Study & Evaluation Scheme

of

Bachelor of Technology
(Computer Science & Engineering)
Specialization in
Artificial Intelligence, Machine Learning & Deep Learning

[Applicable w.e.f. Academic Session - 2020-21 till revised]

[As per CBCS guidelines given by UGC]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

Website: www.tmu.ac.in

Study & Evaluation Scheme	
SUMMARY	
Institute Name	**COLLEGE OF COMPUTING SCIENCES & INFORMATION TECHNOLOGY**
Programme	***Bachelor of Technology(Computer Science & Engineering) Specialization in AI + ML + DL***
Duration	*Four Years full time(Eight Semesters)*
Medium	*English*
Minimum Required Attendance	*75%*
Credits	
Maximum Credits	*184*
Minimum Credits Required for Degree	*176*

Assessment:					
Evaluation			**Internal**	**External**	**Total**
Theory			40	60	100
Practical/ Dissertations/ Project Reports/ Viva-Voce			50	50	100
Class Test-1	**Class Test-2**	**Class Test-3**	**Assignment(s)**	**Attendance& Participation**	**Total**
Best two out of three					
10	10	10	10	10	40
Duration of Examination			**External**	**Internal**	
			3 Hours	1.5 Hours	

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester end examination and teachers continuous evaluation.(i.e. both internal and external).A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have at least 45% marks in aggregate to clear the semester.

 # Provision for delivery of 25% content through online mode.

 # Policy regarding promoting the students from semester to semester & year to year. No specific condition to earn the credit for promoting the students from one semester to next semester.

 # Maximum Duration: Maximum no of years required to complete the program: N+2 (N=No of years and For B.Tech(CSE){AI + ML + DL} N=4)

Question Paper Structure	
1	*The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to*

	V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.
2	*Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.*
3	*The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.*
Evaluation of practical course [From Second Year Onwards]	
1	**Practical Courses Internal Evaluation (50 marks)** EXPERIMENT (30 MARKS) | ATTENDANCE (10 MARKS) | VIVA (10 MARKS) | TOTAL INTERNAL (50 MARKS)
2	**Practical Courses External Evaluation (50 marks)** The external evaluation would also be done by the External Examiner based on the experiment performed during the examination. EXPERIMENT (30 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | TOTAL EXTERNAL (50 MARKS)
IMPORTANT NOTES:	
1	*The purpose of examination should be to assess the CourseOutcomes (CO) that will ultimately lead to of attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy).*
2	*Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.*
3	*There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.*
4	*Progression: There is no restriction to earn minimum credits for progression from semester to semester and year to year.*

A. Introduction:

An undergraduate degree programme in computer engineering with specialization in AI + ML + DL, aims to provide students with a solid foundation in the underlying principles of computer engineering before students move forward in an area of Artificial Intelligence , Machine Learning and Deep Learning. The course will comprise of a range of learning modes- laboratory work tutorials, lectures, project work and individual research. Engineering bachelorcourse will take four years for completion. Computer engineering seeks to understand the application of computer science in the form of software and hardware. It comprises of the skills like computer programming languages, database utilities, web programming, Building AI and Machine Learning Models and others.

Students will develop and gain various skills that are transferable within the engineering world and practical skills that are equally useful in plenty of other sectors. Problem-solving skills are honed, and their interpersonal and communication skills will also improve with the amount of team work that they will be required to do. Students will also learn how to better manage their time and resources and assess the risks involved in a certain project. Other useful skills that they will learn include design, leadership and organizational skills.

The institute emphasis on the following courses ***balanced with core and elective courses****:* The curriculum of B.Tech. specialized program emphasizes an intensive, flexible engineering education with 155 credits of core courses (all types), 15 credits of electives and 14 credits of field/internship projects. Total 184 credits are allotted for the B.Tech. degree.

The programme structure and credits for B.Tech. are finalized based on the stakeholders' requirements and general structure of the programme. Minimum number of classroom contact teaching credits for the B.Tech. program will be 162 credits and Project/internship will be of 14 credits. However, the minimum number of the credits for award of B.Tech. degree will be 176 credits. Out of 184total credits of classroom contact teaching, 75 credits are to be allotted for Professional core courses (PCC), 19 credits are allotted to Basic Science Courses (BSC), 11 credits are allotted to Engineering Science Courses (ESC), 6 credits are allotted to open elective courses (OEC), 21 credits are allotted to Humanities and Social Sciences including Management courses (HSMC), 9 credits are allotted to Professional Elective courses and rest of 26 credits for Laboratory courses(LC).

B.TECH (CSE) Specialization in AI + ML + DL : Four-Year (8-Semester) CBCS Programme				
Basic Structure: Distribution of Courses				
S.No.	**Type of Course**	**Credit Hours**	**Total Maximum Credits**	**Minimum credit required**
1	Professional Core Courses (PCC)	25 Courses of 3 Credit Hrs. each (Total Credit Hrs. 25X3)	75	75
2	Professional Elective Courses (PEC)	3 Courses of 3 Credit Hrs. each (Total Credit Hrs. 3X3)	9	9
3	Mandatory Courses (MC)	1 Courses of 3 Credit Hrs. each (Total Credit Hrs. 1X3)	3	3
4	Laboratory Courses (LC)	4 Courses of 2 Credit Hrs. each (Total Credit Hrs. 4X2) 18 Courses of 1 Credit Hrs. each (Total Credit Hrs. 18X1)	26	26
5	Project / Industrial Training/Seminar (PROJ)	1 Courses of 6 Credit Hrs. each (Total Credit Hrs. 1X6) 1 Courses of 4 Credit Hrs. each (Total Credit Hrs. 1X4) 2 Courses of 2 Credit Hrs. each (Total Credit Hrs. 2X2)	14	14
6	Open Elective Courses (OEC)	2 Courses of 3 Credit Hrs. each (Total Credit Hrs. 2X3)	6	49
7	Basic Science Courses (BSC)	4 Courses of 4 Credit Hrs. each (Total Credit Hrs. 4X4) 1 Courses of 3 Credit Hrs. each (Total Credit Hrs. 1X3)	19	
8	Engineering Science Courses (ESC)	2 Courses of 4 Credit Hrs. each (Total Credit Hrs. 2X4) 1 Courses of 3 Credit Hrs. each (Total Credit Hrs. 1X3)	11	
9	Humanities and Social Sciences including Management courses (HSMC)	1 Courses of 4 Credit Hrs. each (Total Credit Hrs. 1X4) 5 Courses of 3 Credit Hrs. each (Total Credit Hrs. 5X3) 1 Courses of 2 Credit Hrs. each (Total Credit Hrs. 1X2)	21	
10	Value Added Audit Course (VAAC)	6 Courses of 0 Credit Hrs. each (Total Credit Hrs. 6X0)	0	
Total Credits			**184**	**176**

Contact hours include work relatedto Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

B. Tech (Honours) Programme:

Additionally, A programme B.Tech with Honours is introduced in order to facilitate the students to choose additionally with the specialized courses of their choices and build their competence in a specialized area. The features of the new programme, include:

1. B.Tech Student in regular stream can opt for B.Tech (Hons.), provided he/she passed in all courses with minimum aggregate 75% marks upto the end of second semester.
2. For B. Tech (Hons), Student needs to earn additional 24 credits (over and above the required minimum 184 credits) relevant to her/his discipline as recommended by the faculty advisor.
3. The students opting for this program have to take four additional courses of their specialization of a minimum of 2 credits each from 3rd to 8th semesters.
4. The faculty advisor will suggest the additional courses to be taken by the students based on their choice and level of their academic competence.
5. The list of such additional courses offered by the NPTEL will be approved by the Honourable Vice Chancellor in the beginning of the academic year to facilitate the registration process.
6. The student can also opt for post graduate level courses.
7. The students have to submit the NPTEL course completion certificate to exam division for considering as B.Tech (Hons)

* Student should have to take permission of registration for the B.Tech. (Hons.) degree from Honourable Vice Chancellor in starting of third semester.

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC/AICTE and adopted by our University.

The following is the course module designed for the B.TECH (CSE) program:

Professional Core Course (PCC):Professional core courses of B.TECH (CSE)with specialization in AI + ML + DL, will provide a holistic approach to computer education, giving students an overview of the field, a basis to build specialization in the field of artificial intelligence , machine learning and deep learning. These core courses are the strong foundation to establish computer knowledge and provide broadmulti-disciplined knowledge can be studied further in depth during the last phase of engineering for better understanding of building intelligent models for real life applications.

The core courses will provide more practical-based knowledge, case-based lessons andcollaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the society at large.

A wide range of core courses provides groundwork in the basic computer disciplines: programming languages, Database, Web Programming, Mobile Applications, Big data, Data Mining, Machine Learning, Deep Learning etc.

The integrated foundation isimportant for students because it will not only allow them to build upon existing skills, but they can also explorecareer options in a range of industries, and expand their understanding of various computer fields.

We offer twenty fiveprofessional core courses with 3 credit each from semester III onwards during the B.Tech. programme.

Humanities and Social Sciences including Management courses (HSMC): As per the AICTE guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the ***Humanities and Social Sciences including Management courses*** are actually Ability Enhancement Compulsory Course (AECC) which is designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offer one HSMC of 4 credits and five courses of 3 credits and one courses of 2 credits in different semesters of engineering course.

Basic Science Course (BSC):Basic Science Course of B.TECH (CSE) program will provide a basic foundation to build the knowledge in the field of engineering and science. The BSC consists of courses like mathematics, physics and chemistry. These BSC courses has been placed in Semester-I, II and III. Total 19 credits have been assigned to BSC with 4 Courses of 4 Credit, 1 Courses of 3 Credit.

Engineering Science Course (ESC):Engineering Science Course of B.TECH (CSE) program will provide a basic foundation of the various field of engineering like Electrical, Electronics, Mechanical and Civil. These ESC courses has been placed in Semester-I & II and total 11 credits has been assigned with 2 Courses of 4 Credit,1 Courses of 3Credit .

Open Elective Course (OEC): Open Elective is an interdisciplinary additional subject that is compulsory in the seven and eight semester of a program. The score of Generic Elective is counted in your overall aggregate marks under Choice Based Credit System (CBCS). Each Generic Elective paper will be of 3 Credits and students will have the choice of taking 2 OEC: 1 each in Semester VII & VIII. Each student has to take Open Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Generic Electives.

Mandatory Course (MC):This is a compulsory course that does not have any choice and will be of 3 credits. Each student of B.TECH(CSE) program has to compulsorily pass the Environment Studies course and acquire 3 credits.

Value Added Course (VAC): A Value Added Course is a non-credit audit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be four courses of Aptitude in Semester III, IV, V & VI semesters and two courses of Soft Skills in V &VI Semesters and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

Professional Elective Course (PEC): The discipline specific elective courseis chosen to make students specialist or having specialized knowledge of a specific domain. It will be covered from Vth semester onward

of the program relevant to chosen disciplines of core courses of the program. Each student has to choose three Program Elective Course (PEC); 1 PEC in Semester-VI of 3 credit, 1 PEC in Semester-VII of 3 credit, 1 PEC in Semester-VIII of 3 credit.

Laboratory Course (LC): The Lab Course (LC) is the laboratory course which student has to take as per the core courses. In computer science and engineering these lab course has the emphasis on technicalities related to enhancing the knowledge in programming languages / Database / web programming. Total 21 LC has to be chosen across the eight semester of with 18 courses of 1 credit and 4 courses of 2 credits.

Project / Industrial Training/Seminar(PROJ): The project and Industrial training has to be taken as per the guideline issued from time to time. It helps to provide the industrial exposure to the students. They are being able to learn, enhance their skills and utilize the learnt concept to be able to understand the facts practically. Total 14 credit are being assigned to it with 2 courses of 2 credit each in Vth Semester, 1 course of 4 credit in VIIth semester, 1 course of 6 credit in VII semester.

C. Program Outcomes for Engineering:

PO – 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO – 2	**Problem analysis& Solving:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO – 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO – 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO – 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO – 6	**Social Interaction & effective citizenship:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO – 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO – 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO – 9	**Attitude (Individual and team work):** Function effectively as an individual, and as member or leader in diverse teams, and in multidisciplinary settings.

PO – 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clean instructions.
PO – 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO – 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developedby the end of Four-year**B.TECH(CSE) Specialization in AL + ML + DL:**

PSO – 1	**Understanding** the knowledge of basic sciences, humanities and technical management courses of the program. Able to solve engineering problems of real time projects in the field of computer science and information technology.
PSO – 2	**Understanding** the phases of software project development life cycle and various roles.
PSO – 3	**Applying** hardware and software skills pertinent to practices in the field of computer science and information technology while acquiring mathematical foundations, algorithmic principles along with proper judgment through projects and industrial interactions.
PSO – 4	**Analyzing** the various storage structures of data on different platforms along with security issues.
PSO - 5	**Analyzing** large data samples and discover knowledge to provide solution to engineering problem.
PSO - 6	**Developing** skills of practical competency with emerging technologies, programming languages and open source platforms.
PSO - 7	**Developing** effective artificial intelligence based solutions for real world problem.

E. Pedagogy & Unique practices adopted: "Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

1. Case Based Learning:Case based learning enhances student skills at delineating the critical decision dilemmas faced by organizations, helps in applying concepts, principles and analytical skills to solve the delineated problems and develops effective templates for business problem solving. Case method of teaching is used as a critical learning tool for effective learning and we encourage it to the fullest.

2. Role Play&Simulation:Role-play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of

the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore,role-play& simulation exercises such as virtual share trading, marketing simulationetc. are being promoted for the practical-based experiential learning of our students.

3. Video Based Learning (VBL)&Learning through Movies (LTM):These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM,wherever possible.

***4. Field /Live Projects*:**The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

5. Industrial Visits: Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

6. MOOCs: Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs.

University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.

Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through onlyNPTEL/Swayam could be given 2 credits for each MOOC course.
For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

a) This is recommended for every student to take at least one MOOC Course throughout the programme.
b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.
d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.

e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.

f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.

College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree

7. Special Guest Lectures (SGL): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry, we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and provide greater insights.

8. Student Development Programs (SDP): Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

9. Industry Focused programes:Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses/contents are to be delivered by industry experts to provide practice based insight to the students.

10. Special Assistance Programme for Slow &Fast Learners:The College gets a diverse group of students every year. They differ in terms of their intelligence , efforts and interest. We make efforts to identify them as Slow and fast learners within first three months of their joining. Slow learners are given extra time and sessions to bridge the learning gap under the guidance of faculty coordinator and Fast learners are provided challenging assignments/Projects/Readings and learning opportunity

11. Orientation Program: The Orientation Programme is designed keeping in mind the guidelines of UGC & the Council. This Programme is for 03 Weeks duration. The Programme designed by the College is Approved by the office of the Vice Chancellor. The purpose is to make the fresh students comfortable and provide awareness about the college and the university. The Topics covered are multi -faceted encompassing: Academic rules & regulation, Examination rules & regulation, Learning resources, participation in Extra -curricular & extra Mural Activities, Discipline, Conduct, Motivational talks, Industry talks, & Bridge Courses/content etc

12. Mentoring Scheme: Every Student shall be provided with a faculty Mentor to help him /her in their personal & Academic Issues. The mentor maintains a register of al all his/her mentees with complete personal & parents 'details. It is essential to have at least to meet once in a month. The mentor enters the discussions held, advice given and efforts & improvements made by the mentee. This register of the mentor must be counter signed by the HOD once a month and by the Principal once in a semester

13. Career & Personal Counseling:Helps Gain Confidence and Insight. Career Counselling helps a counselee understand the hurdles in his/her career path. This knowledge helps to develop the confidence to overcome these hurdles. It is the duty of a good counselor to provide such insight and confidence to the counselee.

14. Competitive Exam Preparation:It is true that competitive exams are not that easy to ace it, but it is also not something impossible. With proper guidance and hard work of faculties, student's can easily crack any competitive exam such as GATE, Bank Services, Civil Services or any other govt. administrative platform.

15. Extra-curricular Activities: organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

16. Participation in Workshops, Seminars & writing & Presenting Papers: A seminar may have several purposes or just one purpose. For instance, a seminar may be for the purpose of education, such as a lecture, where the participants engage in the discussion of an academic subject for the aim of gaining a better insight into the subject. Other forms of educational seminars might be held to impart some skills or knowledge to the participants.

17. Formation of Student Clubs, Membership & Organizing & Participating events:Computer Science clubs channelize the energies of students and make use of their skills and talents, which satisfy their instincts and urges and helps in their overall personality development. Through activities of a computer science club, learning of computer science and its applications become joyful. The computer science club caters to freedom for expression, where as the classroom atmosphere leads to conformity and repression. Students organize thought and translate into action.

18. Capability Enhancement & Development Schemes:The development of soft skills has become important in today's fast growing world. The students at the college are taught to communicate and interact at a professional level. The qualities of confidence and critical thinking are developed making the students better at soft skills. Soft skill development courses inculcate ethical attitude towards others and also help in the nurturing of better interpersonal skills. Much of the communication related activities are developed and taught to students who are willing and interested to enhance their skills.

***19.* Library Visit & Utilization of E-Learning Resources:**Student can visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

- **a)** Institute Library & Information is subscribing online e-books and e-journals databases (DELNET and EBSCO host E-databases) as per the requirement of the institute and fulfilling AICTE norms. IP based access is given to all computers connected on campus LAN to access e-journals.
- **b)** For the effective utilization of resources, Information Literacy training programs are conducted to the staff and students.
- **c)** Wi-Fi enabled campus
- **d)** Regular addition of latest books and journals
- **e)** Well maintained e-library to access e-resources

Study & Evaluation Scheme

Programme: B. Tech. (Computer Science & Engineering) Specialization in AI+ML+DL
Semester I

S. No	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	BSC-1	EAS116	Engineering Mathematics-I	3	1	-	4	40	60	100
2	BSC-2	EAS112	Engineering Physics	3	1	-	4	40	60	100
		EAS113	Engineering Chemistry							
3	ESC-1	EEE117	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC111	Basic Electronics Engineering							
4	MC-1	TMU-101	Environmental Studies	2	1	0	3	40	60	100
5	HSMC-1	TMUGE101	English Communication–I	2	0	2	3	40	60	100
6	LC-1	EAS162	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS163	Engineering Chemistry (Lab)							
7	LC-2	EEE161	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC161	Basic Electronics Engineering (Lab)							
8	LC-3	EME161	Engineering Drawing (Lab)	-	-	4	2	50	50	100
		EME162	Workshop Practice (Lab)							
			Total	**13**	**4**	**10**	**22**	**350**	**450**	**800**

Programme: B. Tech. (Computer Science & Engineering) Specialization in AI+ML+DL
Semester II

S. No	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	BSC-3	EAS211	Engineering Mathematics-II	3	1	-	4	40	60	100
2	BSC-4	EAS212	Engineering Physics	3	1	-	4	40	60	100
		EAS213	Engineering Chemistry							
3	ESC-2	EEE217	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC211	Basic Electronics Engineering							
4	ESC-3	ECS201	Computer Basics & C Programming	3	-	-	3	40	60	100
5	HSMC-2	TMUGE201	English Communication–II	2	0	2	3	40	60	100
6	LC-4	EAS262	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS263	Engineering Chemistry (Lab)							
7	LC-5	EEE261	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC261	Basic Electronics Engineering (Lab)							
8	LC-6	ECS251	Computer Basics & C Programming (Lab)	-	-	2	1	50	50	100
9	LC-7	EME261	Engineering Drawing (Lab)		-	4	2	50	50	100
		EME262	Workshop Practice (Lab)							
			Total	**14**	**3**	**12**	**23**	**400**	**500**	**900**

Programme: B. Tech. (Computer Science & Engineering) Specialization in AI+ML+DL
Semester III

S. No.	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC-1	ECS305	Data Structure using C++	3	0	0	3	40	60	100
2	PCC-2	ECS306	Data Base Management System	3	0	0	3	40	60	100
3	PCC-3	EEC302	Digital Electronics And Computer Organization	3	0	0	3	40	60	100
4	BSC-5	EAS 301	Mathematics-III	3	0	0	3	40	60	100
5	PCC-4	EAI305	Programming with Python	3	0	0	3	40	60	100
6	HSMC-3	TMUGE301	English Communication-III	2	0	2	3	40	60	100
7	LC-8	ECS355	Data Structure using C++ (Lab)	0	0	4	2	50	50	100
8	LC-9	ECS356	Data Base Management System (Lab)	0	0	2	1	50	50	100
9	LC-10	EAI353	Python LAB	0	0	2	1	50	50	100
	Total			**17**	**0**	10	**22**	**390**	**510**	**900**

For Lateral Entry student with polytechnic/ B.Sc background will have to pass below additional courses either in III[rd] or IV[th] semester with minimum 40% marks if they have not taken these courses in their polytechnic/B.Sc degree.

1	LC-3	EME161/261	Engineering Drawing (Lab)	-	-	4	-	50	50	100
2	LC-7	EME162/262	Workshop Practice (Lab)	-	-	4	-	50	50	100
3	HSMC-1	TMU101	Environmental Studies	2	1	3	-	40	60	100

Value Added Course:
It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

SNO	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	VAC– I	TMUGA301	Foundation in Quantitative Aptitude	2	1	0	0	40	60	100

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Semester IV

S. No	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC-5	ECS401	Theory of Computation	3	0	0	3	40	60	100
2	PCC-6	EAI402	Computer Network	3	0	0	3	40	60	100
3	PCC-7	EAI403	Software Engineering & Testing	3	0	0	3	40	60	100
4	PCC-8	EAI404	Artificial Intelligence	3	0	0	3	40	60	100
5	PCC-9	ECS407	Java Programming	3	0	0	3	40	60	100
6	PCC-10	ECS406	Operating System	3	0	0	3	40	60	100
7	HSMC-4	TMUGE401	English Communication-IV	2	0	2	3	40	60	100
8	LC-11	ECS456	Java Programming Lab	0	0	2	1	50	50	100
9	LC-12	EAI452	Artificial Intelligence Lab	*0*	*0*	2	1	50	50	100
10	LC-13	EAI453	Computer Network Lab	0	0	2	1	50	50	100
	Total			**20**	**0**	**8**	**24**	**430**	**570**	**1000**

Value Added Course *:

SNO	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	VAC– II	TMUGA401	Analytical Reasoning	2	1	0	0	40	60	100

NOTE: After the examination of 4th Semester. Student has to take industrial training of minimum 40days before the starting of 5th Semester. The evaluation will be performed with below mentioned code in 5th semester.

