with different file systems.
4	Install Operating System - Windows family (such as Windows 8/ Windows 10, Windows server 12)
5	Install Operating System -Unix family (such as Linux/Ubuntu/Centos)
6	Troubleshoot Hard disk problems.
7	Install local printer (Software configuration settings on printer and troubleshooting).Share Printer in Network.
8	Set keyboard, mouse, monitor, Speaker, Microphone and LCD Projector.
9	Install SMPS, measure voltage levels in main connectors of SMPS connecting various subsystems.
10	Assemble and Disassemble Desktop System.
11	Troubleshoot computer system by diagnosing the problem.
12	Use diagnostic software for fault finding and viruses.
13	Undertake Preventive Maintenance of PC using vacuum cleaner and simple tools.

Textbooks			
Sr. no.	Title	Author	Edition/Publication
1	The computer hardware installation, interfacing, troubleshooting and maintenance	James, K.L	PHI Learning, New Delhi. 2014 ISBN: 978-81-203-4798-4
2	Comdex: Hardware and Networking Course Kit	Gupta, Vikas	Dreamtech Press, New Delhi ISBN: 978-93-5119-265-7

Reference Books			
Sr. no.	Title	Author	Edition/Publication
1.	The Complete PC Upgrade And maintenance Guide	Minasi, Mark	BPB Publication, New Delhi ISBN:978-81-265-0627-9
2.	Computer Architecture and Maintenance Vol.	Kadam, Sachin	Shroff Publication, Mumbai ISBN: 978-9350230244

Equivalence of Subjects between CBCS and NEP for S.Y. B. Tech (Semester-III & IV)

Name of Programme: Computer Science and Engineering (AIML)

Class: S. Y. B. Tech Semester- III

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	Probability & Statistics	Probability & Statistics	100 %	
2	Discrete Mathematical Structures			Removed in new syllabus
3	Data Structures using C	Data Structures	85%	
4	Computer Networks	Computer Networks	65%	
5	Computer Organization and Architecture			Removed in new syllabus
6	Programming Fundamentals using C++	Programming Fundamentals using C++ (PFC++)	100%	OE-1
7	Soft Skills	Employability Enhancement Skills-I	80%	

Class: S. Y. B. Tech Semester- IV

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	Automata Theory			Removed in new syllabus
2	Fundamentals of AI			Newly introduced
3	Advanced Computer Graphics	Advanced Computer Graphics	70%	
4	Operating Systems	Operating Systems	95%	
5	Software Engineering	Software Development using Agile	10%	OE-II
6	Python Programming			Newly introduced
7	Mini Project	Mini Project Lab	100%	
8	Environmental Studies	Environmental Science	100%	

Exit Course for Computer Science and Engineering After 2nd Year

- **As part of the NEP 2020 Revised Syllabus, for the First Year B. Tech Exit, students must earn a total of 8 additional credits. This includes 6 credits from online SWAYAM NPTEL courses and 2 credits from Virtual Lab performance.**
- **Students must complete two SWAYAM NPTEL courses (12-week duration) from the provided list and successfully perform two Virtual Labs from the specified list.**
- **Each SWAYAM NPTEL course carries 3 credits, while each Virtual Lab is worth 1 credit.**

Sr. No.	Name of NPTEL Course
1	Artificial Intelligence: Knowledge Representation And Reasoning
2	Cryptography and Network Security
3	Computer Vision And Image Processing - Fundamentals And Applications

Sr. No.	Name of Virtual Lab
1	Data Analytics with Python
2	Programming In Java