PROJ-1	ECS591	Industrial Training

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Semester V

S. No	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC-11	EAI501	Artificial Neural Network	3	0	0	3	40	60	100
2	PCC-12	ECS503	Analysis and Design of Algorithms	3	0	0	3	40	60	100
3	PCC-13	EAI503	Web Technology and Development	3	0	0	3	40	60	100
4	PCC-14	EAI504	Introduction to Machine Learning	3	0	0	3	40	60	100
5	HSMC-5	EHM505	Human Values and Professional Ethics	2	0	0	2	40	60	100
6	LC-14	ECS552	Analysis and Design of Algorithms (Lab)	0	0	2	1	50	50	100
7	LC-15	EAI552	Web Technology and Development (Lab)	0	0	2	1	50	50	100
8	LC-16	EAI553	Machine Learning using Python (Lab)	0	0	2	1	50	50	100
9	PROJ-1	ECS559	MOOC	0	0	0	2	50	50	100
10	PROJ-2	ECS599	Industrial Training	0	0	0	2	50	50	100
	Total			**14**	**0**	**6**	**21**	**450**	**550**	**1000**

Value Added Course *:

SNO	*Course Category*	*Course Code*	*Course*		*Periods*		*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	VAC – III	TMUGS501	Managing Self	2	1	0	0	40	60	100
2	VAC– IV	TMUGA501	Modern Algebra & Data Analysis	2	1	0	0	40	60	100

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Semester VI

S. No	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC-15	ECS611	Data Warehousing and Data Mining using R	3	1	0	4	40	60	100
2	PCC-16	EAI602	Genetic Algorithms	3	0	0	3	40	60	100
3	PCC-17	EAI603	Big Data Analytics	3	0	0	3	40	60	100
4	PCC-18	EAI604	Knowledge Representation & Reasoning	3	0	0	3	40	60	100
5	PCC-19	EAI605	Pattern Recognition	3	0	0	3	40	60	100
6	HSMC-6	EHM601	Entrepreneurship	3	0	0	3	40	60	100
7	PEC-1	**Professional Elective Course –I**		3	0	0	3	40	60	100
8	LC-17	EAI651	Big Data Analytics(Lab)	0	0	2	1	50	50	100
9	LC-18	ECS654	Data Warehousing and Data Mining using R (Lab)	0	0	2	1	50	50	100
10	LC-19	EAI653	IOT (Lab)	0	0	4	2	50	50	100
	Total			**21**	**1**	**8**	**26**	**430**	**570**	**1000**

Value Added Course *:

SNO	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	VAC –V	TMUGS601	Managing Work and Others	2	1	0	0	40	60	100
2	VAC – VI	TMUGA601	Advance Algebra and Geometry	2	1	0	0	40	60	100

Programme: B. Tech. (Computer Science & Engineering) Specialization in AI+ML+DL
Semester VII

S. No	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC-20	ECS716	Digital Image Processing and Computer Vision	3	0	0	3	40	60	100
2	PCC-21	EAI702	Deep Learning –I	3	0	0	3	40	60	100
3	PCC-22	ECS709	Cloud Computing	3	0	0	3	40	60	100
4	PCC-23	EAI704	Intelligent System and Fuzzy Logic	3	0	0	3	40	60	100
5	PEC-2	**Professional Elective Course –II**		3	0	0	3	40	60	100
6	LC-20	ECS756	Digital Image Processing using Sci-Lab (Lab)	0	0	2	1	50	50	100
7	LC-21	EAI752	Deep Learning using python (Lab)	0	0	2	1	50	50	100
8	PROJ-3	EAI753	Project Work Phase-I**(ML)**	0	0	8	4	50	50	100
9	OEC-1		Open Elective Course –I	3	0	0	3	40	60	100
			Total	**18**	**0**	**12**	**24**	**390**	**510**	**900**

Programme: B. Tech. (Computer Science & Engineering) Specialization in AI+ML+DL
Semester VIII

S. No	*Course Category*	*Course Code*	*Course*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	HSMC-7	EHM801	Project Management for Engineers	3	0	0	3	40	60	100
2	PCC-24	EAI802	Deep Learning- II	3	0	0	3	40	60	100
3	PEC-3	**Professional Elective Course –II**I		3	0	0	3	40	60	100
4	PCC-25	ECS814	Block Chain Technology	3	0	0	3	40	60	100
5	LC-22	EAI851	Deep Learning- II Lab	0	0	2	1	50	50	100
6	PROJ-4	EAI852	Project Work Phase- II**(DL)**	0	0	12	6	50	50	100
7	**OEC-2**		Open Elective Course–II	3	0	0	3	40	60	100
			Total	**15**	**0**	**14**	**22**	**300**	**400**	**700**

Scheme of Professional Elective Courses (PEC): Student can choose any one course from each PEC.

S No.	Professional Elective Course –I (Semester-VI)		Professional Elective Course –II (Semester-VII)		Professional Elective Course –III (Semester-VIII)	
	Course Code	Course	Course Code	Course	Course Code	Course
1.	EAI606	Mobile Communication	EAI705	Web Mining & Crawlers	EAI803	Forensic Science and Machine Learning
2.	EAI607	Advanced Operating System	EAI706	Natural Language Processing	EAI804	Reinforcement Learning
3.	EAI608	Advanced Computer Architecture	EAI707	Dimensionality Reduction and Validation	EAI805	Sensor Technology
4.	EAI609	Cyber Law and Information Security	EAI708	Uncertainty and Logic Programming	EAI806	IOT Security
5.			EAI709	Data Science using R Programming	EAI808	Robotics

Course Code: EAS116	**Basic Science Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **Engineering Mathematics-I**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of eigenvalues and eigenvectors, Optimization & derivatives of functions of several variables, partial and total differentiation, implicit functions.	
CO2.	**Understanding** the concepts of curl and divergence of vector field.	
CO3.	**Understanding** of Green's theorem, Gauss Theorem, and Stokes theorem.	
CO4.	**Applying** the concept of Leibnitz's theorem for successive derivatives.	
CO5.	**Analyzing** the intangibility of a differential equation to find the optimal solution of first order first degree equations.	
CO6.	**Evaluating** the double integration and triple integration using Cartesian, polar co-ordinates and the concept of Jacobian of transformation.	
Course Content:		
Unit-1:	**Determinants**- Rules of computation; Linear Equations and Cramer's rule. **Matrices:** Elementary row and column transformation; Rank of matrix; Linear dependence; Consistency of linear system of equations; Characteristic equation; Cayley-Hamilton Theorem (without proof); Eigen values and Eigen vectors; Complex and Unitary matrices.	**8 Hours**
Unit-2:	**Differential Equation--**First order first degree Differential equation: variable separable, Homogeneous method, Linear differential equation method, Exact Differential equation.	**8 Hours**
Unit-3:	**Differential Calculus:** Leibnitz theorem; Partial differentiation; Euler's theorem; Change of variables; Expansion of function of several variables, Jacobians, Error function.	**8 Hours**
Unit-4:	**Multiple Integrals:** Double integral, Triple integral, Beta and Gamma functions; Dirichlet theorem for three variables, Liouville's Extension of Dirichlet theorem.	**8 Hours**
Unit-5:	**Vector Differentiation:** Vector function, Differentiation of vectors, Formulae of Differentiation, Scalar and Vector point function, Geometrical Meaning of Gradient, Normal and Directional Derivative, Divergence of a vector function, Curl of a vector **Vector Integration:** Green's theorem, Stokes' theorem; Gauss' divergence theorem.	**8 Hours**
Text Books:	**1.** Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers.	
Reference Books:	**1.** Kreyszig E., *Advanced Engineering Mathematics*, Wiley Eastern. **2.** Piskunov N, *Differential & Integral Calculus*, Moscow Peace Publishers. **3.** Narayan Shanti, *A Text book of Matrices*, S. Chand ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	**1.** https://www.youtube.com/watch?v=EGnI8WyYb3o **2.** https://www.youtube.com/watch?v=ksS_yOK1vtk&list=PLbRMhDVUMngfIrZCNOyPZwHUU1pP66vQW	

Course Code: EAS112	**Basic Science Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **Engineering Physics**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basic concepts of interference, diffraction and polarisation.	
CO2.	**Understanding** the concept of bonding in solids and semiconductors.	
CO3.	**Understanding** the special theory of relativity.	
CO4.	**Applying** special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.	
CO5.	**Applying** the concepts of polarized light by the Brewster's and Malus Law	
Course Content:		
Unit-1:	**Interference of Light:** Introduction, Principle of Superposition, and Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring.	**8 Hours**
Unit-2:	**Diffraction**: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope.	**8 Hours**
Unit-3:	**Polarization:** Introduction, production of plane polarized light by different methods, Brewster's and Malus Law. Quantitative description of double refraction, Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter.	**8 Hours**
Unit-4:	**Elements of Material Science:** Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers.	**8 Hours**
Unit-5:	**Special Theory of Relativity:** Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence.	**8 Hours**
Text Books:	**1.** Elements of Properties of Matter, D. S. Mathur, S. Chand & Co.	
Reference Books:	**1.** F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill. **2.** Concept of Modern Physics, Beiser, Tata McGraw-Hill. **3.** R. Resnick, Introduction to Special Relativity, John Wiley, Singapore. ***Latest editions of all the suggested books are recommended.**	
Additional	**1.** https://www.youtube.com/watch?v=toGH5BdgRZ4&list=PLD9DDFBDC338	

Electronic Reference Material:	226CA **2.** https://www.youtube.com/watch?v=CuqsU7B1MtU	

Course Code: **EAS113**	**Basic Science Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **Engineering Chemistry**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of softening & purification of water.	
CO2.	**Understanding**calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.	
CO3.	**Understanding** the concept of lubrication, Properties of Refractory & Manufacturing of cements.	
CO4.	**Applying** the conceptsof the mechanism of polymerizationreactions, Natural and synthetic rubber& vulcanization.	
CO5.	**Applying** the conceptsof spectroscopic & chromatographic techniques.	
Course Content:		
Unit-1:	**Water and Its Industrial Applications:** Sources, Impurities, Hardness and its units, Industrial water, characteristics, softening of water by various methods (External and Internal treatment), Boiler trouble causes effects and remedies, Characteristic of municipal water and its treatment, Numerical problem based on water softening method like lime soda, calgonetc	**8 Hours**
Unit-2:	**Fuels and Combustion:** Fossil fuel and classification, calorific value, determination of calorific value by Bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of byproduct, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number.	**8 Hours**
Unit-3:	**Lubricants:** Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories	**8 Hours**
Unit-4:	**Polymers:** Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber, preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6, Terylene, Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S.	**8 Hours**

Unit-5:	**A. Instrumental Techniques in chemical analysis:** Introduction, Principle, Instrumentation and application of IR, NMR, UV, Visible, Gas Chromatography, Lambert and Beer's Law. **B. Water Analysis Techniques:** Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques.	**8 Hours**
Text Books:	**1.** Agarwal R. K., Engineering Chemistry, Krishna Prakashan.	
Reference Books:	**1.** Morrison & Boyd, Organic Chemistry, Prentice Hall **2.** Barrow Gordon M., Physical Chemistry, McGraw-Hill. **3.** Manahan Stanley E., Environmental Chemistry, CRC Press **4.** Lee I.D., Inorganic Chemistry. **5.** ChawlaShashi, Engineering Chemistry, DhanpatRai Publication	
Additional Electronic Reference Material:	1. https://www.youtube.com/watch?v=RV-OyRTaIOI 2. https://www.youtube.com/watch?v=phhfkikb6Lw	

Course Code: **EEE117**	**Engineering Science Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **Basic Electrical Engineering**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basics of Network, AC Waveform and its characteristics.	
CO2.	**Understanding** the basic concept of Measuring Instruments, Transformers & three phase Power systems.	
CO3.	**Understanding** the basic concepts of Transformer.	
CO4.	**Understanding** the basic concept of power measurement using two wattmeter methods.	
CO5.	**Applying** the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.	
Course Content:		
Unit-1:	**D.C. Network Theory:** Passive, active, bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum Power Transfer theorem, Star-delta & delta-star conversion.	**8 Hours**
Unit-2:	**Steady State Analysis of A.C. Circuits:** Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor.	**8 Hours**
Unit-3:	**Basics of Measuring Instruments:** Introduction to wattmeter & Energy meter extension range of voltmeter and ammeter. **Three Phase A.C. Circuits:** Line and phase voltage/current relations; three phase power, power measurement using two wattmeter methods.	**8 Hours**
Unit-4:	**Single phase Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses.	**8 Hours**
Unit-5:	**Electrical machines:** DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)	**8 Hours**
Text Books:	**1.** Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill	
Reference Books:	**1.** Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. **2.** A Grabel, Basic Electrical Engineering, McGraw Hill. **3.** Cotton H., Advanced Electrical Technology, Wheeler Publishing. 4. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.	

	5. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://nptel.ac.in/courses/108/108/108108076/ 2. https://sites.google.com/tmu.ac.in/dr-garima-goswami/home	

Course Code: **EEC111**	**Engineering Science Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **Basic Electronics Engineering**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of electronic components like diode, BJT & FET.	
CO2.	**Understanding** the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers	
CO3.	**Understanding** the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.	
CO4.	**Understanding** the concepts of number system, Boolean algebra and logic gates.	
CO5.	**Applying** the knowledge of series, parallel and electromagnetic circuits.	
Course Content:		
Unit-1:	**p-n Junction:** Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator	**8 Hours**
Unit-2:	**Bipolar Junction Transistor (BJT):** Basic construction, transistor action; CB, CE and CCconfigurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias	**8 Hours**
Unit-3:	**Field Effect Transistor (FET):** Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self-biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics.	**8 Hours**
Unit-4:	**Operational Amplifier (Op-Amp):** Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator.	**8 Hours**
Unit-5:	**Switching Theory:** Number system, conversion of bases (decimal, binary, octal and hexadecimalnumbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth table- AND, OR &NOT,Seven segment display & K map.	**8 Hours**

Text Books:	**1.** Robert Boylestad& Louis Nashelsky, Electronic Circuit and Devices, Pearson India.	
Reference Books:	**1.** Sedra and Smith, Microelectronic Circuits, Oxford University Press. **2.** Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd. **3.** Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International.	
Additional Electronic Reference Material:	1. https://www.youtube.com/watch?v=USrY0JspDEg 2. https://www.youtube.com/watch?v=Hkz27cFW4Xs	

Course Code: TMU101	**Mandatory Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **Environmental Studies**	**L-2** **T-1** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** environmental problems arising due to constructional and developmental activities.	
CO2.	**Understanding** the natural resources and suitable methods for conservation of resources forsustainable development.	
CO3.	**Understanding** the importance of ecosystem and biodiversity and its conservation for maintaining ecological balance.	
CO4.	**Understanding** the types and adverse effects of various environmental pollutants and their abatement devices.	
CO5.	**Understanding** Greenhouse effect, various Environmental laws, impact of human population explosion, environment protection movements, different disasters and their management.	
Course Content:		
Unit-1:	Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development. **Ecology andEnvironment**:ConceptofanEcosystem-its structure andfunctions, Energy Flow in an Ecosystem,FoodChain,FoodWeb, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.	**8 Hours**
Unit-2:	**Natural Resources:** Renewable & Non-Renewable resources; Landresources and landuse change;Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies. **Biodiversity:** Hot SpotsofBiodiversityinIndiaandWorld,Conservation,ImportanceandFactorsResponsibleforLossofBiodiversity,BiogeographicalClassification ofIndia	**8 Hours**
Unit-3:	**Environmental Pollutions:** Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies	**8 Hours**

Unit-4:	**Environmental policies & practices: Climate change & Global** Warming (GreenhouseEffect),Ozone Layer -Its Depletion andControlMeasures,PhotochemicalSmog,AcidRain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context	**8 Hours**
Unit-5:	Human population growth;impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case study	**8 Hours**
Field Work:	**1.** Visit to an area to document environmental assets; river/forest/flora-fauna etc. **2.** Visit to a local polluted site: urban/ rural/industrial/agricultural. **3.** Study of common plants, insects, birds & basic principles of identification. **4.** Study of simple ecosystem; pond, river etc.	
Text Books:	**1.** "Environmental Chemistry", De, A. K., New AgePublishersPvt.Ltd.	
Reference Books:	**1.** "BiodiversityandConservation",Bryant, P. J., Hypertext Book **2.** "Textbook of Environment Studies", Tewari, Khulbe&Tewari,I.K. Publication	
Additional Electronic Reference Material:	1. https://www.youtube.com/watch?v=8tamfocnHb8 2. https://www.youtube.com/watch?v=YlE1DDo25IQ	

Course Code: **TMUGE101**	**Humanities And Social Science Including Management Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **English Communication – I**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering and understanding** of the basic of English grammar and vocabulary.	
CO2.	**Understanding** of the basic Communication process.	
CO3.	**Applying** correct vocabulary and tenses in sentences construction.	
CO4.	**Analyzing** communication needs and developing communication strategies using both verbal & non-verbal method.	
CO5.	**Drafting** applications in correct format for common issues.	
CO6.	**Developing** self-confidence.	
Course Content:		
Unit-1:	**I Introductory Sessions** • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasonsFailure,strategies to overcome Fear of Failure • Importance of English Language in present scenario (Practice: Self-introduction session)	**6 Hours**
Unit-2:	**Basics of Grammar** • Parts of Speech • Tense • Subject and Predicate • Vocabulary: Synonym and Antonym (Practice: Conversation Practice)	**12 Hours**
Unit-3:	**Basics of Communication** • Communication: Process, Types, 7Cs of Communication, Importance & Barrier • Language as a tool of communication • Non-verbal communication: Body Language • Etiquette & Manners • Basic Problem Sounds (Practice: Pronuciation drill and building positive body language)	**10 Hours**

Unit-4:	**Application writing** • Format & Style of Application Writing • Practice of Application writing on common issues.	**8 Hours**
Unit-5:	**Value based text reading:** Short Story (Non- detailed study) • Gift of Magi - O. Henry	**4 Hours**
Text Books:	**1**. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	1. Kumar, Sanjay. &PushpLata. "Communication Skills" New Delhi: Oxford University Press. 2. Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster. 3. Harris, Thomas. A. "I am ok, You are ok" New York: Harper and Row. 4. Goleman, Daniel. "Emotional Intelligence' Bantam Book.	
Additional Electronic Reference Material	**1.** https://www.youtube.com/watch?v=4XEa-8HD3lE **2.** https://www.youtube.com/watch?v=sb6ZZ2p3hEM&feature=youtu.be **3.** https://www.youtube.com/watch?v=Df3ysUkdB38 **4.** https://www.youtube.com/watch?v=0LdYaj3jcws **5.** https://www.youtube.com/watch?v=64XIkMqPm_8 **6.** https://www.youtube.com/watch?v=_vS6O8YlMq0	
Methodology:	**1.** Language Lab software. **2.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion. **3.** Conversational Practice will be effectively carried out by Face to Face & Via Media (Telephone, Audio-Video Clips) **4.** Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized	

Evaluation Scheme

Internal Evaluation	External Evaluation	Total Marks
40 Marks	**60 Marks**	

20 Marks (Best 2 out of Three CTs) ***(From Unit- II, IV & V)***	10 Marks (Oral Assignments) ***(From Unit I & III)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit II, IV & V)***	20 Marks (External Viva)* ***(From Unit -1 & III)***	**100**

*Parameters of External Viva

Content	**Body Language**	**Confidence**	**Question Responsiveness**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note: External Viva will be conducted by 2-member committee comprising

a) One Faculty teaching the class

b) One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: EAS162	Laboratory Course-1 Specialization- Artificial Intelligence, Machine Learning & Deep Learning B.TECH(CSE) Semester-I **Engineering Physics (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding of the operation of various model of optical devices.	
CO2.	Identifying types of Semiconductors using Hall experiments.	
CO3.	Applying the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter& spectrometer.	
CO4.	Applying the concept of resonance to determine the AC frequency using sonometer&Melde's apparatus.	
CO5.	Applyingthe concept of resolving & dispersive power by a prism.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	To determine the wavelength of monochromatic light by Newton's ring.	
2	To determine the wavelength of monochromatic light by Michelson-Morley experiment.	
3	To determine the wavelength of monochromatic light by Fresnel's Bi-prism.To determine the Planck's constant using LEDs of different colours.	
4	To determine the Planck's constant using LEDs of different colours.	
5	To determine the specific rotation of cane sugar solution using Polarimeter	
6	To verify Stefan's Law by electrical method	
7	To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up	
8	To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment.	
9	To compare Illuminating Powers by a Photometer.	
10	To determine the frequency of A.C. mains by means of a Sonometer.	
11	To determine refractive index of a prism material by spectrometer	
12	To determine the Flashing & Quenching of Neon bulb.	
13	Determination of Cauchy's constant by using spectrometer.	
14	To study the PN junction characteristics	

15	To determine the resolving power and dispersive power by a prism	
16	To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode	
17	Study the characteristics of LDR	
18	To study the characteristics of a photo-cell.	
Books:	**1.** B.Sc.Practical Physics, Gupta and Kumar, PragatiPrakashan. **2.** B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EAS163	Laboratory Course-1 Specialization- Artificial Intelligence, Machine Learning & Deep Learning B.TECH(CSE)- Semester-I Engineering Chemistry (Lab)	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Hardness of water.	
CO2.	**Analyzing** & estimating of various parameters of water.	
CO3.	**Analyzing** of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.	
CO4.	**Analyzing** of open & closed Flash point of oil by Cleveland &Pensky's Martens apparatus.	
CO5.	**Analyzing** of viscosity of lubricating oil using Redwood Viscometer.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	Determination of Total Hardness of a given water sample.	
2	Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate	
3	To determine the pH of the given solution using pH meter and pH-metric titration	
4	Determination of dissolved oxygen content of given water sample	
5	To find chemical oxygen demand of waste water sample by potassium dichromate	
6	Determination of free chlorine in a given water sample	
7	To determine the chloride content in the given water sample by Mohr's method	
8	To prepare the Bakelite resin polymer	
9	To determine the concentration of unknown sample of iron spectrophotometrically	
10	To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer	
11	To determine the flash & fire point of a given lubricating oil	
12	Determination of calorific value of a solid or liquid fuel.	
13	Determination of calorific value of a gaseous fuel	
14	Determination of % of O_2, CO_2, % CO in flue gas sample using Orsat apparatus.	
15	Proximate analysis of coal sample.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE161	Laboratory Course-2 Specialization- Artificial Intelligence, Machine Learning & Deep Learning B.TECH(CSE)- Semester-I Basic Electrical Engineering (Lab)	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Kirchoff& Voltage law.	
CO2.	**Understanding** the concepts of Thevenin&Norton theorem.	
CO3.	**Analyzing** the energy by a single-phase energy meter.	
CO4.	**Analyzing** the losses and efficiency of Transformer on different load conditions.	
CO5.	**Analyzing** the electrical circuits using electrical and electronics components on bread board.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	To verify the Kirchhoff's current and voltage laws.	
2	To study multimeter.	
3	To verify the Superposition theorem	
4	To verify the Thevenin's theorem.	
5	To verify the Norton's theorem.	
6	To verify the maximum power transfer theorem	
7	To verify current division and voltage division rule.	
8	To measure energy by a single-phase energy meter	
9	To measure the power factor in an RLC by varying the capacitance	
10	To determine resonance frequency, quality factor, bandwidth in series resonance	
11	To measure the power in a 3-phase system by two-wattmeter method	
12	To measure speed for speed control of D.C. Shunt Motor	
13	To determine the efficiency of single-phase transformer by load test.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEC161	Laboratory Course-2 Specialization- Artificial Intelligence, Machine Learning & Deep Learning B.TECH(CSE)- Semester-I Basic Electronics Engineering (Lab)	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the implementation of diode-based circuits.	
CO2.	**Understanding** the implementation of Operational amplifier-based circuits.	
CO3.	**Analyzing** the characteristics of pn junction diode & BJT.	
CO4.	**Analyzing** the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.	
CO5.	**Analyzing** the truth tables through the different type's adders.	
LIST OF EXPERIMENTS:	**Note: Minimum eight experiments should be performed-**	
1	To study the V-I characteristics of p-n junction diode.	
2	To study the diode as clipper and clamper	
3	To study the half-wave rectifier using silicon diode.	
4	To study the full-wave rectifier using silicon diode.	
5	To study the Zener diode as a shunt regulator.	
6	To study transistor in Common Base configuration & plot its input/output characteristics	
7	To study the operational amplifier in inverting & non-inverting modes using IC 741.	
8	To study the operational amplifier as differentiator & integrator.	
9	To study various logic gates & verify their truth tables.	
10	To study half adder/full adder & verify their truth tables	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)	ON THE DAY OF EXAM (15 MARKS)	TOTAL

EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EME161	Laboratory Course-3 Specialization- Artificial Intelligence, Machine Learning & Deep Learning B.TECH(CSE)- Semester-I Engineering Drawing (Lab)	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Engineering Drawing.	
CO2.	**Understanding** how to draw and represent the shape, size & specifications of physical objects.	
CO3.	**Applying** the principles of projection and sectioning.	
CO4.	**Applying** the concepts of development of the lateral surface of a given object.	
CO5.	**Creating** isometric projection of the given orthographic projection.	
LIST OF EXPERIMENTS:	**All to be performed**	
1	To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions.	
2	To draw the types of lines and conventions of different materials.	
3	To draw and study dimensioning and Tolerance	
4	To construction geometrical figures of Pentagon and Hexagon	
5	To draw the projection of points and lines	
6	To draw the Orthographic Projection of given object in First Angle	
7	To draw the Orthographic Projection of given object in Third Angle	
8	To draw the sectional view of a given object	
9	To draw the development of the lateral surface of given object	
10	To draw the isometric projection of the given orthographic projection.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)	ON THE DAY OF EXAM (15 MARKS)	TOTAL

EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Drawing Sheet (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Note: The drawing sheet could be manual or in Auto CAD.

Course Code: **EME162**	**Laboratory Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-I** **Workshop Practice (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts to prepare simple wooden joints using wood working tools.	
CO2.	**Applying** the techniques to produce fitting jobs of specified dimensions.	
CO3.	**Applying** the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.	
CO4.	**Applying** the concepts of black smithy and lathe machine to produce different jobs.	
CO5.	**Creating** core and moulds for casting.	
LIST OF EXPERIMENTS:	**Perform any ten experiments selecting at least one from each shop**	
1	**Carpentry Shop**: 1. To prepare half-lap corner joint. 2. To prepare mortise &tenon joint. 3. To prepare a cylindrical pattern on woodworking lathe.	
2	**Fitting Bench Working Shop:** 1. To prepare a V-joint fitting 2. To prepare a U-joint fitting 3. To prepare a internal thread in a plate with the help of tapping process	
3	**Black Smithy Shop:** 1. To prepare a square rod from given circular rod 2. To prepare a square U- shape from given circular rod	
4	**Welding Shop:** 1. To prepare a butt and Lap welded joints using arc welding machine. 2. To prepare a Lap welded joint Gas welding equipment. 3. To prepare a Lap welded joint using spot welding machine	
5	**Sheet-metal Shop:** 1. To make round duct of GI sheet using 'soldering' process. 2. To prepare a tray of GI by fabrication	
6	**Machine Shop:** 1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c.	

	2. To perform the following operations on Centre Lathe: Turning, Step turning, Taper turning, Facing, Grooving and Knurling 3. To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of drilling machine.	
7	**Foundry Shop:** 1. To prepare core as per given size. 2. To prepare a mould for given casting.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EAS211	**Basic Science Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Engineering Mathematics-II**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of the wave, diffusion and Laplace equations & Fourier series.	
CO2.	**Understanding** the methods of separation of variables	
CO3.	**Understanding** the concepts of Fourier series' representation of single variable function.	
CO4.	**Applying** Laplace transform to determine the complete solutions of linear ODE	
CO5.	**Applying** the method of variations of parameters to find solution of equations with variable coefficients.	
Course Content:		
Unit-1:	**Differential Equations:** Linear Differential Equation, Linear Differential Equation with constant coefficient: Complementary functions and particular integrals, Linear Differential Equation with variable coefficient: Removal method, changing independent variables, Method of variation of parameters, Homogeneous Linear Differential Equation, Simultaneous linear differential equations.	**8 Hours**
Unit-2:	**Series Solutions:** PowerSeries solutions of ODE, Ordinary Point, Singular Points, Frobenius Method. **Special Functions:** Legendre equation and Polynomial, Legendre Function, Rodrigue's formula, Laplace definite integral for first and second kind, Bessel equation and Polynomial, Bessel Function, Orthogonal properties and Recurrence Relation for Legendre and Bessel function.	**8 Hours**
Unit-3:	**Partial differential equations –**Method of separation of variables for solving partial differential equations; Wave equation up to two dimensions; Laplace equation in two-dimensions; Heat conduction equations up to two-dimensions; Equations of transmission Lines.	**8 Hours**
Unit-4:	**Fourier Series:** Periodic functions, Trigonometric series; Fourier series; Dirichlet's conditions, Determination of fourier coefficient by Euler's formulae; Fourier series for discontinuous functions, Even and odd functions, Half range sine and cosine series.	**8 Hours**
Unit-5:	**Laplace Transform:** Laplace transform; Existence theorem; Laplace transform of derivatives and integrals; Inverse Laplace transform; Unit step function; Diratch delta function; Laplace transform of periodic functions; Convolution theorem.	**8 Hours**

Text Books:	**1.** Grewal B.S., Higher Engineering Mathematics, Khanna Publishers.	
Reference Books:	**1.** Kreyszig E., Advanced Engineering Mathematics, Wiley Eastern. **2.** Piskunov N, Differential & Integral Calculus, Moscow Peace Publishers. **3.** Narayan Shanti, A Text book of Matrices, S. Chand **4.** Bali N.P., Engineering Mathematics-II, Laxmi Publications.	
Additional Electronic Reference Material	1. https://www.youtube.com/watch?v=luJMl37-nso **2.** https://www.youtube.com/watch?v=NdouX5-KD6Y	

Course Code: EAS212	**Basic Science Course-4** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Engineering Physics**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basic concepts of interference, diffraction and polarisation.	
CO2.	**Understanding** the concept of bonding in solids and semiconductors.	
CO3.	**Understanding** the special theory of relativity.	
CO4.	**Applying** special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.	
CO5.	**Applying**the concepts of polarized light by the Brewster's and Malus Law	
Course Content:		
Unit-1:	**Interference of Light:** Introduction,Principle of Superposition, Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring.	**8 Hours**
Unit-2:	**Diffraction**: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope.	**8 Hours**
Unit-3:	**Polarization:** Introduction, production of plane polarized light by different methods, Brewster's and Malus Law. Quantitative description of double refraction, Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter.	**8 Hours**
Unit-4:	**Elements of Material Science:** Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers.	**8 Hours**
Unit-5:	**Special Theory of Relativity:** Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence.	**8 Hours**
Text Books:	**1.** Elements of Properties of Matter, D. S. Mathur, S. Chand & Co.	

Reference Books:	**4.** F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill. **5.** Concept of Modern Physics, Beiser, Tata McGraw-Hill. **6.** R. Resnick, Introduction to Special Relativity, John Wiley, Singapore.	
Additional Electronic Reference Material	1. https://www.youtube.com/watch?v=toGH5BdgRZ4&list=PLD9DDFBDC338226CA 2. https://www.youtube.com/watch?v=CuqsU7B1MtU	

Course Code: **EAS213**	**Basic Science Course-4** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Engineering Chemistry**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of softening & purification of water.	
CO2.	**Understanding**calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.	
CO3.	**Understanding** the concept of lubrication, Properties of Refractory & Manufacturing of cements.	
CO4.	**Applying** the conceptsof the mechanism of polymerizationreactions, Natural and synthetic rubber& vulcanization.	
CO5.	**Applying** the conceptsof spectroscopic & chromatographic techniques.	
Course Content:		
Unit-1:	**Water and Its Industrial Applications:** Sources, Impurities, Hardness and its units, Industrial water, characteristics, softening of water by various methods (External and Internal treatment), Boiler trouble causes effects and remedies, Characteristic of municipal water and its treatment, Numerical problem based on water softening method like lime soda, calgonetc	**8 Hours**
Unit-2:	**Fuels and Combustion:** Fossil fuel and classification, calorific value, determination of calorific value by Bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of byproduct, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number.	**8 Hours**
Unit-3:	**Lubricants:** Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories	**8 Hours**
Unit-4:	**Polymers:** Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber, preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6, Terylene, Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S.	**8 Hours**

Unit-5:	**A. Instrumental Techniques in chemical analysis:** Introduction, Principle, Instrumentation and application of IR, NMR, UV, Visible, Gas Chromatography, Lambert and Beer's Law. **B. Water Analysis Techniques:** Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques.	**8 Hours**
Text Books:	**1.** Agarwal R. K., Engineering Chemistry, Krishna Prakashan.	
Reference Books:	**1.** Morrison & Boyd, Organic Chemistry, Prentice Hall **2.** Barrow Gordon M., Physical Chemistry, McGraw-Hill. **3.** Manahan Stanley E., Environmental Chemistry, CRC Press	
Additional Electronic Reference Material	1. https://www.youtube.com/watch?v=RV-OyRTaIOI 2. https://www.youtube.com/watch?v=phhfkikb6Lw	

Course Code: EEE217	**Engineering Science Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Basic Electrical Engineering**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basics of Network, AC Waveform and its characteristics.	
CO2.	**Understanding** the basic concept of Measuring Instruments, Transformers & three phase Power systems.	
CO3.	**Understanding** the basic concepts of Transformer.	
CO4.	**Understanding** the basic concept of power measurement using two wattmeter methods.	
CO5.	**Applying** the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.	
Course Content:		
Unit-1:	**D.C. Network Theory:** Passive, active, bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum Power Transfer theorem, Star-delta & delta-star conversion.	**8 Hours**
Unit-2:	**Steady State Analysis of A.C. Circuits:** Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor.	**8 Hours**
Unit-3:	**Basics of Measuring Instruments:** Introduction to wattmeter & Energy meter extension range of voltmeter and ammeter. **Three Phase A.C. Circuits:** Line and phase voltage/current relations; three phase power, power measurement using two wattmeter methods.	**8 Hours**
Unit-4:	**Single phase Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses.	**8 Hours**
Unit-5:	**Electrical machines:** DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)	**8 Hours**
Text Books:	**1.** Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill	
Reference Books:	**1.** Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. **2.** A Grabel, Basic Electrical Engineering, McGraw Hill. **3.** Cotton H., Advanced Electrical Technology, Wheeler Publishing. 4. Del Toro, Principles of Electrical Engineering, Prentice-Hall International. **5.** W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional	3. https://nptel.ac.in/courses/108/108/108108076/	

electronics reference material:	4. https://sites.google.com/tmu.ac.in/dr-garima-goswami/home	

Course Code: **EEC211**	**Engineering Science Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Basic Electronics Engineering**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of electronic components like diode, BJT & FET.	
CO2.	**Understanding** the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers	
CO3.	**Understanding** the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.	
CO4.	**Understanding** the concepts of number system, Boolean algebra and logic gates.	
CO5.	**Applying** the knowledge of series, parallel and electromagnetic circuits.	
Course Content:		
Unit-1:	**p-n Junction:** Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator	**8 Hours**
Unit-2:	**Bipolar Junction Transistor (BJT):** Basic construction, transistor action; CB, CE and CCconfigurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias	**8 Hours**
Unit-3:	**Field Effect Transistor (FET):** Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self-biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics.	**8 Hours**
Unit-4:	**Operational Amplifier (Op-Amp):** Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator.	**8 Hours**
Unit-5:	**Switching Theory:** Number system, conversion of bases (decimal, binary, octal and hexadecimalnumbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth table- AND, OR &NOT,Seven segment display & K map.	**8 Hours**

Text Books:	**1.** Robert Boylestad& Louis Nashelsky, Electronic Circuit and Devices, Pearson India.	
Reference Books:	**1.** Sedra and Smith, Microelectronic Circuits, Oxford University Press. **2.** Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd. **3.** Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International.	
Additional Electronic Reference Material	1. https://www.youtube.com/watch?v=USrY0JspDEg 2. https://www.youtube.com/watch?v=Hkz27cFW4Xs	

Course Code: **ECS201**	**Engineering Science Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-II** **Computer Basics & C Programming**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concept of various components of computer system	
CO2.	Understanding the basic programming Language constructs.	
CO3.	Analyzing basic mathematical problem and their solutions through programming	
CO4.	Applying knowledge to prepare programming solutions for distinct problems.	
CO5.	Applying knowledge to prepare scalable solutions through functions.	
Course Content:		
Unit-1:	**Concepts in Computer Application:** Definition of Electronic Computer; History; Generations; Characteristics and Application of Computers; Classification of Computers; Functional Component of Computer: CPU, I/O devices, Type of Memory & Memory Hierarchy, Firmware and Human ware. **Data and data types:** Definitions, data, data types: Integer, Character, Float, String, etc.: Constants and Variable Declaration; Token; Keyboard; Identifier	**8 Hours**
Unit-2:	**Programming Language Classification & Computer Languages:** Generation of Languages; Introduction to 4GLs; Translators; Assemblers; Compilers; Interpreters. Number System: Decimal, Octal, Binary and Hexadecimal & their Conversions; Various Code: BCD, ASCII and EBCDIC and Gray Code. **Operators and Expressions:** Numeric and relation operators; logical operator; bit operator; operator precedence and associatively	**8 Hours**
Unit-3:	**Internet and Web Technologies:** Hypertext Markup Language; WWW; Gopher; FTP; Telnet; Web Browsers; Search Engines; Email. **Control Structure:** while statement, if, else, Nested if else statement. Nested logic: for loop, do while loop, While Loop, loop inside a loop structure, Switch Statement. Break and default with switch.	**8 Hours**
Unit-4:	**Concepts in Operating Systems:** Elementary Concepts in Operating Systems; Textual Vs GUI Interface. **Arrays:** Notation and representation; Manipulation of array elements; Multidimensional arrays.	**8 Hours**
Unit-5:	**Functions & Strings**: Definition; Declaration; Call by Value; Call by Reference; Returns values and their types; Function calls. **Structure & Dynamic Memory Allocation:**Structures and union, run	**8 Hours**

	time memory allocation functions, Introduction of preprocessor directives.	
Text Books:	**1.** Sinha P. K., Computer Fundamentals, BPB Publications.	
Reference Books:	**1.** Peter Nortans, Introduction to Computers, Tata McGraw Hill. **2.**Yashavant Kanetkar, Let us C , BPB Publications. **3.** Leon & Leon, Fundamental of Information Technology, Vikas Publishing. **4.** Kanter, Managing Information System, Prentice-Hall. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.digimat.in/nptel/courses/video/106105171/L01.html **2.** https://nptel.ac.in/courses/106/104/106104128/	

Course Code: **TMUGE201**	**Humanities And Social Science Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-II** **English Communication – II**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering & understanding** the basics of English Grammar and Vocabulary	
CO2.	**Understanding** the basics of Listening, Speaking & Writing Skills	
	Understanding principles of letter drafting and various types of formats.	
CO3.	**Applying** correct vocabulary and grammar in sentence construction while writing and delivering presentations	
CO4.	**Analyzing** different types of listening, role of Audience & Locale in presentation	
CO6.	**Creating** Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	U**nit - I Functional Grammar** • Prefix, suffix and One words substitution • Modals • Concord	**10 Hours**
Unit-2:	Listening Skills (04 hours) • Difference between listening & hearing, Process and Types of Listening • Importance and Barriers to listening	**04Hours**
Unit-3:	**Writing Skills** • Official letter and email writing • Essentials of a paragraph, • Developing a paragraph: Structure and methods Paragraph writing (100-120 words)	**12 Hours**
Unit-4:	**Strategies & Structure of Oral Presentation** • Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body langauge • Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. • Modes of speech delivery and 5 W's of presentation	**8 Hours**
Unit-5:	**Value based text reading:** Short Essay (Non- detailed study) • How should one Read a book? - Virginia Woolf	**6 Hours**

Text Books:	**1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	**1.** Nesfield J.C. "*English Grammar Composition & Usage*" Macmillan Publishers **2.** SoodMadan "*The Business letters"* Goodwill Publishing House, New Delhi **3.** Kumar Sanjay &Pushplata "*Communication Skills*" Oxford University Press, New Delhi.	
Additional Electronic Reference Material	**1.** https://www.youtube.com/watch?v=A0uekze2GOU **2.** https://www.youtube.com/watch?v=JIKU_WT0Bls **3.** https://www.youtube.com/watch?v=3Tu1jN65slw **4.** https://youtu.be/sb6ZZ2p3hEM **5.** https://youtu.be/yY6-cgShhac **6.** https://youtu.be/cc4yXwOQsBk **7.** https://youtu.be/yY6-cgShhac **8.** https://youtu.be/84qoeCofXXQ https://www.youtube.com/watch?v=-9MXmxLisI8&t=28s	
Methodologies:	**1.** Words and exercises, usage in sentences. **2.** Language Lab software. **3.** Sentence construction on daily activities and conversations. **4.** Format and layout to be taught with the help of samples and preparing letters on different subjects. **5.** JAM sessions and Picture presentation. **6.** Tongue twisters, Newspaper reading and short movies. **7.** Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized. **8.** Text reading: discussion in detail, critical appreciation by reading the text to develop students' reading habits with voice modulation.	

Evaluation Scheme

<table>
<tr><th colspan="3">Internal Evaluation</th><th colspan="2">External Evaluation</th><th>Total Marks</th></tr>
<tr><td colspan="3">40 Marks</td><td colspan="2">60 Marks</td><td rowspan="4">100</td></tr>
<tr><td>20 Marks (Best 2 out of Three</td><td>10 Marks (Oral</td><td rowspan="3">10 Marks (Attendance)</td><td>40 Marks (External Written</td><td>20 Marks</td></tr>
<tr><td>CTs)</td><td>Assignments)</td><td>Examination)</td><td>(External Viva)*</td></tr>
<tr><td>(From Unit-I, III & V)</td><td>(From Unit-II &IV)</td><td>(From Unit-1, III & V)</td><td>(From Unit- II & IV)</td></tr>
</table>

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

***Note**: External Viva will be conducted by 2-member committee comprising*

***a)** One Faculty teaching the class*

***b)** One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: EAS262	**Laboratory Course-4** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Engineering Physics (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** of the operation of various models of optical devices.	
CO2.	**Understanding** types of Semiconductors using Hall experiments.	
CO3.	**Applying** the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer.	
CO4.	**Applying** the concept of resonance to determine the AC frequency using sonometer &Melde's apparatus.	
CO5.	**Applying** the concept of resolving & dispersive power by a prism.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	To determine the wavelength of monochromatic light by Newton's ring.	
2	To determine the wavelength of monochromatic light by Michelson-Morley experiment.	
3	To determine the wavelength of monochromatic light by Fresnel's Bi-prism.To determine the Planck's constant using LEDs of different colours.	
4	To determine the Planck's constant using LEDs of different colours.	
5	To determine the specific rotation of cane sugar solution using Polarimeter	
6	To verify Stefan's Law by electrical method	
7	To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up	
8	To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment.	
9	To compare Illuminating Powers by a Photometer.	
10	To determine the frequency of A.C. mains by means of a Sonometer.	
11	To determine refractive index of a prism material by spectrometer	
12	To determine the Flashing & Quenching of Neon bulb.	
13	Determination of Cauchy's constant by using spectrometer.	

14	To study the PN junction characteristics	
15	To determine the resolving power and dispersive power by a prism	
16	To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode	
17	Study the characteristics of LDR	
18	To study the characteristics of a photo-cell.	
Books:	**1.** B.Sc.Practical Physics, Gupta and Kumar, PragatiPrakashan. **2.** B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EAS263	**Laboratory Course-4** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Engineering Chemistry (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Hardness of water.	
CO2.	**Analyzing** & estimating of various parameters of water.	
CO3.	**Analyzing** of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.	
CO4.	**Analyzing** of open & closed Flash point of oil by Cleveland &Pensky's Martens apparatus.	
CO5.	**Analyzing** of viscosity of lubricating oil using Redwood Viscometer.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	Determination of Total Hardness of a given water sample.	
2	Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate	
3	To determine the pH of the given solution using pH meter and pH-metric titration	
4	Determination of dissolved oxygen content of given water sample	
5	To find chemical oxygen demand of waste water sample by potassium dichromate	
6	Determination of free chlorine in a given water sample	
7	To determine the chloride content in the given water sample by Mohr's method	
8	To prepare the Bakelite resin polymer	
9	To determine the concentration of unknown sample of iron spectrophotometrically	
10	To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer	
11	To determine the flash & fire point of a given lubricating oil	
12	Determination of calorific value of a solid or liquid fuel.	
13	Determination of calorific value of a gaseous fuel	
14	Determination of % of O_2, CO_2, % CO in flue gas sample using Orsat apparatus.	
15	Proximate analysis of coal sample.	

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE261	**Laboratory Course-5** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Basic Electrical Engineering (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Kirchoff& Voltage law.	
CO2.	**Understanding** the concepts of Thevenin&Norton theorem.	
CO3.	**Analyzing** the energy by a single-phase energy meter.	
CO4.	**Analyzing** the losses and efficiency of Transformer on different load conditions.	
CO5.	**Analyzing** the electrical circuits using electrical and electronics components on bread board.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	To verify the Kirchhoff's current and voltage laws.	
2	To study multimeter.	
3	To verify the Superposition theorem	
4	To verify the Thevenin's theorem.	
5	To verify the Norton's theorem.	
6	To verify the maximum power transfer theorem	
7	To verify current division and voltage division rule.	
8	To measure energy by a single-phase energy meter	
9	To measure the power factor in an RLC by varying the capacitance	
10	To determine resonance frequency, quality factor, bandwidth in series resonance	
11	To measure the power in a 3-phase system by two-wattmeter method	
12	To measure speed for speed control of D.C. Shunt Motor	
13	To determine the efficiency of single-phase transformer by load test.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEC261	**Laboratory Course-5** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Basic Electronics Engineering (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the implementation of diode-based circuits.	
CO2.	**Understanding** the implementation of Operational amplifier-based circuits.	
CO3.	**Analyzing** the characteristics of pn junction diode & BJT.	
CO4.	**Analyzing** the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.	
CO5.	**Analyzing** the truth tables through the different type's adders.	
LIST OF EXPERIMENTS:	**Note: Minimum eight experiments should be performed-**	
1	To study the V-I characteristics of p-n junction diode.	
2	To study the diode as clipper and clamper	
3	To study the half-wave rectifier using silicon diode.	
4	To study the full-wave rectifier using silicon diode.	
5	To study the Zener diode as a shunt regulator.	
6	To study transistor in Common Base configuration & plot its input/output characteristics	
7	To study the operational amplifier in inverting & non-inverting modes using IC 741.	
8	To study the operational amplifier as differentiator & integrator.	
9	To study various logic gates & verify their truth tables.	
10	To study half adder/full adder & verify their truth tables	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: **ECS251**	**Laboratory Course-6** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH(CSE)- Semester-II** **Computer Basics & C Programming Lab**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Analyzing** basic mathematical problem and their solutions through programming	
CO2.	**Applying** knowledge to prepare programming solutions for specific problems.	
CO3.	**Applying** knowledge to prepare scalable solutions through function	
CO4.	**Applying** the concepts of programming solutions for distinct problems	
CO5.	**Applying** the concepts of scalable solutions through function	
Course Content:		
	LIST OF EXPERIMENTS- **1.** To write a program to calculate Sum & average of N numbers. **2.** To write a program to convert integer arithmetic to a given number of day and month. **3.** To write a program to find maximum and minimum out of 3 numbers a, b & c. **4.** To write a program to find factorial of positive integer. **5.** To write a program to find sum of series up to n number, β+5+8+……+n. **6.** To write a program to print all the number between 1 to 100 which are dividing by 7. **7.** To write a program to generate Fibonacci series up to n. **8.** To write a program to implement a function to calculate area of a circle. **9.** To write a program to implement a recursive function to calculate factorial of given number. **10.** To write a program to find whether number is prime or not. **11.** To write a program to find that the enter character is a letter or digit. **12.** To write a program to find addition of two matrix of n*n order. **13.** To write a program to find multiplication of two matrix of n*n order. **14.** To write a program to add 6 digit numbers in even case & multiple 6 digit number in odd case. **15.** To write a program to find even or odd up to a given limit n. **16.** To write a program to find whether a given no is palindrome or not. **17.** To write a program to joining & Comparing the 2 string.	

Evaluation of practical course

Practical Courses Internal Evaluation (50 marks)

EXPERIMENT (30 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)

Practical Courses External Evaluation (50 marks)

The external evaluation would also be done by the External Examiner based on the experiment performed during the examination.

EXPERIMENT (30 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EME261	**Laboratory Course-7** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Engineering Drawing (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Engineering Drawing.	
CO2.	**Understanding** how to draw and represent the shape, size & specifications of physical objects.	
CO3.	**Applying** the principles of projection and sectioning.	
CO4.	**Applying** the concepts of development of the lateral surface of a given object.	
CO5.	**Creating** isometric projection of the given orthographic projection.	
LIST OF EXPERIMENTS:	**All to be performed**	
1	To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions.	
2	To draw the types of lines and conventions of different materials.	
3	To draw and study dimensioning and Tolerance	
4	To construction geometrical figures of Pentagon and Hexagon	
5	To draw the projection of points and lines	
6	To draw the Orthographic Projection of given object in First Angle	
7	To draw the Orthographic Projection of given object in Third Angle	
8	To draw the sectional view of a given object	
9	To draw the development of the lateral surface of given object	
10	To draw the isometric projection of the given orthographic projection.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the drawing sheet by the students and a Viva taken by the faculty concerned. The marks shall be given on the drawing sheet & regard maintained by the faculty.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)	ON THE DAY OF EXAM (15 MARKS)	TOTAL

EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Drawing Sheet (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Note: The drawing sheet could be manual or in Auto CAD.

Course Code: EME262	**Laboratory Course-7** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.TECH (CSE)- Semester-II** **Workshop Practice (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts to prepare simple wooden joints using wood working tools.	
CO2.	**Applying** the techniques to produce fitting jobs of specified dimensions.	
CO3.	**Applying** the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.	
CO4.	**Applying** the concepts of black smithy and lathe machine to produce different jobs.	
CO5.	**Creating** core and moulds for casting.	
LIST OF EXPERIMENTS:	**Perform any ten experiments selecting at least one from each shop**	
1	**Carpentry Shop**: 1. To prepare half-lap corner joint. 2. To prepare mortise &tenon joint. 3. To prepare a cylindrical pattern on woodworking lathe.	
2	**Fitting Bench Working Shop:** 1. To prepare a V-joint fitting 2. To prepare a U-joint fitting 3. To prepare a internal thread in a plate with the help of tapping process	
3	**Black Smithy Shop:** 1. To prepare a square rod from given circular rod 2. To prepare a square U- shape from given circular rod	
4	**Welding Shop:** 1. To prepare a butt and Lap welded joints using arc welding machine. 2. To prepare a Lap welded joint Gas welding equipment. 3. To prepare a Lap welded joint using spot welding machine	
5	**Sheet-metal Shop:** 1. To make round duct of GI sheet using 'soldering' process. 2. To prepare a tray of GI by fabrication	
6	**Machine Shop:** 1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c. 2. To perform the following operations on Centre Lathe: Turning, Step turning, Taper turning, Facing, Grooving and Knurling 3. To perform the operations of drilling of making the holes on the given	

	metallic work-piece (M.S.) by use of drilling machine.	
7	**Foundry Shop:** 1. To prepare core as per given size. 2. To prepare a mould for given casting.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: **ECS305**	**Professional Core Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **DATA STRUCTURE USING C++**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding of different data structures and their usage.	
CO2.	Applying the understanding to solve basic operations on data structures.	
CO3.	Analyzing various approaches to solve different problems using data structures.	
CO4.	Analyzing various methods and the best solution as per running time of basic problems of programming.	
CO5.	Developing programming skills to solve problems with various storage structures	
Course Content:		
Unit-1:	**C++ Programming Basics:** Variables, data type, features of object-oriented programming, Functions, Call by Reference, Call by Address, Call by Value, Function Overloading, Inline Function, Enumerations. **Object & Classes:** Access Specifiers, Constructors. Default, Copy Constructor, destructor, Object as Function, Arguments, Returning Object from Function. Static Data Members, Static Member Functions, Abstract class, Const Data and Classes. Friend Function	**8 Hours**
Unit-2:	**Introduction:** Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time Space trade off. **Arrays:** Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Sparse Matrices, and Vectors, Arrays in terms of pointers, Static and Dynamic Memory Management. Tower of Hanoi Problem.	**8 Hours**
Unit-3:	**Stack:** Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Applications of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. **Queues:** Array representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque, Priority Queue. **Linked List:** Representation and Implementation: Singly Linked List, Doubly Linked List, Circular Linked List, Circular Doubly Linked List, Header Linked List. Operations on Linked List: Insert, Delete, Searching, Traversing. Array and Queue Implementation using Linked List, Polynomial representation and addition.	**8 Hours**
Unit-4:	**Sorting:** Insertion Sort, Bubble Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort, Practical consideration for Internal Sorting. Searching and Hashing: Sequential search, binary search, Hash Table, Hash	**8 Hours**

	Functions, Collision Resolution Strategies, Hash Table Implementation. **Trees:**Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Tree.	
Unit-5:	**Graphs:** Definitions and concepts, representation using Adjacency matrix, Adjacency lists, BFS and DFS, File Structures: Physical Storage Media FileOrganization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices.	**8 Hours**
Text Books:	1. Lipschutz, S., Data Structure, Tata McGraw Hill. 2. Tenenbaum, A.M., Data Structures using C & C++, Prentice Hall of India.	
Reference Books:	1.Sahani, S.and Horowitz, E., Fundamentals of Data Structures, Galgotia 2.Kruse, R., Data Structures and Program Design in C, Pearson Education. 3.Cormen, T. H., Introduction to Algorithms, Prentice Hall of India. 4.Loudon, K., Mastering Algorithms With C,Shroff Publisher & Distributors. ***Latest editions of all the suggested books are recommended**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/102/106102064/ https://www.youtube.com/watch?v=92S4zgXN17o&list=PL2_aWCzGMAwI3W_JlcBbtYTwiQSsOTa6P	

Course Code: **ECS306**	**Professional Core Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **DATABASE MANAGEMENT SYSTEM**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of data base systems, structure and architecture along with data models and its type.	
CO2.	Understanding different transaction processing concepts and different types of serialization techniques.	
CO3.	Understanding different database recovery like shadow paging, deferred/immediate updates and Concurrency control techniques.	
CO4.	Applying integrity and constraints using SQL and PL/SQL.	
CO5.	Analyzing the anomalies of database and removal of these anomalies using different normalization techniques.	
Course Content:		
Unit-1:	**Database:**History, database system vs. file system; Concepts; Architecture; Data models; Schema; Instances; Data independence and Database Languages: Interfaces, DDL(Data Definition Language), DML(Data Manipulation Language); ER Model: Notations, Diagram, reduction of Diagrams to tables, Extended ER Mapping Constraints. **Keys:** Concepts, Types, Comparison, Operations.Abstraction: Generalization, Aggregation.	**8 Hours**
Unit-2:	**Relational data Model and Language:** Concepts; Integrity: Entity, Referential; Constraints: Keys, Domain; Relational Algebra; Relational Calculus; Tuple and Domain Calculus. **Introduction to SQL:** Characteristics, Advantage, Data Types and Literals, Commands, Operators and their Procedure, Tables, Views and Indexes, Queries and sub queries, Aggregate functions, Operations: Insert, Update, Delete, Join, Union, Intersection, Minus, Cursors.	**8 Hours**
Unit-3:	**Data Base Design:** Functional Dependencies; Lossless Join Decompositions; Alternative approaches to Database Design, Canonical Cover and Dependency preservation. **Normalization:** Normal Forms using FD, MVD, and JDs.	**8 Hours**
Unit-4:	**Transaction Processing Concepts:** Transaction system, Serializability, Testing, Schedules: Conflict& View Serializable Schedule; **Recoverability:** Recovery from Transaction Failures; Log Based Recovery, Checkpoints, Deadlock Handling.	**8 Hours**

Unit-5:	**Concurrency Control Techniques**: Locking Techniques, Time-Stamping Protocols, Validation based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction.	**8 Hours**
Text Books:	1.Korth, H.F.,Silbertz, A., Database Concepts, McGraw Hill.	
Reference Books:	1.Desai, B.C., An introduction to Database Systems,Galgotia. 2.Majumdar, A. K. and Bhattacharya, P., Database Management System, Tata McGraw Hill. 3.Ramakrishnan, R., Gehrke, J., Database Management System, McGraw Hill ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106093/ https://www.youtube.com/watch?v=1057YmExS-I&list=PLEbnTDJUr_Ic_9b4PcKmlae41cyxEefot	

Course Code: **EEC302**	**Professional Core Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **DIGITAL ELECTRONICS AND COMPUTER ORGANIZATION**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basics of Number system, Boolean algebra and its applications in digital electronics.	
CO2.	Understanding different combinational and sequential circuits in digital electronics.	
CO3.	Understanding the organization of computer system and its components, memory hierarchy, I/O mechanism.	
CO4.	Applying the concepts to design various combinational and sequential circuits.	
CO5.	Analyzing the efficiency of various gates and flip-flops based upon their functionality.	
Course Content:		
Unit-1:	**Number System:** Data representation, Data Types and Number Systems, Binary Number System, Octal & Hexa-Decimal Number System; Fixed Point Representation; 1's &2's Complement; Binary Fixed Point Representation; Arithmetic Operation on Binary Numbers; Overflow &Underflow; Floating Point Representation; Codes: ASCII, EBCDIC Codes, Gray Code, Excess-3 & BCD; Error Detection & Correcting Codes; Binary Storage and Registers.	**8 Hours**
Unit-2:	**Boolean algebra:** Definition, Properties, Law's. **Digital Logic Circuits**: Logic Gates: AND, OR, NOT Gates and their Truth Tables, NOR, NAND &XOR Gates; Demorgan's Theorem; Map Simplification; **Minimization Techniques:** K Map Two, Three and More variables maps; Sum of Product & Product of Sums; Don't care conditions; Combination & Sequential Circuits; Half adder &Full adder; Full subtractor and decimal adder, Code Conversion; Multilevel NAND and NOR Circuits; Multiplexers and Demultiplexers; ROM Working & Circuit.	**8 Hours**
Unit-3:	**Sequential logic**: Flip-Flops: RS, D, JK & T Flip-Flop, Triggering in flip flops, Analysis of Clocked Sequential Circuits; State Reduction and Assignment; flip flop excitation tables; Design procedure and Design of Counters; Design with equations; Registers; Counters and the memory unit; Shift registers; Ripple counters and Synchronous counters; Timings sequence digital logic families; Processor organization; General Register Organization; Stack Organization and Addressing Modes.	**8 Hours**
Unit-4:	**Computer Registers and I/O:** Registers transfer logic; Intel Register Transfer; Arithmetic Logic and Shift Micro Operation; Conditional; Constant Statement; Fixed Point Binary Data Floating Point Data; Instruction Codes; Input-output organizations- I/O Interface; Properties of simple I/O Devices and their controller; Isolated vs. Memory-mapped I/O; Modes of data transfer; Synchronous & Asynchronous data transfer.	**8 Hours**
Unit-5:	**Computer Organization:** Block Level Description of the Functional Units as Related to the Execution of a Program; Fetch; decode and Execute Cycle. **Memory organization:** Auxiliary Memory; Magnetic Drum; Disk & Tape; Semi-conductor memories; Memory; Hierarchy; Associative memory; Virtual memory; Address space & memory space; Address mapping; page table; Page replacement; segmentation; Cache memory; Hit ratio; Mapping techniques;	**8 Hours**

	Writing into Cache.	
Text Books:	**1.** Mano, M., *Computer System Architecture*, Prentice Hall of India.	
Reference Books:	**1.** Tannenbaum, O., *Structured Computer Organization*, Prentice Hall of India. **2.** Hayes, P.J., *Computer Organization*, McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/117/105/117105078/ https://www.youtube.com/playlist?list=PL41Z-nyV-Dsj3RJIhBLaMu77CzxKN5E_w	

Course Code: **EAS301**	**Basic Science Course-5** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **MATHEMATICS-III**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of singularities, zeroes and poles, functions , relations, propositions, truth tables, logical equivalence and implications, converse, inverse, bi-conditional statements, negation of compound statements, tautologies and contradiction, arguments, fallacies, quantifiers.	
CO2.	**Applying** the concept of power series, Taylor's and Laurent's series, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Residue theorem.	
CO3.	**Applying** the core mathematics concept to solve the problems.	
CO4.	**Analyzing** the method of least squares and curve fitting of straight line and parabola, solution of cubic and bi-quadratic equations, correlation and regression, Binomial distribution, Poisson distribution and Normal distribution.	
CO5.	**Evaluating** the real integral of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$, Line integral in the complex plane.	
Course Content:		
Unit-1:	**Functions of a Complex Variable**: Analytic functions; C-R equations and harmonic functions; Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	**8 Hours**
Unit-2:	**Functions of a Complex Variable II**: Representation of a function by power series; Taylor's and Laurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integral of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$.	**8 Hours**
Unit-3:	**Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, Curve Fitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Solution of cubic and bi-quadratic equations, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	**8 Hours**
Unit-4:	**Propositional Calculus:** Propositions: Algebra, Conditional; Truth tables; Logical Equivalence andimplications; Converse; Inverse; Contra-positive; Bi-conditional statements; Negation of Compound statements; Tautologies and Contradiction; Normal Forms; Arguments; Fallacies; Quantifiers.	**8 Hours**
Unit-5:	**Set Theory:** Concepts, Operations, Identities, Venn diagram, Cartesian product.**Relation**: Definition, Types, Pictorial representation, Composition.**Function**:Definition, classification, types and composition. **Combinatorics:** Principles, Permutation and Combination, Recurrence Relations and Generating Functions,Mathematical Induction.	**8 Hours**
Text Books:	1. Grewal B.S., *Higher Engineering Engineering Mathematics*, Khanna Publishers.	
Reference Books:	1. Kreyszig E., *Advanced Engineering Engineering Mathematics*, Wiley	

	Eastern. 2. Piskunov N, *Differential & Integral Calculus*, Moscow Peace Publishers. 3. Narayan Shanti, *A Text book of Matrices*, S. Chand. 4. Bali N.P., Engineering Engineering Mathematics-III, Laxmi Publications. 5. Lipchitz, S. & Lipson S., *Discrete Mathematics*, Outline series Tata McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/122/107/122107037/ https://www.youtube.com/playlist?list=PL7A8749D363875113	

Course Code: **EAI305**	**Professional Core Course-4** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **PROGRAMMING WITH PYTHON**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding of different control statements of python.	
CO2.	Understanding various data storage structure used in python like dictionary, List and Series.	
CO3.	Understanding the concept of network programming usage with python.	
CO4.	Applying various packages used in data science like numpy, pandas and scikit.	
CO5.	Analyzing the concept of exception handling concept.	
CO6.	Developing problem solving skills using python constructs	
Course Content:		
Unit-1:	**Introduction to python-**The python Language, History of python, Unique features of python, python-2 and python-3 differences, Install python and environment setup, Installation from Source Code and Binaries. The Python Interpreter. first python program, python identifiers, keywords and indentation, comments, document interlude, command line arguments, getting user input, usage of read and print functions, python data types, variables-values and types, Expression and operators, conditional statements, Looping, Control flow statements Break, Continue ,Pass, Python Iterators, importing modules, Numeric Operations-usage of Math module.	**8 Hours**
Unit-2:	**Python Strings-** String Manipulation Accessing Strings ,Basic Operations ,String slices. **Functions:** Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions. Recursive functions. **Lists and Tuple:** Introduction to List and Tuple, Accessing List and Tuple, Operations, working with List and Tuple, Function and Methods. **Dictionaries:** Working with dictionaries, properties and functions.	**8 Hours**
Unit-3:	**OOPs Concept:** Class and Object, Attribute, Inheritance, Operator Overloading, Overriding, Data Hiding, Metaclasses, **Core Built—ins:** Built—in Types, Built—in functions, The sys Module, The getopt Module. Strings and Regular Expression. **File and Text I/O Operations:** The os Module, Filesystem Operations, File Objects, Auxiliary Module for File I/O, Compressed File, Text Input and Output, Opening and Closing File, Reading data form keyboard, Reading and Writing a File, Copy the content from one file to another file.	**8 Hours**
Unit-4:	**CGI:** Introduction, Architecture, CGI environment variable, Get and Post Method, Cookies, File Upload.	**8 Hours**

	Database: Introduction, Connection(MySQL), Executing Queries, Transactions. **Module:** Importing and creating Module, Math Module, Random Module, Package, usage of Numpy, scikit and pandas. **Multithreaded Programming-** starting a new thread, thread module, synchronizing thread, multithreaded queue.	
Unit-5:	**Network programming** – sockets, socket module, and Client/Server Programming; **Python date and time-** time module, calendar module, datetime module, pytz module. **XML processing-** parsing XML, make_parser method, parse and parseString methods, **Exceptions:** try Statement, Exception Propagation, Except Clause, Try Finally Clause, User Defined Exception, The raise statement.	**8 Hours**
Text Books:	1. "Python in a Nutshell" by Alex Martelli, Oreilly Publication.	
Reference Books:	1. Core Python Programming by Wesley J. Chun, Pearson Education 2. An Introduction to Python by Guido Van Russom, Fred L.Drake, Network Theory Limited. 3. Beginning Python: From Novice To Professional By Magnus Lie Hetland, Second Edition Apress 4. Programming in Python by Mark Summerfield, Pearson Education ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106182/ https://www.youtube.com/watch?v=rfscVS0vtbw	

Course Code: **TMUGE301**	**Humanities and Social Sciences including Management courses-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **English Communication -III**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the art of public speaking and strategies of reading comprehension.	
CO3.	Applying correct vocabulary and sentence construction during public speaking or professional writing.	
CO4.	Analyzing different types of sentences like simple, compound and complex. Drafting notice, agenda and minutes of the meeting.	
CO5.	Developing speaking skills during common conversation and power point presentation.	
Course Content:		
Unit-1:	**English Grammar & Vocabulary** •Correction of Common Errors (with recap of English Grammar with its usage in practical context.) •Synthesis: Simple, complex and compound sentence •Commonly used Idioms & phrases (Progressive learning whole semester)	**8 Hours**
Unit-2:	**Speaking Skills** •Art of public speaking •Common conversation •Extempore •Power Point Presentation (PPt) Skills: Nuances of presenting PPTs	**8 Hours**
Unit-3:	**Comprehension Skills** •Strategies of Reading comprehension: Four S's •How to solve a Comprehension (Short unseen passage: 150-200 words)	**8 Hours**
Unit-4:	**Professional Writing** • Preparing Notice Agenda & Minutes of the Meeting	**8 Hours**
Unit-5:	**Value based text reading:**Short story • The Barber's Trade Union – Mulk Raj Anand	**8 Hours**

Text Books:	**1.** Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	1.Allen, W. "Living English Structure" Pearson Education, New Delhi. 2.Joseph, Dr C.J. & Myall E.G. "A Comprehensive Grammar of Current English" Inter University Press, Delhi 3.Wren & Martin "High School English Grammar and Composition" S.Chand&Co.Ltd., New Delhi. 4.Norman Lewis "Word Power Made Easy" Goyal Publications & Distributers, New Delhi. 5.Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. 6.Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi. 7.Agrawal, Malti "Professional Communication" KrishanaPrakashan Media (P) Ltd. Meerut. **Note:** • **Class (above 30 students) will be divided in to two groups for effective teaching.** • **For effective conversation practice, groups will be changed weekly.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/109/106/109106129/ https://www.youtube.com/watch?v=0AM35Nu5McY	

Methodologies:

1. Idiom & Phrases and exercises, usage in sentences.
2. Language Lab software.
3. Power Point presentation.
4. Newspaper reading, short articles from newspaper to comprehend and short movies.
5. Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.
6. Text reading : discussion in detail, Critical appreciation by reading the text to develop students' reading habits with voice modulation.

Note:

- Class (above 30 students) will be divided in to two groups for effective teaching.
- For effective conversation practice, groups will be changed weekly.

Evaluation Scheme

Internal Evaluation	External Evaluation	Total Marks

40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) ***(From Unit- I, III,IV& V)***	10 Marks (Oral Assignments) ***(Unit –II)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit- I, III,IV& V)***	20 Marks (External Viva)* ***(Unit –II)***	**100**

*Parameters of External Viva

Content	**Body Language**	**Communication skills**	**Confidence**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note*:External Viva will be conducted by 2-member committee comprising*

- ***a)*** *One Faculty teaching the class*
- ***b)*** *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: **ECS355**	**Laboratory Course-8** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **DATA STRUCTURE USING C++ (LAB)**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the concept of different data types and their usage using C++ Programs.	
CO2.	Applying the concept of recursion for problem solving using tail and binary recursion.	
CO3.	Applying the programming constructs and their usage for problem solving.	
CO4.	Applying the understanding to solve basic operations searching, sorting, insertion, deletion on data structures.	
CO5.	Developing programming skills to solve problems with various storage structures like stack, queue, linked list and tree.	
	LIST OF EXPERIMENTS	
	1. Implement the concepts of C++ classes, objects and various instances. 2. Implement the features of inheritance, overloading and friend function. 3. To write programs implementing Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort. 4. To write programs implementing Searching programs: Linear Search, Binary Search. 5. To write programs Array implementation of Stack, Queue, Circular Queue, Linked List. 6. To write programs implementing Stack, Queue, Circular Queue, Linked List using dynamic memory allocation. 7. To write program implementing Binary tree. 8. To write programs implementing Tree Traversals (pre-order, in-order, post-order). 9. To write programs implementing graph traversal (BFS, DFS).	

Course Code: ECS356	**Laboratory Course-9** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester III** **DATA BASE MANAGEMENT SYSTEM (LAB)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of DML operation to database table to complete different queries on database.	
CO2.	Applying the concepts of different DDL operations.	
CO3.	Applying the concepts of DCL operations like grant and revoke for administration purpose on a table.	
CO4.	Applying the concepts of PL/SQL for creating different triggers to develop event driven action in database.	
CO5.	Analyzing the concepts of PL/SQL for creating functions and procedure to apply DML on tables	
	LIST OF EXPERIMENTS	
	1. To write a program to Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions. **2.** To write a program in PL/SQL, Understanding the concept of Cursors. **3.** To write a program for implementing Join, Union & intersection etc. **4.** To write a program for Creating Views, Writing Assertions Triggers. **5.** To write a program for Creating Forms, Reports etc. **6.** To write codes for generating read and update operator in a transaction using different situations. **7.** To write a program to Implement 2PL concerning central algorithm. **8.** To develop code for understanding of distributed transaction processing. Students are advised to use Developer 2000 Oracle 8+ version for above experiments. However, depending on the availability of Software's students may use power builder/SQL Server/DB2 for implementation.	

Course Code: EAI353	**Laboratory Course-10** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B. Tech (CSE) - Semester III** **PYTHON LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of different collections - list, tuple, dictionaries and dataframes.	
CO2.	Applying the concepts to built functions in Python.	
CO3.	Applying the concept of database connectivity with python to perform some operations in database.	
CO4.	Applying the programming construct to perform various matrix operations.	
CO5.	Analyzing the concepts of packages in python and create own packages.	
	LIST OF EXPERIMENTS	
	1. To write a program to calculate Sum & average of N numbers using all loops. 2. To write a program to find maximum and minimum out of 3 numbers a, b & c. 3. To write a program to find sum of series up to n number, 3+5+8+……+n. 4. To write a program to generate Fibonacci series up to n. 5. To write a program to implement a function to calculate area of a circle using functions. 6. To write a program to demonstrate the tupple. 7. To write a program to demonstrate the list, adding items in list, removing item and removing list. 8. To write a program to find addition of two matrix of n*n order using list. 9. To write a program to demonstrate the use of dictionary. 10. To write a program to demonstrate the different string operations. 11. To write a program to creating class. 12. To write a program to creating a blank class. 13. To write a program to implement different inheritance. 14. To write a program overload different operators. 15. To write a program to creating class.	

	16. To write a program to sockets. 17. To write a program to implement exception handling. 18. To implement different operator overloading. 19. To connect MySQL database and perform different DML and DDL commands. 20. To write a program to create sockets. 21. To write a program to creating and importing modules.	

Course Code: TMUGA-301	Value Added Audit Course- I BTech- Semester-III **Foundation in Quantitative Aptitude**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Solving complex problems using Criss cross method, base method and square techniques.	
CO2.	Applying the arithmetical concepts of Average, Mixture and Allegation.	
CO3.	Evaluating the different possibilities of various reasoning based problems in series, Blood relationand Direction.	
CO4.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.	
Course Content:		
Unit-1:	**Speed calculations** Squares till 1000,square root, multiplications: base 100, 200 300 etc., 11-19, crisscross method for 2X2, 3X3, 4X4, 2X3, 2X4 etc., cubes, cube root	**3 Hours**
Unit-2:	**Percentages** Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	**5 Hours**
Unit-3:	**Profit Loss Discount** Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	**5 Hours**
Unit-4:	**SI and CI** Simple Interest, finding time and rate, Compound Interest, difference between SI and CI, Installments	**4 Hours**
Unit-5:	**Averages** Basic Averages, Concept of Distribution, Weighted Average, equations	**3 Hours**
Unit-6:	**Mixtures and allegations** Mixtures of 2 components, mixtures of 3 components, Replacements	**5 Hours**
Unit-7:	**Blood relations** Indicating type, operator type, family tree type	**3 Hours**
Unit-8:	**Direction sense** Simple statements, shadow type	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal	

	*** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme for Quantitative Aptitude:-

The students will be evaluated on the score of 100 for the semester. Detailed scheme for the course is as follows.

a. 20 marks each for CT1 + CT2 + CT3
b. 30 marks for final external exams.
c. 10 marks for attendance, at the end of semester, will be provided in the following manner.
d. Attendance criterion for appearing in the exams and campus placements is 80%.

S No	% Attendance<	Marks
1	30	0
2	30-40	2
3	40-50	4
4	50-60	5
5	60-70	6
6	70-80	7
7	80-90	8
8	90-100	10

So for CT1 (20) + CT2 (20) + CT3(20) + Final External exam (30) + Attendance (10) = 100 marks

References:

- M Tyra: Quicker Maths
- Reference website:- Indiabix.com
- Verbal and Non Verbal Reasoning by R.S. Agrawal

Course Code: **ECS401**	**Professional Core Course-5** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **THEORY OF COMPUTATION**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the fundamentals of Computational theory and basic terminology used.	
CO2.	Understanding basics of various machines used for computations like FSM, PDA, TM.	
CO3.	Understanding the grammar, language, formation of regular expression in FA, minimization of FA and CFG.	
CO4.	Applying the concepts to design various machines like FSM, PDA etc.	
CO5.	Analyzing the efficiency of various machines based upon their functionality and limitations.	
Course Content:		
Unit-1:	**Fundamentals:** Strings, Alphabet, Language, Operations, Finite state machine, Definitions, Finite automaton model, acceptance of strings and languages, Deterministic finite automaton and non deterministic finite automaton, Transition diagrams and language recognizers, Chomsky hierarchy of languages.	**8 Hours**
Unit-2:	**Finite Automata:** NFA with NULL (€) transitions-Significance, Acceptance of languages. Conversions and Equivalence, Equivalence between NFA with and without null transitions, NFA to DFA conversion, Minimization of finite state machine (FSM), Equivalence between two FSM`s, Finite Automata with output-Moore and Mealy machines	**8 Hours**
Unit-3:	**Regular Languages:** Regular sets, Regular expressions, Identify rules, Constructing finite Automata for a given regular expressions, Conversion of finite automata to regular expressions, Pumping lemma of regular sets. **Grammar Formalism:** Regular grammars-right linear and left linear grammars, Equivalence between regular linear grammar and FA, Context free grammar, Derivation trees, Sentential forms, Rightmost and leftmost derivation of strings.	**8 Hours**
Unit-4:	**Context Free Grammars:** Ambiguity in context free grammars. Minimization of context free grammars, Chomsky normal form, Greiback normal form, Pumping lemma for context free languages.	**8 Hours**
Unit-5:	**Push Down Automata:** Push down automata, Definition, Model, Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, Introduction to Tuning Machine (TM), TM Definition, TM Model, Design of TM.	**8 Hours**
Text Books:	1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science (Automata, Languagesand Computation)", PHI	
Reference Books:	1. Martin J. C., "Introduction to Languages and Theory of Computations", TMH 2. Papadimitrou, C. and Lewis, C.L., "Elements of theory of Computations", PHI 3. Cohen D. I. A., "Introduction to Computer theory", John Wiley & Sons	

	4. Kumar Rajendra, "Theory of Automata (Languages and Computation)", PPM*** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/104/106104028/ https://www.youtube.com/playlist?list=PLbMVogVj5nJSd25WnSU144ZyGmsqjuKr3	

Course Code: EAI402	**Professional Core Course-6** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **COMPUTER NETWORK**
Course Outcomes:	**On completion of the course, the students will be :**
CO1.	Understanding the concepts of network fundamentals and terminology.
CO2.	Understanding the principles of LAN design such as topology and configuration
CO3.	Understanding various network industry standards such as: the OSI model, Routing Protocols, Address Resolution and Reverse Address Resolution Protocols.
CO4.	Analyzing different type of network interfaces and their usage.
CO5.	Evaluating the configurations of IP Addresses and Subnetting, MAC Addressing.
Course Content:	
Unit-1:	**Network:** Goals, Applications, Components; Direction of Data flow networks, Categories, Types of Connections, Topologies, Protocols and Standards, ISO / OSI model, Transmission Media, Types, ISDN, Routers.
Unit-2:	**Medium Access Sub-Layer:** Channel Allocations, ALOHA protocols, Error detection and correction: Parity, LRC, CRC, Hamming code, Flow Control and Error control; Stop and wait, Go back-N, ARQ, Selective repeat ARQ, Sliding Window, HDLC, Ethernet: IEEE-802.3, 802.4, 802.5, 802.11, FDDI, SONET , Bridges.
Unit-3:	**Network Layer:** Internet works, Packet Switching and Datagram Approach, IP addressing methods, Sub netting, Routing: Distance Vector, Link State.
Unit-4:	**Transport Layer:** Duties, Multiplexing, Demultiplexing, Sockets. **Protocols:** User Datagram Protocol (UDP), Transmission Control Protocol (TCP),Congestion Control, Quality of Services (QOS), Integrated Services.
Unit-5:	**Application Layer:** Domain Name Space (DNS), File Transfer Access and Management, Electronic Mail, Virtual Terminals, WWW, Security, Cryptography.
Text Books:	1.Forouzan, B.A., Data Communication and Networking, Tata McGraw Hill.
Reference Books:	1.Stallings, W., Data and Computer Communication, Macmillan Press. 2.Keshav, S., An Engineering Approach on Computer Networking, Addison-Wesley. 3.Larry, L.P. and Peter, S.D., Computer Network, Harcourt Asia. ***Latest editions of all the suggested books are recommended.**
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105081/ https://www.youtube.com/playlist?list=PLEbnTDJUr_IegfoqO4iPnPYQui46QqT0j&app=desktop

Course Code: EAI403	**Professional Core Course-7** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **SOFTWARE ENGINEERING & TESTING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the phases of software development life cycle.	
CO2.	Applying Agile Methodology of software testing and constructing software testing plan.	
CO3.	Analyzing various methods of Software development cost estimation.	
CO4.	Analyzing software requirement specification document and its usability.	
CO5.	Analyzing software Maintenance and quality assurance standard.	
Course Content:		
Unit-1:	**Introduction to Software Engineering:** Introduction to Software Engineering, Importance of Software, Software Development Life Cycle (SDLC) & its phase. **Software Process Models:** Water Fall, Evolutionary Process Model - Prototype & Spiral Model, Incremental Process Model – Iterative Approach, RAD **Requirement Engineering:** Overview of Functional and Non Functional Requirements, User Requirements, System Requirements, Interface Specifications, Context Diagram, Software Requirement Specifications (SRS) **Case Study:** SRS following IEEE Standards	**8 Hours**
Unit-2:	**Software-Design:** Design Principles, Low Level Design- Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies- Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design, Data Flow Diagrams (DFD), Data Dictionary, Entity Relationship Diagrams (ERD), Concept of User Interface. **Coding:** Coding Standards, Code Review	**8 Hours**
Unit-3:	**Software Testing:** Overview of Testing, Verification & Validation, Levels of Testing – Unit Testing, Integration Testing (including Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs), System Testing, Acceptance Testing. Overview of Functional Testing (Black Box Testing), Structural Testing (White Box Testing), Non-Functional Testing (Stress Testing, Regression Testing, Performance Testing) , Alpha & Beta Testing of Products	**8 Hours**
Unit-4:	**Test Management:** Software Testing Life Cycle (STLC), Test Cycle, Test Estimation, Test Plan, Test Cases, Test Scenarios. **Testing Tools:** Static, Dynamic, Characteristics of Modern Tools and Automation. **Agile Methodology:** Agile Manifesto- Values & Principles, Agile Methods- Extreme Programming, Scrum. Challenges in Adopting Agile Method. **Software Reliability:** Overview of Software Reliability, Reliability Metrics	**8 Hours**

Unit-5:	**Software Maintenance:** Need for Software Maintenance, Categories of Maintenance: Preventive, Corrective, Adaptive and Perfective Maintenance, Cost of Maintenance, Overview of Reverse Engineering, Overview of Computer-Aided Software Engineering (CASE) **Software Quality Assurance:**Overview of Software Quality, Concept of Quality Standards (ISO 9001 and SEI Capability Maturity Model) **Change Management:** Software Configuration Management Activities, Change Control Process, Software Version Control	**8 Hours**
Text Books:	1.Agarwal, K.K., Software Engineering, New Age International.	
Reference Books:	1. Sommerville, I., *Software Engineering*, Addison-Wesley. 2. Aggarwal, K.K. & Singh, Y., *Software Engineering*, New Age International Publishers. 3. Boris, B., *Software Testing Techniques*, Van Nostrand Reinhold. 4. Boris, B., *Black-Box Testing – Techniques for Functional Testing of Software and Systems*, John Wiley & Sons. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105150/ https://www.youtube.com/watch?v=T3q6QcCQZQg	

Course Code: **EAI404**	**Professional Core Course-8** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **ARTIFICIAL INTELLIGENCE**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the Artificial Intelligence, application areas and importance of Turing test in identifying AI applications	
CO2.	Understanding the role of state space search and production system in enumerating complex problems in AI	
CO3.	Understanding the syntax & programming constructs of both PROLOG and LISP. Applying the PROLOG to implement solutions of complex problems in AI.	
CO4.	Understanding the symbolic logic in AI and able to use predicates & High order logic, effectively for representation of scenario and Understanding the different knowledge representation mechanisms and effectively use them for representing knowledge	
CO5.	Evaluating the performance of various search algorithms and heuristic algorithms in solving complex problems	
Course Content:		
Unit-1:	**Introduction:** Introduction to Artificial Intelligence, History of Artificial Intelligence, Turing Test, Founding Blocks and sub fields of Artificial Intelligence, Application Areas, Applications of Artificial Intelligence – Expert System, Intelligent Agents, Computer vision, Natural Language Possessing.	**8 Hours**
Unit-2:	**Search Methods:** State space search, Production System, Problem characteristics, DFS, BFS, Implementation and limitation of DFS and BFS; Heuristic Search Techniques, Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction, Crypt arithmetic and problems.	**8 Hours**
Unit-3:	**Physical Symbol Systems:** Introduction, Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Matching and control knowledge, Other High Order Logic's	**8 Hours**
Unit-4:	**Knowledge Representation:** Structured Knowledge Representation, Slots and filler structure, Semantic Nets and partitioned semantic nets, exceptions and default frames, Conceptual dependency, scripts. **Learning:** learning automation, discovery, analogy & formal learning theory, learning by genetic algorithm.	**8 Hours**
Unit-5:	**PROLOG:** Introduction to Prolog, Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages.	**8 Hours**
Text Books:	1. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed, 1992.	
Reference Books:	1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.	

	2. Peter Jackson, "Introduction to Expert Systems", AWP, M.A., 1992. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105077/ https://www.youtube.com/watch?v=JMUxmLyrhSk	

Course Code: ECS407	**Professional Core Course-9** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **JAVA PROGRAMMING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the object-oriented approach of programming, basic building blocks of java programming, java development environment, datatypes, class, methods, and various predefine packages.	
CO2.	Understanding the various predefine classes, interfaces, which deals with networking, understanding the basic approach of graphical user interface design using Abstract window toolkit and Applet.	
CO3.	Understanding the basic concept of Event handling, Applying the concept of thread and multithreading.	
CO4.	Understanding the Database connectivity using java, along with the classes and methods of java.sql package and creating basic programs using this package.	
CO5.	Applying the graphical user interface design concept using Swing.	
CO6.	Analyzing the predefine methods and interfaces of Swing package and creating basic user interface using swing.	
Course Content:		
Unit-1:	**Core Java:** Operators, Data types, Variables, Arrays, Control Statements, Methods &Classes, Constructors, Introducing Methods, Method Overloading, The this Keyword, Garbage Collection, Introducing Final, Understanding static, Variable Length Arguments, and Ambiguity, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling,java collection framework. **Abstract Window Toolkit (AWT):** Controls, Layout managers, Menus, Images, Graphics.	**8 Hours**
Unit-2:	**Java Swing:** Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.	**8 Hours**
Unit-3:	**JDBC:** Connectivity Model, JDBC/ODBC Bridge, java.sql package, Connectivity to remote database, navigating through multiple rows retrieved from a database. Introduction to Hibernate.	**8 Hours**
Unit-4:	**Java Beans:** Application Builder tools, Bean developer kit (BDK), JAR files, Introspection, Developing a simple bean, Using Bound properties, Java Beans API, Session Beans, Entity Beans, Enterprise Java beans (EJB), RMI (Remote Method Invocation), A simple client-server application using RMI.	**8 Hours**
Unit-5:	**Java Servlets:** Type of Servlets: Generic and HTTP Servlet, Life cycle, Running, Debugging,servlet API, Running a servlet on Apache Tomcat Server,Request Dispatchers: Forward and Include Thread-safe, HTTP Redirects, Cookies, Java Server pages (JSP),Java Server Pages - Understanding	**8 Hours**

	the working of Server side Scripting, JSP Components, Java beans and JSP concepts, JDBC and JSP, Configuring JSP Server (Apache Tomcat), Using JSP Implicit objects, JSP Actions, JSP-Java bean Scope, JSP and MVC,JSTL, A sample website using JSP and Servlets. Introduction to Struts2 Framework, Interceptors and Validation.Struts2 and AJAX.	
Text Books:	1. Margaret, L. Y., The Complete Reference- Internet, Tata McGraw Hill.	
Reference Books:	1. Balagurusamy, E., *Programming in JAVA*, Tata McGraw Hill. 2. Dustin, R. Callway*Inside Servlets*, Addison-Wesley. 3. Steven, H., *Java2 Black Book*, Dreamtech. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105191/ https://www.youtube.com/watch?v=eIrMbAQSU34	

Course Code: ECS406	**Professional Core Course-10** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **OPERATING SYSTEM**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts and states of process, also evaluating the use of various scheduling algorithms and finding the suitability for their usage.	
CO2.	Understanding and Analyzing various issues in Inter Process Communication (IPC) and the role of OS in IPC, also understanding the various characteristics of deadlock and applying the learnt concepts and algorithm to avoid and recover from the deadlock.	
CO3.	Understanding the concepts and implementation of various Memory management policies and usage of the virtual memory.	
CO4.	Applying the Basics of operating system along with the types and main functionalities of the operating system.	
CO5.	Applying the file management policies and disk structure along with scheduling algorithm for applying it to solve the disk scheduling problems.	
Course Content:		
Unit-1:	**Operating System:** History, Types: Batch System, Time Sharing System, Real Time System, Multiprogramming, Distributed System; Functions; Services; System calls; System programs; Virtual machines.	**8 Hours**
Unit-2:	**Process Management:** Process Concept, Process State, Process Control Block, ProcessScheduling, CPU Scheduling - CPU Scheduling, Scheduling Criteria, Scheduling Algorithms,Preemptive & Non-Preemptive Scheduling.	**8 Hours**
Unit-3:	**Process Synchronization:** Critical Section Problem, Race Condition, SynchronizationHardware, Semaphores, Classical Problems of Synchronization. **DeadLocks:** Characterization, Methods for Handling Deadlock, Deadlock Avoidance, Deadlock Detection and Recoveryfrom Deadlock	**8 Hours**
Unit-4:	**Memory Management:** Contiguous Allocation, External and Internal Fragmentation, Paging &Segmentation. **Virtual Memory:** Concept, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.	**8 Hours**
Unit-5:	**Directory Structure,** Allocation Methods: Contiguous Allocation, Linked Allocation, IndexedAllocation Free Space Management. Disk Structure, Disk Scheduling Algorithms, DiskManagement. **Linux:** Basics of Linux, Introduction to Linux - History, Architecture, , Basic commands in Linux, Files and File Structure	**8 Hours**
Text Books:	1.Silbershatz and Galvin," Operating System Concept", Addition WeseleyEigth Edition, 2009. .	
Reference Books:	1. Flynn, Mchoes, "Understanding Operating System", Thomson Press, Sixth Edition, 2013 2. Tannenbaum,"Modern Operating System Concept", PHI Learning,Third	

	Edition, 2009. 3. Joshi, R. C. and Tapaswi, S., "Operating Systems", Wiley Dreamtech. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105214/ https://www.youtube.com/playlist?list=PLsylUObW5M3CAGT6OdubyH6FztKfJCcFB	

Course Code: **TMUGE401**	**Humanities and Social Science including Management Course-4** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **English Communication –IV**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the essentials of effective listening and speaking.	
CO3.	Understanding the corporate expectations and professional ethics.	
CO4.	Applying correct vocabulary and sentence construction during professional writing or job interviews.	
CO5.	Analyzing different types of interviews. Drafting resume, C.V. or cover letter.	
Course Content:		
Unit-1:	**Vocabulary & Grammar:** •Homophones and Homonyms •Correction of Common Errors (with recap of English Grammar with its usage in practical context.) •Transformation of sentences	**12 Hours**
Unit-2:	**Essence of Effective listening & speaking:** • Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Review of these abovementioned* • Impromptu	**5 Hours**
Unit-3:	**Professional Writing** a) Proposal: Significance, Types, Structure & AIDA b) Report Writing: Significance, Types, Structure& Steps towards Report writing	**8 Hours**
Unit-4:	**Job Oriented Skills** a) Cover Letter b) Preparing Rèsumè and Curriculum-Vitae c) Interview: Types of Interview, Tips for preparing for Interview and Mock Interview **d)** Corporate Expectation & Professional ethics: Skills expected in corporate world	**10 Hours**
Unit-5:	**Value based text reading:** Short story a) A Bookish Topic – R.K. Narayan	**5 Hours**
Text Books:	**1.** Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	• Raman Meenakshi & Sharma Sangeeta, *"Technical Communication-Principles & Practice"* Oxford University Press, New Delhi. • Mohan K. & Sharma R.C., "*Business Correspondence of Report Writing",*TMH, New Delhi. • Chaudhary, Sarla "Basic Concept of Professional Communication"	

	Dhanpat Rai Publication, New Delhi. • Kumar Sanjay &Pushplata "*Communication Skills*" Oxford University Press, New Delhi. • Agrawal, Malti "*Professional Communication*" KrishanaPrakashan Media (P) Ltd. Meerut.	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/109/106/109106067/ https://www.youtube.com/watch?v=lPldr57hpPg	

Methodology:

1. The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.
2. Language Lab software.
3. Sentence transformation on daily activities and conversations.
4. Conversational Practice will be effectively carried out by Face to Face & Via Media (Audio-Video Clips)
5. Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.

Note:

- Class (above 30 students) will be divided in to two groups for effective teaching.
- For effective conversation practice, groups will be changed weekly.

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			**60 Marks**		**100**
20 Marks (Best 2 out of Three CTs) ***(Unit –I, III,IV& V)***	10 Marks (Oral Assignments) ***(Unit –II& IV)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(Unit –I, III,IV& V)***	20 Marks (External Viva)* ***(Unit –II& IV)***	

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

***Note**:External Viva will be conducted by 2-member committee comprising*

- ***a)*** *One Faculty teaching the class*
- ***b)*** *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: **ECS456**	**Laboratory Course-11** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **JAVA PROGRAMMING LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying knowledge to solve real world problems based on object-oriented principles.	
CO2.	Applying the basic approach of graphical user interface design using Abstract window toolkit, Applet and swing packages, create some application that are based upon some real world scenario.	
CO3.	Analyzing the concept of database handling and creating application that are able to communicate with various database.	
CO4.	Analyzing the Client server architecture, Understanding the Remote method invocation architecture and creating basic application using Remote method invocation.	
CO5.	Analyzing the web architecture for creating applications using servlets and java server pages.	
	LIST OF EXPERIMENTS	
	1. To write a program in Java for illustrating, overloading, over riding and various forms of Inheritance, Exception handling. **2.** To write programs to create packages and multiple threads in Java. **3.** To write programs in Java for event handling Mouse and Keyboard events. **4.** To create different applications using Layout Manager. **5.** To write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT. **6.** To create Applets using Java. **7.** To write program for Client Server Interaction with stream socket connections. **8.** To write a program in java to read data from disk file.	

Course Code: **EAI452**	**Laboratory Course-12** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **ARTIFICIAL INTELLIGENCE LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the role of PROLOG for implementation of solutions of AI problems	
CO2.	Understanding the architecture and evaluation scheme of PROLOG	
CO3.	Applying the PROLOG for solving trivial problems	
CO4.	Analyzing the solutions for Water Jug problem, Eight Puzzle problem, Monkey Banana problem using PROLOG	
CO5.	Analyzing the various knowledge representation structures.	
	LIST OF EXPERIMENTS	
	1. Write a Prolog Program to solve the water-jug problem using heuristic function. 2. Write various Prolog programs for usage of various components. 3. Write a Prolog Program to show the advantage and disadvantage of green and red cuts. 4. Write a prolog program to use of BEST-FIRST SEARCH applied to the eight puzzle problem. 5. Implementation of the problem solving strategies: (i) Forward Chaining, (ii) Backward Chaining and (iii) Problem Reduction. 6. Write a Prolog Program to implement the STEEPEST-ASCENT HILL CLIMBING. 7. Write a Prolog Program to implement COUNTE PROPAGATION NETWORK.	

Course Code: EAI453	**Laboratory Course-13** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester IV** **COMPUTER NETWORKS LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the working of network simulation tool (Packet Tracer)	
CO2.	Understanding about basic network connectivity. Understand IOS used for networking devices	
CO3.	Understanding about ARP table. Analyzing some trouble shooting commands	
CO4.	Applying the knowledge to Configure the initial switch and router setting, Understand TCP/IP and OSI models	
CO5.	Analyzing MAC and IP addresses, Learn about TCP and UDP communications.	
	LIST OF EXPERIMENTS	
	1. To study Packet Tracer - Network representations 2. To study the navigation of Cisco IOS using packet tracer. 3. To configure initial switch settings. 4. To study the basic network connectivity 5. To investigate the TCP/IP and OSI Models in action 6. To study the connections of Wired and Wireless LAN 7. To study Packet Tracer - Identify MAC and IP Addresses 8. To configure Initial Router Settings 9. To perform Packet Tracer experiment to connect a Router to a LAN 10. To investigate Unicast, Broadcast, and Multicast Traffic 11. Using Packet tracer examine the ARP Table 12. Verifying IPv4 and IPv6 Addressing using packet tracer 13. Perform experiment using packet tracer for Pinging and Tracing to Test the Path 14. Using Packet Tracer Simulation explore TCP and UDP Communications 15. Configure and verify web and email services using packet tracer 16. Perform experiment to configure static IPv4 addressing and verify DNS records	

Course Code: **TMUGA-401**	**Value Added Audit Course- II** **BTech- Semester-IV** **Analytical Reasoning**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the arithmetical concepts in Ratio Proportion Variation.	
CO2.	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.	
CO3.	Identifying different possibilities of reasoning based problems of Syllogismsand Venn diagram.	
CO4.	Examining the optimized approach to solve logs and Surds.	
Course Content:		
Unit-1:	**Ratio, proportions and variations** Concept of ratios, proportions, variations, properties and their applications	**5 Hours**
Unit-2:	**Time and Work** Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	**6 Hours**
Unit-3:	**Time Speed Distance** Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks	**6 Hours**
Unit-4:	**Logs and Surds** Concept and properties of logs, surds and indices	**4 Hours**
Unit-5:	**Coding and decoding** Sequential coding, reverse coding, abstract coding	**3 Hours**
Unit-6:	**Syllogisms** Two statements, three statements	**4 Hours**
Unit-7:	**Venn diagram** Basic concept and applications	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme for Quantitative Aptitude:-

The students will be evaluated on the score of 100 for every semester. Detailed scheme for the course is as follows.

20 marks each for CT1 + CT2 + CT3

a. 30 marks for final external exams.
b. 10 marks for attendance, at the end of semester, will be provided in the following manner.
c. Attendance criterion for appearing in the exams and campus placements is 80%.

S No	% Attendance<	Marks
1	30	0
2	30-40	2
3	40-50	4
4	50-60	5
5	60-70	6
6	70-80	7
7	80-90	8
8	90-100	10

So for CT1 (20) + CT2 (20) + CT3(20) + Final External exam (30) + Attendance (10) = 100 marks

Course Code: EAI501	**Professional Core Course-11** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **ARTIFICIAL NEURAL NETWORK**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding principles of artificial neural network and models of artificial neuron.	
CO2.	Understanding the concept of supervised, un-supervised, and semi-supervised learning algorithms.	
CO3.	Understanding the concept of back-propagation algorithm and back-propagation algorithm based neural network.	
CO4.	Understanding the architecture and applications of associative memory network, auto-associative memory network, and hetero-associative memory network.	
CO5.	Understanding the architecture and applications of adaptive resonance theory and self-organizing map.	
Course Content:		
Unit-1:	**Introduction to ANN** Features, structure and working of Biological Neural Network, Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks** - History of neural network research, characteristics of neural networks terminology, models of neuron Mc Culloch – Pitts model, Perceptron, Hebb Network.	**8 Hours**
Unit-2:	**Learning & Activation function:** Rules, Paradigms, Supervised Learning: Maximum Likelihood and Gradient Descent learning, Stochastic gradient descent for supervised learning, Unsupervised and Reinforcement Learning. **Activation Function:** Identity Function, Binary Function, Bipolar Function, Signam Function, Sigmoidal Function, Ramp Function.	**8 Hours**
Unit-3:	**Backpropagation networks :** (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning Rate.	**8 Hours**
Unit-4:	**Associative Memory Network:** Introduction, Learning Objective, Training Algorithms: Hebb Rule, Outer Product Rule, Architecture of Associative Memory Network. **AutoAssociative Memory Network:** Architecture of AMN, Training Process, Training & Testing Algorithms. **HeteroAssociative Memory Network:** Architecture of AMN, Training Process, Training & Testing Algorithms.	**8 Hours**
Unit-5:	Adaptive Resonance Theory and Self Organizing Map. Test & Implement OR Gate, AND Gate,NOR Gate & XOR Gate using Various Models of ANN.	**8 Hours**

Text Books:	1. S. N. Sivanandam&S. N. Deepa, Principles of S.oft Computing, 2nd Edition, Willy Publication.	
Reference Books:	1. J.A. Anderson, An Introduction to Neural Networks, MIT 2. Hagen Demuth Beale, Neural Network Design, Cengage Learning 3. R.L. Harvey, Neural Network Principles, PHI 4. Kosko, Neural Network and Fuzzy Sets, PHI ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/117/105/117105084/ https://www.youtube.com/watch?v=ysVOhBGykxs	

Course Code: ECS503	**Professional Core Course-12** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **ANALYSIS AND DESIGN OF ALGORITHMS**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basic concept of algorithm design, algorithm efficiency, run time complexity computation, divide and conquer concept of algorithm design, binary search algorithm analysis, divide and conquer approach analysis.	
CO2.	Understanding concept of greedy method in problem solving, exact optimization solution for minimum cost spanning tree, approximate solution for knapsack problem, single shortest path computation.	
CO3.	Applying concept of dynamic programming in problem solving, dynamic programming vs divide and conquer, shortest path computation application, matrix multiplication application, traveling salesman problem application, longest common subsequence application.	
CO4.	Applying basic concept of branch and bound method, LC searching bounding, FIFO branch and bound, 0/1 knapsack problem, travelling salesman problem, complexity measures, polynomial vs non-polynomial time complexity, NP-hard and NP-complete problem.	
CO5.	Analyzing concept of graph problem to get solution of depth first search method, breadth first search method, back tracking, 8-queen problem, knapsack problem.	
Course Content:		
Unit-1:	**Introduction:** Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences and their solution methods. **Sorting in polynomial Time:** Insertion sort, Merge sort, Heap sort, and Quick sort. **Sorting in Linear Time:** Counting sort, Radix Sort, Bucket Sort.	**8 Hours**
Unit-2:	**Advanced Design and Analysis Techniques:** Dynamic programming: Assembly Line Scheduling, Matrix Chain Multiplication, Longest Common Sequence, Traveling salesman Problem (TSP). **Greedy Algorithm:** Activity Selection Problem, Knapsack problem. Backtracking, Branch and Bound.	**8 Hours**
Unit-3:	**Advanced Data Structure:** Red Black Trees, Augmenting Data Structure, Binomial Heap, B-Tree and Fibonacci Heap. **Branch and Bound:** LC searching Bounding, FIFO branch and bound, LC, Applications, 0/1Knapsack problem, Traveling Salesman Problem.	**8 Hours**
Unit-4:	**Graph Algorithms:** Elementary Graph Algorithms, Breadth First Search, Depth First Search, Topological Sort, Strongly Connected Components, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Traveling Salesman Problem.	**8 Hours**

Unit-5:	**Randomized Algorithms, String Matching:** Naïve String Matching, Rabin-Karp, String matching with finite automata, KMP string matching algorithm, Polynomial vs. Non-polynomial Time complexity, NP-Hard and NP-Complete problems.	**8 Hours**
Text Books:	1. Introduction to Algorithms, Coreman 3rd Edition.	
Reference Books:	1. Algorithm Design and Analysis, Udit Agarwal Dhanpat Rai. 2. Computer Algorithms: Introduction to Design and Analysis by Sara Baase and Allen VanGelder, Pearson Education. 3. Algorithm Design by Jon Kleinberg and Eva Tardos, Pearson Education. 4. Fundamental of Algorithms by Brassard Bratley, PHI. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/101/106101060/ https://www.youtube.com/playlist?list=PLrjkTql3jnm8wGQyNhgdmm2gkoa8CXCml	

Course Code: **EAI503**	**Professional Core Course-13** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **WEB TECHNOLOGY AND DEVELOPMENT**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding basic components of a Web Technology (Design And Architecture Using .NET).	
CO2.	Understanding various categories of programs, Web, Window and Console Application. Organize and work with many projects.	
CO3.	Applying skills and concepts to built small real life applications using Web Technology (Design And Architecture Using .NET) standards.	
CO4.	Analyzing the usage of the Web Technology (Design And Architecture Using .NET) programs to create professional, academic, business and many software projects.	
CO5.	Developing personal, academic and business documents by following the current professional and/or industry standards.	
Course Content:		
Unit-1:	**Basics of Web-Technology:** Web Pages; HTML; Designing static HTML Pages using tags: Textbox, Button, Radio Button, Check Box, Text Area, Image, Links, Anchors, Table, Lists, Dropdown List; Form Submission using Get and Post Methods; JavaScript: Adding JavaScript to static HTML pages; Publishing a website.	**8 Hours**
Unit-2:	**Architecture of the ·Net Framework Development Platform:** Compiling Source Code into Managed Modules; Parts of a Managed Module: PE Header, CLR Header, Metadata, Intermediate Language (IL), Combining Managed Modules into Assemblies Loading the CLR; Executing the Assembly Code; The ·Net Framework: Class Library, Common Type System, Common Language Specifications, Building, Packaging, Deploying, and Administering Applications and Types.	**8 Hours**
Unit-3:	**Visual Studio ·Net:** Installing .Net Framework (2.0, 3.0 &4) and the Visual Studio .NET IDE. **ASP ·Net:** Web Forms; Applications; Application Configurations; Server Controls: Using standard controls, Using Rich Controls, Using Validation Controls, Data Bound Controls, Data Source Controls.	**8 Hours**
Unit-4:	**Designing ASP ·Net Websites:** Using Standard Controls on Master Pages; Designing Websites with Themes; Creating Custom Controls; ADO ·Net, Connected vs. Disconnected Data Access;	**8 Hours**
Unit-5:	**Site Navigation:** Navigation Control; Site Maps. **Security Mechanism:** Login Controls; Session Management; Localization and Globalization of yoursite; designing a Sample e-mail web application: Using Master Page, Standard Controls, JavaScript, AJAX; Cookies and Sessions; Uploading files and Data Bound Controls such as Grid View and Repeaters.	**8 Hours**
Text Books:	1. Hejsberg, A. and Wiltamuth, S., C# Developers Guide, Addison-Wesley.	
Reference Books:	1. Greg, H., Jason, W., Saurabh, N., *C#·Net Developers Guide*, SyngRess.	

	2. Robinson, S., Jay, G., *C#*, Wrox Press Professional. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106156/ https://www.youtube.com/channel/UCvtT19MZW8dq5Wwfu6B0oxw	

Course Code: **EAI504**	**Professional Core Course-14** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **INTRODUCTION TO MACHINE LEARNING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding basic concept of machine learning, advantages and disadvantages, applications, learning algorithms: supervised learning, unsupervised learning, semi- supervised learning, reinforcement learning, decision trees, Hunt's algorithm for learning a decision tree.	
CO2.	Understanding concept of KNNs,SVMsand Naïve Bayes algorithms in text classification, decision boundary of KNN, feature selection using KNN, linear classifiers.	
CO3.	Understanding concept of ANN and regression, perceptron algorithm, decision boundary of single neuron, linear regression, logistic regression, and logistic regression for multi-class classification.	
CO4.	Applying concept of feature selection and feature extraction, filter based methods for feature selection, wrapper methods for features selection.	
CO5.	Applying concept of sequence labeling and clustering in classification, probabilistic sequence model, hidden markov model in classification, K-mean clustering, hierarchical clustering methods.	
Course Content:		
Unit-1:	**Introduction to Machine Learning:** Introduction; History, Advantages, Scope and Applications; Learning Algorithms: Supervised Learning; Unsupervised Learning; Semi-Supervised Learning; Reinforcement Learning. **Decision Trees:** Introduction, Scope, Advantages; Hunt's algorithm for learning a decision tree; Details of tree induction;	**8 Hours**
Unit-2:	**KNNs, SVMs and Naïve Bayes:** Examples of few text classification problems; Naïve Bayes for text classification; Introduction to KNN algorithm; Decision boundary KNN Vs Decision tree; What is the best K; KNN Problems; Feature selection using KNNs; Linear Classifiers; Learning non-linear patterns.	**8 Hours**
Unit-3:	**ANN and Regression:** Motivation for Artificial Neural Network; Perceptron Algorithm; Decision Boundary for a single Neuron; Introduction to Linear Regression; ***R*^2**: Coefficient of Determination; Logistic regression vs Linear Regression; Can we use Regression Mechanism for Classification?; Logistic Regression – Deriving the Formula; Logistic Regression for Multi-class Classification; Logistic Regression Decision Boundary.	**8 Hours**
Unit-4:	**Feature Selection:** Introduction tofeature selection: what, why, how and where?; Feature selection vs feature extraction; Feature subset selection using Filter based methods; Wrapper Methods; Wrapper Methods vs Filter Methods; Model based machine learning with regularization; Regularization using L2 and L1.	**8 Hours**

Unit-5:	**Sequence Labeling, Clustering:**Introduction to Sequence Learning; Sequence Labeling as Classification; Probabilistic Sequence Models; Hidden Markov Model; Three Problems of an HMM.Basics of Clustering; Applications of Clustering; Understanding Distance based Clustering; K-means Algorithm; Hierarchical (Agglomerative) clustering; Evaluation of cluster quality.	**8 Hours**
Text Books:	1.Brian, O, Management Information System, Tata McGraw Hill. .	
Reference Books:	**1.** Brian, O., *Introduction to Information System*, McGraw Hill. **2.** Jawadekar, W., *Management Information System*, Tata McGraw Hill. **3.** Jain, S., *Management Information System*, Tata McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106139/ https://www.youtube.com/watch?v=CzdWqFTmn0Y	

Course Code: **EHM505**	**Humanities and Social Sciences including Management-5** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **Human Values & Professional Ethics**	**L-2** **T-0** **P-0** **C-2**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the importance of value education in life and method of self-exploration.	
CO2.	Understanding 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.	
CO3.	Applying right understanding about relationship and physical facilities.	
CO4.	Analyzing harmony in myself, harmony in the family and society, harmony in the nature and existence.	
CO5.	Evaluating human conduct on ethical basis.	
Course Content:		
Unit-1:	Understanding of Morals, Values and Ethics; Introduction to Value Education- need for Value Education. Self- Exploration–content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. Continuous Happiness and Prosperity- basic Human Aspirations. Gender Issues: Gender Discrimination and Gender Bias (home & office), Gender issues in human values, morality and ethics.	**8 Hours**
Unit-2:	Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses. Whistle blowing and beyond, Case study.	**8 Hours**
Unit-3:	Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman and other salient values in relationship.	**8 Hours**
Unit-4:	Understanding Harmony in the Nature and Existence – Whole existence as Co-existence. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	**8 Hours**
Unit-5:	Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Competence in professional ethics: a) Ability to utilize the professional competence for augmenting	**8 Hours**

	universal human order b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems c) Ability to identify and develop appropriate technologies and management patterns for above production systems.	
Text Books:	1.R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Value Education.	
Reference Books:	1. Ivan Illich, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA 2. E.F. Schumacher, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain. 2. A Nagraj, Jeevan Vidya ekParichay, Divya Path Sansthan, Amarkantak. 3. Sussan George, How the Other Half Dies, Penguin Press. Reprinted. 4. PL Dhar, RR Gaur, Science and Humanism, Commonwealth Purblishers. 5. A.N. Tripathy, Human Values, New Age International Publishers. 6. E G Seebauer& Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/109/104/109104068/ https://www.youtube.com/watch?v=vS31O3XfH_0	

Course Code: **ECS552**	**Laboratory Course-14** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **ANALYSIS AND DESIGN OF ALGORITHMS LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying divide and conquer concept of algorithm in binary search, quick sorting and merge sorting.	
CO2.	Applying concept of greedy method in exact optimization solution for minimum cost spanning tree, approximate solution for knapsack problem, single shortest path computation.	
CO3.	Applying concept of dynamic programming in shortest path computation application, matrix multiplication application, traveling salesman problem application, longest common subsequence application.	
CO4.	Applying concept of graph in to find solution of depth first search method, breadth first search method, back tracking, 8-queen problem, and knapsack problem.	
CO5.	Analyzing backtracking concept in connected components computation in graph.	
	LIST OF EXPERIMENTS	
	1Write algorithm and program in C to implement Bubble Sort. 2Write algorithm and program in C to implement Insertion Sort 3Write algorithm and program in C to implement Merge Sort 4Write algorithm and program in C to implement Quick Sort 5Write algorithm and program in C to implement Selection Sort. 6.Write algorithm and program in C insert an element in array at a given position. 7Write algorithm and program in C to implement Linear Search. 8Write algorithm and program in C to implement Binary Search. 9Write algorithm and program in C to implement Counting Sort. 10Write algorithm and program in C to implement Radix Sort. 11Write algorithm and program in C to implement Bucket Sort. 12WAP to implement Fractional KnapSack Problem 13WAP to implement Integer KnapSack Problem 14WAP to implement Matrix Chain Multiplication order. 15WAP to implement Longest Common Subsequence. 16WAP to implement Longest Huffman coding techniques. 17WAP to implement BFS. 18WAP to implement Minimum spanning tree using Kruskal's Algorithm.. 19WAP to implement Minimum spanning tree using Prim's Algorithm. 20WAP to implement single source shortest path using Dikjastra's Algorithm. 21WAP to implement single source shortest path using Bellman Ford Algorithm.	

Course Code: **EAI552**	**Laboratory Course-15** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **WEB TECHNOLOGY AND DEVELOPMENT LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basic constructs of HTML.	
CO2.	Understanding various categories of programs, Web, Window and Console Application. Organize and work with many projects.	
CO3.	Analyzing the usage of the Web Technology (Design And Architecture Using .NET) programs to create professional, academic, business and many software projects.	
CO4.	Analyzing personal, academic and business documents by following the current professional and/or industry standards.	
CO5.	Applying skills and concepts to built small real life applications using Web Technology (Design And Architecture Using .NET) standards.	
	LIST OF EXPERIMENTS	
	1.To write HTML/Java scripts to display your CV in Web Browser. 2.To Create and annotate of static web pages using any HTML editor. 3.To write a program to use XML and JavaScript for creation of your homepage. 4.To write a program in XML for creation of DTD which specifies a particular set of rules? 5.To create a Style sheet in CSS/XSL and display the document in Web Browser. 6.To write a Java Servlet for HTTP Proxy Server. 7.To write a program to use JSP pages for sharing session and application data of HTTP Server. 8.To write a program to use JDBC connectivity program for maintaining database by sending queries.	

Course Code: EAI553	**Laboratory Course-16** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **MACHINE LEARNING USING PYTHON LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying feature extraction algorithms on text data and image data.	
CO2.	Applying feature selection algorithms on text data and image data.	
CO3.	Applying EM algorithm to cluster a set of data stored in a .CSV file.	
CO4.	Applying EM and K-mean algorithm on data and compare results of clustering.	
CO5.	Applying Bayesian network on medical data in diagnosis of heart patients using heart disease data set and Applying Naïve Bayesian Classifier in document classification.	
	LIST OF EXPERIMENTS	
	1.Implement feature extraction algorithms. 2.Implement feature selection algorithm. 3.Apply EM algorithm to cluster a set of data stored in a .CSV file. 4.Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. 5.Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. 6.Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. 7.Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.	

Course Code: **ECS559**	**Project / Industrial Training/Seminar-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **MOOC**	**L-0** **T-0** **P-0** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding various resources and platform of online learning.	
CO2.	Understanding the credit utilities to be earn from online platform.	
CO3.	Understanding the current trends in the technology around the world.	
CO4.	Applying themselves in a competitive environment, weekly assignments and quiz.	
CO5.	Developing Various latest AI models and technologies in real world to shape the career.	
	Evaluation Scheme for MOOC(Massive open online course)	
	University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted 2 credits as per the approval. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through edX, Coursera, IIRS and NPTEL will be given a maximum credit of two with the course with minimum duration of 8 weeks in Mandatory to Pass Category. For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the Institution / University from time to time. 1. There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department/ Program coordinators/Principal being members of the Committee. 2. The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalise a list of courses to be offered with credits defined for each course and the mode of credit consideration of the student. The complete process including the approval of the Vice Chancellor shall be obtained by the College before the starting of MOOC/NPTEL courses. In case of MOOC course the approval will be valid only for the semester offered.	

	3. Students will register for the course and the details of the students enrolling under the course along with the approval of the committee, and will be forwarded to the Examination department within thirty days of start of the MOOC Course by the Coordinator MOOC through the Principal of the College. 4. Internal and external marks will be same as offered by the MOOC course. 5. Where the MOOC course or Add-on on courses are only offering certificate of successful completion, and credit has been assigned to the course. If in case student did not clear the examination, further he/she can enroll for MOOC Course under SWAYAM in next semester / year with the same pattern stated in above points.	

Course Code: **ECS599**	**Project / Industrial Training/Seminar-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester V** **INDUSTRIAL TRAINING**	**L-0** **T-0** **P-0** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understand research and development on latest technology.	
CO2.	Understanding of administrative functions and company culture	
CO3.	Applying the ability to effectively communicate solution to problems (oral, visual, written).	
CO4.	Analyzing capacity for critical reasoning and independent learning	
CO5.	Developing greater clarity about academic and career goals	
	Students will attend Industrial training of six weeks in any industry or reputed organization after the IV semester examination in summer vacation. The evaluation of this training shall be included in the V semester evaluation. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester and shall be the nodal officer for coordination of the training. Students will also be required to prepare an exhaustive technical report of the training undertaken during the V semester which will be duly signed by the officer under whom training was taken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Principal of the college. The student at the end of the V semester will present his report about the training before a committee constituted by the Director of the College which would be comprised of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director. The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned. Not more than three students would form a group for such industrial training/ project submission. **The marking shall be as follows.**	

	Internal: 50 marks By the Faculty Guide - 25 marks By Committee appointed by the Director – 25 marks **External:** 50 marks By Officer-in-charge trainee in industry – 25 marks By External examiner appointed by the University – 25 marks	

Course Code: TMUGS-501	**Value Added Audit Course-III** **BTech- Semester-V** **Managing Self**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education	

	2. Tracy, Brian, Time Management (2018), Manjul Publishing House 3. Hill, Napolean, Think and grow rich (2014), Amazing Reads 4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub 5. https://www.hloom.com/resumes/creative-templates/ 6. https://www.mbauniverse.com/group-discussion/topic.php 7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 8. Burne, Eric, Games People Play (2010), Penguin UK 9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme: Faculty led Continuous Evaluation

- Students will be evaluated on the score of 100 in every course.
- Evaluation of soft skill will follow continuous evaluation method.

Details are as follows:

1) Total Marks for each semester 100

   a) **Internal:** 60 marks for Class Performance (Every class activity will carry 6 marks; each students can participate in maximum of 10 activities).

   b) **External:** 30 marks for External evaluation at the time of external exams (Based on GD and PIs).

   c) **Attendance:** 10 marks for Attendance in the training sessions

S No	% Attendance<	Marks
1.	30	0
2.	30-40	2
3.	40-50	4
4.	50-60	5
5.	60-70	6
6.	70-80	7
7.	80-90	8
8.	90-100	10

In a summary,

100 marks = 60(Class performance) + 30(External) + 10(Attendance)

Course Code: **TMUGA-501**	**Value Added Audit Course-IV** **BTech- Semester-V** **Modern Algebra and Data Management**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.	
CO4.	Correlating the various arithmetic concepts to check sufficiency of data	
Course Content:		
Unit-1:	**Number theory** Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity(Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes	**8 Hours**
Unit-2:	**Data interpretation** Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	**7 Hours**
Unit-3:	**Data Sufficiency** Introduction of Data Sufficiency, different topics based DS	**5 Hours**
Unit-4:	**Permutations and combinations** Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	**6 Hours**
Unit-5:	**Probability** Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	**4 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha	

	• R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme for Quantitative Aptitude:-

The students will be evaluated on the score of 100 for the semester. Detailed scheme for the course is as follows

a. 20 marks each for CT1 + CT2 + CT3
b. 30 marks for final external exams.
c. 10 marks for attendance and practice sheets, at the end of semester, will be provided in the following manner.

S No	% Attendance<	Marks
1	30	0
2	30-40	2
3	40-50	4
4	50-60	5
5	60-70	6
6	70-80	7
7	80-90	8
8	90-100	10

So for CT1 (20) + CT2 (20) + CT3(20) + Final External exam (30) +Attendance (10) = 100 marks

Course Code: **ECS611**	**Professional Core Course-15** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **DATA WAREHOUSING AND DATA MINING USING R**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the various components of data warehousing.	
CO2.	Understanding the constructs and usage of R-Programming language for developers.	
CO3.	Understanding how to design the physical model of data warehouse.	
CO4.	Understanding various algorithms of Data Mining and its process.	
CO5.	Applying the programming concept to solve problems using R-Programming.	
CO6.	Analyzing the concept of data mining using R-Programming.	
CO7.	Developing skills for analyzing and cleaning of the data.	
Course Content:		
Unit-1:	**Introduction:** Motivation (for Data Mining), Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.	**8 Hours**
Unit-2:	**Concept Description:** Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases	**8 Hours**
Unit-3:	**Classification and Predictions:** What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods KNN classifiers, Genetic Algorithm. **Cluster Analysis:** Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis.	**8 Hours**
Unit-4:	**Overview of R programming:** Introduction to R, The S Philosophy, Basic Features of R, Free Software Design of the R, System Limitations of R, R Resources, Installation and getting started with the R interface. **Data Manipulation (dplyr, reshape2 packages) and Scoping Rules of R:** Data Frames, The dplyr Package, dplyr Grammar, Installing the dplyr package,	**8 Hours**

	select(), filter(), arrange(), rename(), mutate(), group_by(), Lexical Scoping: Why Does It Matter?, Lexical vs. Dynamic Scoping	
Unit-5:	**Data Warehousing:** Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Aggregation, OLAP Servers: ROLAP, MOLAP, HOLAP, Process Architecture, 3 Tier Architecture, Data Mart.	**8 Hours**
Text Books:	1.Paul R. P., Fundamentals Of Data Warehousing, John Wiley and Sons.	
Reference Books:	1. Anahony S., Data Warehousing In the Real World: A Practical Guide for Building DecisionSupport Systems, John Wiley and Sons. 2.Kamber and Han, "Data Mining Concepts and Techniques", Hartcourt India P. Ltd., 3. R Programming for Data Science, by Roger D. PengUsing R for Introductory Statistics, by John Verzani, Chapman & Hall/CRC, 2004, ISBN 1584884509 Advanced R, by Hadley Wickham, ISBN 9781466586963 ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/110/107/110107092/ https://www.youtube.com/watch?v=J326LIUrZM8	

Course Code: **EAI602**	**Professional Core Course-16** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **GENETIC ALGORITHMS**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the essential features of genetic algorithm (GA) and to evaluate the population, fitness and search space in it.	
CO2.	Understanding the concepts of encoding, decoding in genetics and implement the various operators and features of GA.	
CO3.	Applying the optimization and searching techniques in search space.	
CO4.	Applying GA for building solutions to various problems and to study and evaluate the stopping criteria for the algorithm.	
CO5.	Analyzing and applying different crossover and mutation operators for effectively solving the desired real-world problems.	
Course Content:		
Unit-1:	**Introduction of Genetic Algorithm:** Objective, learning objectives, Biological correlation with ANN: cell, chromosomes, genes, Population, fitness, reproduction, creation of Offspring, search space, working principle-Simple GA.	**8 Hours**
Unit-2:	**Optimization & Search Technique:** Gradient Based local optimization Method, Random Search, Stochastic Hill Climbing, Simulated Annealing, Symbolic Artificial Intelligence. **Genetic Algorithm & Search Space:** Search Space, world of Genetic Algorithm, Evolution & Optimization, Evolution & GA, Genetic Algorithm v/s Traditional Algorithm.	**8 Hours**
Unit-3:	**Genetic Modelling:** Encoding of GA-Binary Encoding, OCTAL Encoding, Hexadecimal encoding, value encoding, tree encoding and permutation encoding, Fitness function. **Operators in GA:** (Selection (Reproduction), Crossover, Mutation. Selection (Reproduction): Roulette wheel Selection, Random Selection, Rank Selection, Boltzmann Selection, Elitism, Stochastic universal Sampling.	**8 Hours**
Unit-4:	**Crossover Operators:** Single-Point Crossover, Two-Point Crossover, N-point Crossover, Uniform Crossover, three parent Crossover, Crossover with reduced surrogate, Shuffle Crossover, Ordered Crossover. **Mutation Operator:** introduction of Mutation, Flipping Mutation, Interchanging Mutation, Reversing Mutation.	**8 Hours**
Unit-5:	Stopping Criteria of GA, Various constrains of GA, Problem Solving Using Genetic Algorithm, Various applications of GA. Genetic- Neuro Hybrid System.	**8 Hours**
Text Books:	1. S. N. Sivanandam& S. N. Deepa, Principles of S.oft Computing, 2 nd Edition, Willy Publication.	
Reference Books:		

	1. S. Rajasekaran, G.A.V Pai, Neural Network, Fuzzy Logic, and Genetic Algorithm, PHI Publication. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://freevideolectures.com/course/3358/artificial-intelligence-iii/15 https://www.youtube.com/watch?v=Z_8MpZeMdD4	

Course Code: **EAI603**	**Professional Core Course-17** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **BIG DATA ANALYTICS**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the requirement of Big data with respect to 5 V's .	
CO2.	Understanding the basic storage structure used in Big data with respect to clusters.	
CO3.	Understanding the Hadoop Ecosystem and its components.	
CO4.	Applying the data processing in Big data with HIVE , PIG and HBASE.	
CO5.	Analyzing the functionality and working of Zookeeper for monitoring Servers in Cluster.	
Course Content:		
Unit-1:	**Overview of Big Data:** Introduction, Structuring of Data, DBMS v/s Big Data, Characteristics of BigData. Role of Big Data on Detection & Prevention in various fraud activities, Technologies handling for Big Data- Hadoop, HDFS, MapReduce.	**8 Hours**
Unit-2:	**Introduction to Hadoop Eco System:** Architecture of Hadoop EcoSystem, Hadoop Distributed File System, HDFS Architecture, Name node & Data Node, HDFS Commands.CAP Theorem, Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle.	**8 Hours**
Unit-3:	**MapReduce:** Introduction, Framework of MapReduce, MapReduce functions, Techniques to Optimize MapReduce Jobs, Hadoop YARN, Introduction to HBase, HBase Architecture, installation &Programming with HBase, Functions of HBase, Zookeeper architecture, election process in zookeeper.	**8 Hours**
Unit-4:	**Hadoop YARN:** Introduction, YARN Architecture, YARN Scheduler, YARN Commands, YARN Containers & Registry. **HIVE:** Introduction, HIVE Services, Data Types in HIVE, Hive DDL & DML, Various Joins in HIVE. Introduction to spark library used for big data.	**8 Hours**
Unit-5:	**Data Analysis Using Pig:** Introduction, Pig Architecture, Pig Schema, Various Operations of Pig Programming. Flume & Sqoop: Flume & Sqoop Architecture, data importing into HDFS & HIVE. **Social Media Analytics & Text Mining:** Introduction to Social Media, Key Elements of Social Media & Text Mining, Sentiment Analysis.	**8 Hours**
Text Books:	1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.	
Reference Books:	1. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012. 2. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013. 3. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014	

	4. Jy Liebowitz, "Big Data and Business analytics",CRC press, 2013. 5. Chris Eaton, Dirk Deroos, Tom Deutsch et al., "Understanding Big Data", McGrawHIll, 2012. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/104/106104189/ https://www.youtube.com/watch?v=3SK9iJNYehg	

Course Code: **EAI604**	**Professional Core Course-18** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **KNOWLEDGE REPRESENTATION & REASONING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concept of knowledge representation and its various techniques	
CO2.	Understanding the concept of predicate logic, forward chaining, unification, Rate Algorithm	
CO3.	Understanding the concept of Default Reasoning Circumscription, Minimal Models, The Event Calculus Revisited, Default Logic, Auto epistemc Logic. Ontology and Description Logics and applying the reasoning in Multi-agent Systems Epistemic Logic and understand and apply Kripke Semantics in a Multi Agent Scenario.	
CO4.	Understanding the concept of Frame and applying to demonstrate semantic net and understating the concept of Scripts, Script Applier Mechanism (SAM), Plan Applier Mechanism (PAM)and their mechanism and Top Down and Bottom Up Reasoning	
CO5.	Applying the concept of FOL to demonstrate Skolemization and understanding properties and categories of Knowledge representation, Reification and Abstract Entities, Resource Description Framework (RDF), The Event Calculus	
Course Content:		
Unit-1:	**Introduction to knowledge representation:** Propositional Logic Language, Semantics and Reasoning, Syntax and Truth Values, Valid Arguments and Proof Systems, Rules of Inference and Natural Deduction, Axiomatic Systems and Hilbert Style Proofs, The Tableau Method, The Resolution Refutation Method.	**8 Hours**
Unit-2:	First Order Logic (FOL) Syntax, Semantics, Entailment and Models, Proof Systems, Forward Chaining, Unification, Forward Chaining Rule Based Systems, The Rete Algorithm, Programming in a Rule Based Language, The OPS5 Expert System Shell.	**8 Hours**
Unit-3:	Representation in FOL Skolemization, Knowledge Representation, Properties and Categories, Reification and Abstract Entities, Resource Description Framework (RDF), The Event Calculus: Reasoning About Change.	**8 Hours**
Unit-4:	Knowledge Structures Semantic Nets using Frames, Scripts, Script Applier Mechanism (SAM), Goals, Plans and Actions, Plan Applier Mechanism (PAM): Expectations and Recognition, PAM: Top Down and Bottom Up Reasoning.	**8 Hours**
Unit-5:	Introduction to Default Reasoning, Circumscription, Minimal Models, The Event Calculus Revisited, Default Logic, Autoepistemc Logic. Ontology and Description Logics. Reasoning in Multi-agent Systems Epistemic Logic: Kripke Semantics in a Multi Agent Scenario.	**8 Hours**

Text Books:	1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.	
Reference Books:	1. Schank, Roger C., Robert P. Abelson: Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures. Hillsdale, NJ: Lawrence Erlbaum, 1977. 2. R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981. 3. John F. Sowa: Conceptual Structures: Information Processing in Mind and Machine, Addison□Wesley Publishing Company, Reading Massachusetts, 1984. 4. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106140/ https://www.youtube.com/watch?v=vqFT5lRg6y0	

Course Code: **EAI605**	**Professional Core Course-19** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **PATTERN RECOGNITION**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of Pattern Recognition, its principles and various approaches.	
CO2.	Understanding the concepts of Statistical Pattern Recognition	
CO3.	Understanding various methods of parameter estimation like Maximum Likelihood, Bayesian parameter and also methods of dimension reduction.	
CO4.	Understanding the nonparametric techniques of pattern recognition like KNN etc.	
CO5.	Understanding the various techniques of Unsupervised Learning & Clustering.	
Course Content:		
Unit-1:	**Introduction:** Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.	**8 Hours**
Unit-2:	**Statistical Patten Recognition:** Bayesian Decision Theory, Classifiers, Normal density and discriminate functions.	**8 Hours**
Unit-3:	**Parameter estimation methods:** Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminate analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.	**8 Hours**
Unit-4:	**Nonparametric Techniques:** Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.	**8 Hours**
Unit-5:	**Unsupervised Learning & Clustering:** Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.	**8 Hours**
Text Books:	1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification",	
Reference Books:	2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009. 3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009. Data Mining & Data Warehouse ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/117/105/117105101/ https://www.youtube.com/watch?v=ZGUlaomeJ-k	

Course Code: EHM601	**Humanities and Social Sciences including Management courses-6** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **ENTREPRENEURSHIP**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the meaning and concepts of Entrepreneurship	
CO2.	Understanding the concepts and theories of motivation	
CO3.	Understanding different financing options	
CO4.	Understanding the government support policies and its applications	
CO5.	Understanding and applying remedies to sick businesses	
Course Content:		
Unit-1:	**Entrepreneurship:** Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.	**8 Hours**
Unit-2:	**Motivation:** Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	**8 Hours**
Unit-3:	**Business:** Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	**8 Hours**
Unit-4:	**Financing and Accounting:** Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	**8 Hours**
Unit-5:	**Support to Entrepreneurs:** Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	**8 Hours**
Text Books:	1.Khanka. S.S., "Entrepreneurial Development" S. Chand & Co. Ltd., Ram Nagar, New Delhi.	
Reference Books:	**1.** Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill. **2.** Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2nd Edition Dream tech. **3.** Rajeev Roy, 'Entrepreneurship', Oxford University Press. **4.** EDII "Faulty and External Experts – A Hand Book for New	

	Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/110/106/110106141/ https://www.youtube.com/watch?v=QoqohmccTSc	

Internal Evaluation	External Evaluation	Total Marks
40 Marks	**60 Marks**	**100**
The Internal evaluation will be performed by the internal faculty on the basis of the below mentioned parameters: • Problem Identification • Data Collection and Data Analysis • Case study • Proposal of innovative Business idea (All Above mentioned parameters contains 30 marks and 10 marks for Attendance)	External evaluation will be performed by the external examiner on the basis of following parameters: • Report • Presentation • VIVA (All Above Category contains 20 marks each)	

Course Code: EAI606	**Professional Elective Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **MOBILE COMMUNICATION**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basic concept of mobile computing, wireless networks, structure of mobile computing based application.	
CO2.	Understanding various schemes like Fixed Assignment Schemes, Random Assignment Schemes, Reservation Based Schemes .	
CO3.	Understanding the mobile IP, Key functionality of IP, Choose the required functionality at each layer for given application.	
CO4.	Analyzing solution for each functionality at each layer x Use simulator tools and design Ad hoc networks	
CO5.	Evaluating a mobile application and network concepts.	
Course Content:		
Unit-1:	**INTRODUCTION:** Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.	**8 Hours**
Unit-2:	**MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER:** Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP-Adaptation of TCP Window – Improvement in TCP Performance.	**8 Hours**
Unit-3:	**MOBILE TELECOMMUNICATION SYSTEM:** Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).	**8 Hours**
Unit-4:	**MOBILE AD-HOC NETWORKS:** 9 Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.	**8 Hours**
Unit-5:	**MOBILE PLATFORMS AND APPLICATIONS:** Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.	**8 Hours**
Text Books:	1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2012.	
Reference Books:	1. Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007. 2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.	

	3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003. 4. William.C.Y.Lee,“Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,Tata Mc Graw Hill Edition ,2006. 5. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002. 6. Android Developers : http://developer.android.com/index.html 7. Apple Developer : https://developer.apple.com/ 8. Windows Phone Dev Center : http://developer.windowsphone.com 9. BlackBerry Developer: http://developer.blackberry.com/ ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/117/102/117102062/ https://www.youtube.com/watch?v=Ibaqg6P2-8k	

Course Code: EAI607	**Professional Elective Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **ADVANCED OPERATING SYSTEM**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the overview, limitations of existing operating system and study the classical problems related to IPC in operating system.	
CO2.	Understanding the event handling and mutual exclusion in distributed system and further apply it to solve certain problems in distributed environment.	
CO3.	Understanding the recovery techniques along with fault tolerance issues and protocols.	
CO4.	Understanding distributed file system and shared memory architecture and design issues.	
CO5.	Analyzing distributed deadlock and transaction.	
Course Content:		
Unit-1:	**Introduction:** Overview of an operating system, Limitation of existing systems, advancedoperating system- introduction, types, synchronization mechanism. Concept of process, concurrent process- Critical section problem, other synchronization problems-Language mechanisms for synchronization- axiomatic verification of parallel programs-process deadlocks-preliminaries – models of deadlocks , resources, system states.	**8 Hours**
Unit-2:	**Communication in Distributed Systems:** Communication primitives in Distributed systems, Remote process communication, Clock synchronization, Lamport's logical Clock, Vector Clock, Termination detection. Distributed Mutual Exclusion - Non Token based Algorithms-Lamport's Algorithm, Token Based Algorithms-Suzuki kasami's Broadcast Algorithms.	**8 Hours**
Unit-3:	**Deadlock in Distributed system:** Distributed Deadlock- introduction, detection, prevention, correction. Deadlock Detection algorithms. Agreement protocols – classification, solutions , applications. Distributed transaction- Introduction, Model, Distributed commit issues, commit protocols.	**8 Hours**
Unit-4:	**Distributed Resource Management:** Distributed File systems- Architecture, Mechanism,Design issues, NFS, AFS & Coda, Distributed shared memory - architecture, algorithms, protocols, Distributed scheduling – issues, components, algorithms.	**8 Hours**
Unit-5:	**Recovery and Fault Tolerance:** Classification of failure, Basic approach of recovery, RecoveryTechniques. Fault Tolerance – Issues , non-blocking commit protocols, voting protocols,dynamic voting protocols. Security in Distributed systems.	**8 Hours**
Text Books:	1. Andrew S. Tanenbaum and Maarten van Steen. "Distributed Systems: Principles and Paradigms", Prentice Hall.	
Reference Books:	1.Abraham Silberschatz , Peter B. Galvin, G Gagne, "Operating System Concepts" , Addison Wesley. 2. Randy Chow and Theodore Johnson. "Distributed Operating Systems & Algorithms", Addison-Wesley. ***Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/108/106108101/ https://www.youtube.com/playlist?list=PLAwxTw4SYaPkKfusBLVfklgfdcB3BNpwX	

Course Code: EAI608	**Professional Elective Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **ADVANCED COMPUTER ARCHITECTURE**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding parallel computing, it's architecture, along with pipeline processing.	
CO2.	Understanding different processor architectures and system-level design processes.	
CO3.	Understand different interconnection network and learn the multiprocessor architecture.	
CO4.	Understanding of assembly level programming.	
CO5.	Analyzing multiprocessor scheduling strategies and models.	
Course Content:		
Unit-1:	**Parallel Computing:** Concepts, Architecture, Classification Schemes, Applications, Parallelism in Uni-processor Systems, Parallel Computer structures. Pipelining Processing: An overlapped Parallelism, Instructions and Arithmetic.	**8 Hours**
Unit-2:	**Principles of Designing Pipelined Processors:** Internal forwarding and register tagging, Hazard detection and resolution, Job sequencing and collision prevention, Characteristics of Vector processing, multiple vector task dispatching, SIMD array processors, Masking and Data routing.	**8 Hours**
Unit-3:	**SIMD Interconnection Network:** Static, Dynamic networks, Cube interconnection network, ShuffleExchange and Omega Network, SIMD matrix multiplication. Multiprocessor Architecture: Tightly and loosely coupled multiprocessors	**8 Hours**
Unit-4:	**Multiprocessor Scheduling:** Strategies and Deterministic Scheduling Models, Data Flow computing and Data Flow Graph, 8 Bit and 16 Bit Intel Microprocessor Architecture and Register set.	**8 Hours**
Unit-5:	**Assembly Language Programming Based on Intel 8085:** Instructions: Data Transfer, Arithmetic(Addition, Subtraction, Multiplication), Logic, Branch operations; Looping Counting, Indexing, Programming Techniques.	**8 Hours**
Text Books:	1. Hwang, K., Computer Architecture and parallel processing, McGraw Hill	
Reference Books:	1. Tabak, D., Advanced Microprocessor, McGraw Hill. 2. Hall, D.V, Microprocessor and Interfacing, Program and hardware, Tata McGraw Hill. 3. kar, R.S., Microprocessor architecture, programming and application with the 8085. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/103/106103206/ https://www.youtube.com/watch?v=4TzMyXmzL8M	

Course Code: EAI609	**Professional Elective Course-1** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **CYBER LAW AND INFORMATION SECURITY**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding of the information system architecture and the involved components.	
CO2.	Understanding of the basic principles of Information Security, Online payment systems and related security issues along with the rules of E Governance.	
CO3.	Applying and regulating Cyber Laws dealing with Cyber Ethics by implementation of Intellectual Property Right in the areas of Copyright, Patent, Piracy and Plagiarism.	
CO4.	Analyzing the security of Cryptographic System and design and implementation issues related with Firewalls, Virtual Private Networks and Intrusion Detection Systems.	
CO5.	Analyzing the need of physical security in Information System, need of Biometric Security System and related challenges.	
Course Content:		
Unit-1:	Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System, Information Classification and their Roles, Information System Threats and attacks, The system Development Life cycle, Security Challenges in Mobile Devices.	**8 Hours**
Unit-2:	**Risk Management :** Definition of risk management, risk identification, and risk control, Identifying and Accessing Risk, Assessing risk based on probability of occurrence and likely impact, the fundamental aspects of documenting risk via the process of risk assessment, the various risk mitigation strategy options, the categories that can be used to classify controls.	**8 Hours**
Unit-3:	**Physical Security:** Needs, Disaster and Controls, Basic Tenets of Physical Security and physical Entry Controls. Access Control- Biometrics, Factors in Biometrics Systems, Benefits, and Criteria for selection of Biometrics, Design Issues in Biometric Systems.	**8 Hours**
Unit-4:	Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Firewalls, **Network Security:** Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection. Virtual Private Networks: Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN.	**8 Hours**
Unit-5:	**Laws, Investigation and Ethics:** Cyber Crime, Information Security and Law, Types &Overview of Cyber Crimes, Cyber Law Issues in E-Business Management, Overview of Indian IT Act, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy and Protection, Domain Name,	**8 Hours**

	Software piracy, Plagiarism, Ethical hacking.	
Text Books:	1. Godbole,“ Information Systems Security”, Willey	
Reference Books:	1. Yadav, “Foundations of Information Technology”, New Age, Delhi 2. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill 3. Sood,“Cyber Laws Simplified”, McGraw Hill *Latest editions of all the suggested books are recommended.	
Additional Electronic Reference Material:	https://onlinecourses.swayam2.ac.in/nou19_cs08/preview https://www.youtube.com/watch?v=1WAmbR4orO0	

Course Code: EAI651	**Laboratory Course-17** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **BIG DATA ANALYTICS LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the concept to work with basic linux commands.	
CO2.	Applying the concept to install a standalone Hadoop cluster Node.	
CO3.	Applying the concept to read and write data into HDFS from Linux environment.	
CO4.	Analyzing the concept to solve a problem using MAP Reduce programming.	
CO5.	Analyzing the concept for data processing using HIVE.	
	LIST OF EXPERIMENTS	
	1.Basic commands of Linux. 2.Basic commands of HDFS. 3.Introduction, use and assessment of most recent advancements in Big Data technology along with their usage and implementation with relevant tools and technologies. 4.Map Reduce application for word counting on Hadoop cluster. 5.Unstructured data into NoSQL data and do all operations such as NoSQL query with API. 6.Getting maximum temp from temp data using map reduce. 7.Page Rank Computation. 8.Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics	

Course Code: **ECS654**	**Laboratory Course-18** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **DATA WAREHOUSING & DATA MINING WITH R-PROGAMMING LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding Modeling and design of data warehouse.	
CO2.	Understanding how to Install and Configure R Tool and R Studio.	
CO3.	Applying the concept to design a star and snowflake schema.	
CO4.	Analyzing R Explorer, Mining techniques and Attribute Relation File	
CO5.	Developing basic data warehouse applications along with the data visualization using R.	
	LIST OF EXPERIMENTS	
	1. To develop an application to implement defining subject area, design of fact dimension table, data mart. 2. To develop an application to construct a multidimensional data. 3. To develop an application to implement data generalization and summarization technique. 4. To develop an application to extract association rule of data mining. 5. To develop an application for classification of data. 6. To develop an application for decision tree. 7. To develop an application to implement R PROGRAMMING loops. 8. To develop an application to implement structure and components of an R-Programming	

Course Code: **EAI653**	**Laboratory Course-19** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VI** **IOT LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding Arduino Experiments to ON, ON/OFF, BLINK LED light.	
CO2.	Understanding various structures of the data received through sensors in IOT	
CO3.	Applying Arduino Experiments using GPS to identify location.	
CO4.	Applying IOT to identify the different technologies.	
CO5.	Applying and Evaluate the use of different type of shields such as Bluetooth relay, Key –pad screw etc.	
	LIST OF EXPERIMENTS	
	ARDUINO EXPERIMENTS BASED ON THE FOLLOWINGS SENSORS SHOULD BE PERFORMED 1.Experiment to ON LED light on pin 13 2.Experiment to ON/OFF LED light on pin 13 3.Experiment to Blink LED light on pin 13 4.Experiment to perform the alternate task on bell ringer and LED 5.Experiment to Blink alternate LEDs light(Hint use 4 LEDs) 6.Experiment to measure distance of an object using IR OBSTACLE SENSOR 7.Experiment to detect Leakage of as using GAS SENSOR 8.Experiment to detect fire of as using FIRE SENSOR 9.Experiment to demonstrate controlling of relay shield from serial monitor (Arduino IDE) 10.Experiment to ON/OFF LED light based on light intensity 11.Experiment to demonstrate the use of BLUETOOTH RELAY SHIELD 12.Experiment to demonstrate the use of LCD AND KEYPAD-SCREW SHIELD 13.Experiment to demonstrate the use of HEART BEAT SENSOR 14.Experiment to demonstrate the use of GSM 15.Experiment to demonstrate the use of GPS	

Course Code: TMUGS-601	**Value Added Audit Course-V** **BTech- Semester-VI** **Managing Work and Others**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**8 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004), RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com 6. https://www.hloom.com/resumes/creative-templates/	

	7. https://www.mbauniverse.com/group-discussion/topic.php 8. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme: Faculty led Continuous Evaluation

- Students will be evaluated on the score of 100 in every course.
- Evaluation of soft skill will follow continuous evaluation method.

Details are as follows:

2) Total Marks for each semester 100

d) **Internal:** 60 marks for Class Performance (Every class activity will carry 6 marks; each students can participate in maximum of 10 activities).

e) **External:** 30 marks for External evaluation at the time of external exams (Based on GD and PIs).

f) **Attendance:** 10 marks for Attendance in the training sessions

S No	% Attendance<	Marks
1.	30	0
2.	30-40	2
3.	40-50	4
4.	50-60	5
5.	60-70	6
6.	70-80	7
7.	80-90	8
8.	90-100	10

In a summary,

100 marks = 60(Class performance) + 30(External) + 10(Attendance)

Course Code: TMUGA-601	Value Added Audit Course-VI BTech- Semester-VI **Advance Algebra and Geometry**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.	
CO2.	Illustrating the different concepts of Height and Distance and Functions.	
CO3.	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.	
CO4.	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.	
Course Content:		
Unit-1:	**Clocks and calendars** Introduction , Angle based , faulty Clock, Interchange of hands, Introduction of Calendars, Leap Year , Ordinary Year	**5 Hours**
Unit-2:	**Set theory** Introduction , Venn Diagrams basics, Venn Diagram – 3 sets, 4-Group Venn Diagrams	**4 Hours**
Unit-3:	**Heights and Distance** Basic concept, Word problems	**3 Hours**
Unit-4:	**Functions** Introduction to Functions, Even and Odd Functions, Recursive	**3 Hours**
Unit-5:	**Problem Solving** Introduction, Puzzle based on 3 variable, Puzzle based on 4 variable	**6 Hours**
Unit-6:	**Data Sufficiency** Introduction, Blood relation based, direction based, ranking based	**5 Hours**
Unit-7:	**Crypt Arithmetic** Introduction of Crypt Arithmetic, Mathematical operations using Crypt Arithmetic, Company Specific Pattern	**4 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Evaluation Scheme for Quantitative Aptitude:-

The students will be evaluated on the score of 100 for the semester. Detailed scheme for the course is as follows

a. 15 marks each for CT1 + CT2 + CT3
b. 30 marks for final external exams.
c. 15 marks for Online Tests
d. 10 marks for attendance and practice sheets, at the end of semester, will be provided in the following manner.

S No	% Attendance<	Marks
1	30	0
2	30-40	2
3	40-50	4
4	50-60	5
5	60-70	6
6	70-80	7
7	80-90	8
8	90-100	10

So for CT1 (20) + CT2 (20) + CT3(20) + Final External exam (30) + Attendance (10) = 100 marks

Course Code: ECS716	Professional Core Course-20 Specialization- Artificial Intelligence, Machine Learning & Deep Learning B.Tech (CSE) Semester VII **Digital Image Processing and Computer vision**	L-3 T-0 P-0 C-3
Course Outcomes:		
CO1.	Understanding the different types of image transforms and their properties	
CO2.	Understanding the different techniques employed for the enhancement of images	
CO3.	Understanding the concept of image restoration & degradation models and color models.	
CO4.	Understanding the concept of supervised, un-supervised, and semi-supervised learning algorithms.	
CO5.	Analyzing different image compression techniques and their functionality.	
Course Content:		
Unit-1:	**Digital Image Fundamentals:** Representation; Elements of visual perception; Simple image formation model; Image sampling and quantization; Basic relationships between pixels; Imaging geometry; Review of matrix theory results: Row and Column ordering, Toeplitz, Circulant and Block matrices; Review of image transforms: 2D-DFT, FFT, WALSH, HADAMARD, HAAR, DCT and wavelet transforms.	**8 Hours**
Unit-2:	**Image Enhancement:** Spatial domain methods: Point processing, Intensity transformations, histogram processing; Image subtraction and averaging; Spatial filtering: Smoothing, Sharpening, Frequency domain methods; **Filtering:** Low pass, High pass filtering, Homomorphic filtering, Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, , Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT, Generation of spatial masks from frequency domain specifications.	**8 Hours**
Unit-3:	**Image Segmentation:** Detection of discontinuities: Point, Line and Edge and Combined detection; Edge linking and Boundary description; Local and global processing using HOUGH transform; Thresholding; Region oriented segmentation: Basic formulation, Region growing by pixel aggregation, Region splitting and merging; Use of motion in segmentation; Representation and description.	**8 Hours**
Unit-4:	**Image Restoration Basics:** Algebraic approaches: Inverse filtering, Wiener filtering, Color models and Gray level to Color transformation. **Depth estimation and Multi-camera views:** Perspective, Binocular Stereopsis- Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework.	**8 Hours**
Unit-5:	**Pattern classification:** Clustering: K-Means, K-Medoids, Mixture of Gaussians, **Classification:** Discriminant Function, Supervised, Un-supervised, Semi-supervised;	**8 Hours**

	Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA; Non-parametric methods.	
Text Books:	1. Gonzalez R. C., Woods R. E., Digital Image Processing, Pearson Education.	
Reference Books:	1. Pratt W. K., Digital Image Processing, John Wiley and Sons. 2. Boyle R., Sonka M., Hlavac V., Image Processing, Analysis And Machine Vision, Vikas Publishing House. 3. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990. **Journals:** • IEEE Transactions on Pattern Analysis and Machine Intelligence • IEEE Transactions on Computers • Pattern Recognition • Computer Vision, Graphics and Image Processing ***Latest editions of all the suggested books are recommended,**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105032/ https://www.youtube.com/watch?v=i8RjituGfrQ	

Course Code: EAI702	**Professional Core Course-21** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **DEEP LEARNING – I**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding basic concept of deep learning, ML vs AI vs DL, applications, linear algebra matrices, linear transformations, probability-distribution, mass function, density function, regression, classification, clustering, over-fitting, under-fitting, logistic regression, confusion matrix.	
CO2.	Understanding concept of neural network, classification model, multilayer feed forward neural network, back propagation learning, activation functions, loss functions for classification, hyper parameters-learning rate, regularization, momentum, sparsity.	
CO3.	Understanding concept of CNN, operations, feature selections, architecture of CNN, convolutional algorithms, random and unsupervised features, neuroscientific basis for CNN.	
CO4.	Understanding concept of optimization in training of deep models, challenges in NN optimization, algorithms used for optimization, optimization strategies and Meta-algorithms.	
CO5.	Applying neural network in TensorFlow, Sessions in TensorFlow, Logistic regression model, Beyond Gradient Descent model, momentum based optimization, gradient points in wrong direction.	
Course Content:		
Unit-1:	**Introduction:** History, Advantages, disadvantages, limitations; ML Vs AI Vs DL; Applications and examples of DL, Cycle of Deep Learning. Applied Math and Basics of Machine Learning: Linear Algebra-Matrices, Vector spaces, linear transformations, probability, probability distribution, probability mass function, density function. Machine learning Working: Regression, Classification, Clustering, Overfitting-Underfitting optimization, logistic regression , evaluating models, confusion metrics.	**8 Hours**
Unit-2:	**Foundations of Neural N/W and Deep Learning:** Neural N/Ws: Biological Neurons, Perceptron-single layer perceptron, classification model, features, decision regions. Multilayer Feedforward N/Ws. Training NNs: Back propagation Learning. Activation Functions: Linear, Sigmoid, Tanh, Hard Tanh, Softmax, Rectified Linear. Loss Functions: Loss Function Notation, Loss Functions for Regressions, Loss Functions for Classifications, Loss Functions for reconstructions. Hyper-Parameters: Learning Rate, Regularization, Momentum, Sparsity	**8 Hours**
Unit-3:	**Implementing Neural N/Ws in TensorFlow:** Introduction; TensorFlow Operations; Placeholder Tensors; Sessions in TensorFlow; Logistic Regression **Model;** Logging and Training Logistic Regression Model; Beyond Gradient Descent: Challenges with Gradient Descent, Model Identifiability, Momentum Based Optimization, Gradient Points in the wrong direction.	**8 Hours**

Unit-4:	**Optimization for Training Deep Models:** Learning and pure Optimization, Challenges in NN Optimization, Basic Algorithms of Optimization, Parameters Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-order Methods, Optimization Strategies and Meta-Algorithms.	**8 Hours**
Unit-5:	**Convolution Networks:** Neurons in Human Vision, Convolutional Operation, Features Selection, Filters and Feature Maps, Convolutional Layer, Max Pooling, Architecture of Convolutional Networks, Variants of the Basic Convolution Function ,Structured Output, Data Types, Efficient Convolutional Algorithms, Random and Unsupervised Features, Neuroscientific Basis for Convolutional N/W, Visualizing Learning in CNN.	**8 Hours**
Text Books:	1Charu CAggarwal,"Neural Network and Deep Learning",Springer.	
Reference Books:	1 Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009. 2 Skansi , Sandro ,"Introduction to Deep Learning",Springer. 3J Brownlee ,"Deep Learning with Python". ***Latest editions of all the suggested books are recommended**,	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106184/ https://www.youtube.com/watch?v=O5xeyoRL95U	

Course Code: ECS709	**Professional Core Course-22** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **CLOUD COMPUTING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the Cloud Computing and its role in current scenario.	
CO2.	Understanding the different models of Cloud Computing and their limitations	
CO3.	Understanding the importance of Cloud services and economic factors related to them	
CO4.	Analyzing various risk factors involved in Cloud Computing and to tackle them using risk management techniques	
CO5.	Evaluating the virtual data centre architecture, governance strategy, security mechanism and contingency plans.	
Course Content:		
Unit-1:	**Fundamentals:** Cloud Computing definition, Essential characteristics, principals, Usage, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery	**8 Hours**
Unit-2:	**Cloud Storage, Security and Design:** Virtualized Data Center Architecture, concept, planning and design, disaster recovery principles, Managing VDC environments and infrastructures, Storage strategy and governance; security and regulations, Designing secure solutions, Securing storage in virtualized and cloud environments, Monitoring and management; security auditing and SIEM.	**8 Hours**
Unit-3:	**Cloud Services and Economics:** Introduction to cloud services, Reliability, availability and security of services deployed, performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Availability of infrastructure, choosing a Cloud platform for an organization, application requirements, economic constraints & business needs,	**8 Hours**
Unit-4:	**Governance and Enterprise Risk Management**: Information security governance processes, Governance and enterprise risk management in Cloud Computing, Governance Recommendations, Enterprise Risk Management Recommendations, Information Risk Management Recommendations and Third Party Management Recommendations	**8 Hours**
Unit-5:	**Storage Network Design:** Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations.	**8 Hours**
Text Books:	1. David, E.Y. Sarna, Implementing and Developing Cloud Computing Applications, CRC Press.	
Reference Books:	1. Mather, T., Cloud Security and Privacy: An Enterprise Perspective On Risks And Compliance, O'Relly	

	2. Volker Herminghaus, Albrecht Scriba, “Storage Management in Data Centers” Springer; editioN[ISBN: 978-3540850229]. 2009. 3. Gautam Shroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010. 4. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach” McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009. 5. Dimitris N. Chorafas, “Cloud Computing Strategies” CRC Press; 1 edition [ISBN: 1439834539],2010 ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105167/ https://www.youtube.com/watch?v=EN4fEbcFZ_E	

Course Code: **EAI704**	**Professional Core Course-23** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **INTELLIGENT SYSTEM AND FUZZY LOGIC**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding basic concept of AI, knowledge acquisition, knowledge representation, expert system architecture, inference engine.	
CO2.	Understanding concept of neural ANN, neuron model, activation functions, NN architecture, supervised and unsupervised learning, applications of NN.	
CO3.	Understanding concept of fuzzy rule, uncertainity, statistics and random processes, fuzzy sets, classical sets, operations on fuzzy and classical sets, crisp relations, properties of crisp relations, fuzzy relations.	
CO4.	Understanding basic concept of genetic algorithms, reproduction, cross-over and mutation scaling, fitness, applications, neuro-fuzzy system, fuzzy-expert system, fuzzy-ga system.	
CO5.	Applying concept of fuzzy arithmetic, fuzzy to crisp conversion, lambda cut for fuzzy relations, de-fuzzification, fuzzy transform, fuzzy set extension principle.	
Course Content:		
Unit-1:	**Introduction:** Components of AI, human intelligence vs. machine intelligence, Knowledge Acquisition, Representation and organization: Structured Knowledge representation using Semantic Networks, Frames, Expert system architecture, functions of various parts, Mechanism and role of inference engine, Types of Expert system.	**8 Hours**
Unit-2:	**Artificial Neural network:** Structure and function of a single neuron, artificial neuron models, Types of activation functions, Neural network architectures: Fully connected, layered, acyclic, feed forward, Neural learning: correlation, competitive, Supervised learning: Back propagation algorithm, Unsupervised learning, winner-take all networks, Application areas of neural networks.	**8 Hours**
Unit-3:	**Fuzzy Logic:** Background, uncertainity and imprecision, Statistics and Random Processes, Uncertainty in information, Fuzzy sets and memberships, Chance vs ambiguity, Classical Sets- Operations on classical sets, Fuzzy sets- Operation on Fuzzy sets. **Classical Relations and Fuzzy Relations:** Crisp relations-cardinality of crisp relations,operations on crisp relations, properties of crisp relations.FuzzyRelations:cardinality of crisp relations, operations on crisp relations, properties of crisp relations.	**8 Hours**
Unit-4:	**Fuzzy to Crisp conversions and Fuzzy Arithmetic:** Lambda-cut for fuzzy sets, Lambda-cut for fuzzy relations, DeFuzzyfication methods. Principle-crisp functions, Mapping and relations, Functions of Fuzzy-Set Extensions principle, Fuzzy transform.	**8 Hours**
Unit-5:	**Genetic Algorithm:** introduction and concept, coding, reproduction, cross-over and mutation Scaling, fitness, applications. Hybrid Systems: Introduction to Neuro-fuzzy systems, Fuzzy-Expert system, Fuzzy-GA systems.	**8 Hours**

Text Books:	1. Timothy J. Ross, Fuzzy logic with Engineering Applications , McGraw Hill, New York, 3rd Edition	
Reference Books:	1.Martin T. Hagan, Howard B. Demuth, Mark H. Beale, Neural Network Design,PWS Publishing Company, Thomson Learning, 1st Edition 2. N.P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press, 1st Edition ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/127/105/127105006/ https://www.youtube.com/watch?v=IrJ8728kM4k	

Course Code: EAI705	**Professional Elective Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **WEB MINING & CRAWLERS**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding of the history and background of web search, internet, WWW, web-search characteristics, spam, The Web Search Users, search engines, architecture of search engines. Crawling, indexing, and ranking and apply ranking concept to analysis page ranking algorithm.	
CO2.	Understanding the basic data mining concepts, Association Rules and Sequential Patterns, Generation of Frequent & Interesting item-sets, Mining with multiple minimum supports, Extended Model and Various Mining Algorithm.	
CO3.	Understanding the concept Web crawling algorithms, Breadth First Search, Best First Search, A* Search, Adaptive A* Search, Page Rank algorithms for Ranking Google Sites	
CO4.	Understanding the basic concept of Web Spiders & Crawlers and various method of information retrievals	
CO5.	Applying the concept of web crawling and analysis the various web crawling algorithms	
Course Content:		
Unit-1:	**Web Search Basics:** Background and history, Introduction to internet and WWW, Web characteristics, Spam, The Web Search Users, search engines, architecture of search engines. Crawling, indexing, and ranking: Page Rank Analysis.	**8 Hours**
Unit-2:	Data Mining Foundations, Association Rules and Sequential Patterns, Basic Concepts of Association Rules: Generation of Frequent & Interesting Itemsets, Mining with multiple minimum supports, Extended Model, Various Mining Algorithm.	**8 Hours**
Unit-3:	Web crawling algorithms: Breadth First Search, Best First Search, A* Search, Adaptive A* Search.Page Rank algorithms for Ranking Google Sites.	**8 Hours**
Unit-4:	**Web Spiders & Crawlers:** Crawler Ethics and Conflicts, Basics of Web crawling, Architecture of web crawling. Basic Concepts of Information Retrieval. **Various Methods of Information Retrieval:** The Boolean model, The vector space model, The probabilistic model	**8 Hours**
Unit-5:	**Various crawling techniques:** incremental crawler, parallel crawler, distributed crawlers, focused crawler, agent based crawler, Hidden web Crawler.	**8 Hours**
Text Books:	1. Paul R. P., Fundamentals Of Data Warehousing, John Wiley and Sons.	
Reference Books:	1. Anahony S., Data Warehousing In the Real World: A Practical Guide for Building DecisionSupport Systems, John Wiley and Sons. 2.Kamber and Han, "Data Mining Concepts and Techniques", Hartcourt India P. Ltd.,	

Additional Electronic Reference Material:	http://www.nptelvideos.in/2012/11/internet-technologies.html https://www.youtube.com/watch?v=ALizgnSFTwQ	

Course Code: **EAI706**	**Professional Elective Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **NATURAL LANGUAGE PROCESSING**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the VC dimension and PAC learning models for noise reduction, model selection and generalization	
CO2.	Understanding the role of Bayesian Decision theory for classification	
CO3.	Understanding the back propagation in multilayer neural networks and role of perceptron in ANN models	
CO4.	Understanding the concept of clustering and maximization algorithm	
CO5.	Applying dimensionality reduction principles for scaling and analysis of models	
Course Content:		
Unit-1:	**Introduction to Natural Language Processing (NLP):** Definition, History, Applications of NLP, Goals of NLP.	**8 Hours**
Unit-2:	**Words and Phonetics:** Regular expressions and Automata, Morphology and phonetics fundamentals, morphological diversity of Indian languages, morphology paradigms, finite state machine based morphology, Computational Phonology and Text-to-Speech, Probabilistic Models of Pronunciation and Spelling, N-grams, HMMs and Speech Recognition, Wordnet and linking.	**8 Hours**
Unit-3:	**Parsing:** Part-of Speech Tagging, theories of parsing, syntactic and statistical parsing, parsing algorithms, hybrid of rule based and probabilistic parsing, scope ambiguity and attachment ambiguity resolution, Tree banks.	**8 Hours**
Unit-4:	**Discourse and dialogue:** discourse and dialogue analysis, anaphora resolution, named entity resolution, event anaphora, Information extraction and retrieval.	**8 Hours**
Unit-5:	**Applications:** sentiment analysis, text entailment, machine translation, automated speech recognition systems, question-answering based systems, shallow parsers.	**8 Hours**
Text Books:	1. Jurafsky, D. & J. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition", Prentice Hall, 2000. ***Latest editions of all the suggested books are recommended.**	
Reference Books:	2. Grosz, B.J., Sparck Jones, K. & Webber, B.L. (eds) "Readings in natural language processing", Los Altos, CA. Morgan Kaufmann, 1986. 3. Allen, J., "Natural Language Understanding", Redwood City, CA: 1994. Benjamin / Cummings. 4. Bharti, Akshar,Chaitanya Vineet, Sangal Rajeev, "Natural Language Processing", Prentice Hall.	
Additional	https://nptel.ac.in/courses/106/105/106105158/	

Electronic Reference Material:	https://www.youtube.com/watch?v=05ONoGfmKvA	

Course Code: **EAI707**	**Professional Elective Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **DIMENSIONALITY REDUCTION AND VALIDATION**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding about non lineardimention reduction	
CO2.	Understanding dimensional reduction methods	
CO3.	Understanding various dimensionality reduction method	
CO4.	Analyzing PCA and its variants	
CO5.	Analyzing about real world actionability from analytics	
Course Content:		
Unit-1:	**Introduction:** Dimensionality Reduction, Advantage and Disadvantage of Dimension Reduction, Components of Dimensionality Reduction; Characteristics of Analysis Method: Expected Functionalities, Internal Characteristics; Important for dimension reduction: missing values, lower variance, decision trees, forward feature construction, backward feature elimination, data dimension reduction and data science.	**8 Hours**
Unit-2:	**Dimensionality Reduction Methods:** Pearson method, chi square method, numerosity reduction: Regression, clustering, histogram.Attribute subset selection method, discretization and concept hierarchy.	**8 Hours**
Unit-3:	**Statistics and Information Theory Based Techniques:** Vector Quantization and Mixture Models; **PCA:** PCA Model, Nonlinear PCA, Online PCA, PCA Rotations and Sparse PCA, Localized PCA and Subspace segmentation, Robust PCA; KernalEntropty Component Analysis; ICA(Independent Component Analysis); FA(Factor Analysis); Kernal PCA and Multi dimensional Scaling; Elastic Maps,nets, principal graphs and principal trees; LDA.	**8 Hours**
Unit-4:	**Random Forest and Linear Discriminant:** Random forest in dimension reduction, factor analysis, factor estimation model, factor extraction, orthogonal rotations, oblique rotation, factor scores.Linear discriminant analysis, equations for analysis, applications, linear discriminant and PCA, Independent component analysis, blind source separation, mixing and unmixing signals.	**8 Hours**
Unit-5:	**Categorization of dimensional Reduction Methods:** Hard Vs Soft DR; Traditional Vs Generative; Linear vs Non-Linear; Continuous vs discrete; Implicit vs Explicit; Integrated vs External Estimation; Layered vs standalone embedding; Single vs multiple coordinate systems; Optional vs mandatory vector quantization; Batch vs online algorithms; Exact vs approximate optimization.	**8 Hours**

Text Books:	1. Lee, John A, Verleysen ,Michel," Non-Linear dimension reduction." 2007.	
Reference Books:	**1.** Norman R Draper, "Applied Regression Analysis",ThirdEdition,Wiley publication. 2. Han and Kamber ," Data Mining: Concepts and Techniques",3rd edition. Douglas C. Montgomery, "Introduction to Linear Regression Analysis",fifth edition, wiley and sons publication. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://onlinecourses.nptel.ac.in/noc19_cs52/preview https://nptel.ac.in/courses/106/106/106106139/	

Course Code: **EAI708**	**Professional Elective Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **UNCERTAINITY AND LOGIC PROGRAMMING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding and remember LISP and other functional programming paradigm.	
CO2.	Understanding and analyzing the first order logic for solving real world problems.	
CO3.	Understanding various knowledge representation methods.	
CO4.	Applying the reasoning capabilities under uncertain situations in any event.	
CO5.	Analyzing the use of logic programming languages for AI and other domains.	
Course Content:		
Unit-1:	Introduction to symbolic processing. Common LISP, LISP paradigms for knowledge representation. Other functional programming paradigms.	**8 Hours**
Unit-2:	Logic programming fundamentals, First-order logic: Completeness, compactness and undecidability, Herband universe, skolemization, natural detection systems, resolution, unification algorithms,	**8 Hours**
Unit-3:	Logic programming languages: their declarative and procedural semantics, Verification issues, Prolog programming for AI using LISP and prolog.	**8 Hours**
Unit-4:	Using predicate logic: Representing simple facts in logic, Representing instance and ISA relationship, Computable Function and predicates, Resolution, Natural Deduction.	**8 Hours**
Unit-5:	Symbolic Reasoning Under Uncertainty: Introduction to Non-monotonic Reasoning, logics for Non-monotonic Reasoning, Implementation Issues, Augmenting a problem-solver, Implementation,Depth-first Search, Breadth first Search.	**8 Hours**
Text Books:	**1.** Elaine Rich, "Artificial Intelligence".	
Reference Books:	1. Walker, McCord et.al., "Knowledge Systems and Prolog ",Addison Wesley. 2. Carl Townsend, "Introduction to Turbo Prolog", BPB. 3. Clocksin and Mellish, "Programming in Prolog", Narosa Publishing.	

	*Latest editions of all the suggested books are recommended.	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105079/ https://www.youtube.com/watch?v=1lKsSiEsJ18	

Course Code: **EAI709**	**Professional Elective Course-2** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **DATA SCIENCE USING R PROGRAMMING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basic of R programming, datatypes, operators, understanding about debugging tools, date and time loop functions.	
CO2.	Understanding data visualization, Create and customize visualizations using ggplot2	
CO3.	Understanding Linear algebra for data science, analyzing algebraic view: vectors, matrices, product of matrix vector, rank, null space, solution of over-determined set of equations and pseudo-inverse.	
CO4.	Analyzing the Linear algebra for data science, geometric view: vectors, distance, projections, eigen value decomposition.	
CO5.	Analyzing Linear Regression, Multiple Linear Regression, Linear Model selection.	
Course Content:		
Unit-1:	Overview of R, R data types and objects, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools.	**8 Hours**
Unit-2:	Reading and writing data using R, Create and customize visualizations using ggplot2, Data Visualization using R.	**8 Hours**
Unit-3:	Linear algebra for data science - algebraic view: vectors, matrices, product of matrix vector, rank, null space, solution of over-determined set of equations and pseudo-inverse.	**8 Hours**
Unit-4:	Linear algebra for data science- geometric view: vectors, distance, projections, eigen value decomposition.	**8 Hours**
Unit-5:	Univariate and multivariate linear regression, Model assessment (including cross validation, verifying assumption used in linear regression), Assessing importance of different variables, subset selection	**8 Hours**
Text Books:	**1.** Acharya. S, "Data Analytics using R", McGrawHill Education. ***Latest editions of all the suggested books are recommended.**	
Reference Books:	**1.** Ozdemir. S, "Principles of Data Science ", Packt.	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106179/ https://www.youtube.com/watch?v=32o0DnuRjfg	

Course Code: **ECS756**	**Laboratory Course-20** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **DIGITAL IMAGE PROCESSING WITH SCI LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the spatial and frequency domain image enhancement techniques to enhance the brightness and contrast of the blurred images.	
CO2.	Applying the image enhancement and Image restoration & degradation models to improve the quality of blurred images.	
CO3.	Applying the loss less and lossy image compression techniques to reduce the number of required bits as much as possible without losing image visual quality.	
CO4.	Applying the image segmentation techniques to divide the images into sub-images.	
CO5.	Applying the edge and line detection algorithms	
	LIST OF EXPERIMENTS	
	1.To Write Program To Implement The Spatial Image Enhancement Functions On A Bitmap Image – (a)Mirroring (Inversion) (b)Rotation (Clockwise) (c)Enlargement (Double Size) 2.To Write Program To Implement (a)Low Pass Filter (b)High Pass Filter 3.To Write Program To Implement (a)Arithmetic Mean Filter (b)Geometric Mean Filter 4.To Write Program To Implement Smoothing And Sharpening Of An Eight Bit Color Image 5.To Write Program To Implement (a)Boundary Extraction Algorithm (b)Graham's Scan Algorithm 6.To Write Program To Implement (a)Edge Detection (b)Line Detection	

Course Code: **EAI752**	**Laboratory Course-21** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **DEEP LEARNING USING PYTHON LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the Python and libraries available for performing different tasks of deep learning applications	
CO2.	Understanding the procedure for reading data from various sources in Python	
CO3.	Understanding the role of Artificial Neural Network and its implementation in Deep Learning	
CO4.	Applying various deep learning algorithms on given data set for developing effective model	
CO5.	Analyzing the result generated by the model by changing parameters	
	LIST OF EXPERIMENTS	
	1.Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 2.Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 3.Build an Artificial Neural Network by implementing the Back propagation algorithm. 4.Build an Artificial Neural Network by implementing the Feed forward algorithm. 5.Calculation of best association rules based on classification using min support and confidence threshold.	

Course Code: **EAI753**	**Project / Industrial Training/Seminar-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VII** **PROJECT WORK PHASE-I**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the phases of SDLC and performing initial investigation about project.	
CO2.	Understanding to design ER-Diagram and DFD of the project.	
CO3.	Applying the designing procedures to design database.	
CO4.	Developing SRS Document for the project.	
CO5.	Developing Forms and Front end of the Project.	
	Description	
	Students should devote themselves to prepare something tangible, which could be a working model of their thoughts based on their subject of choice (Preferably based on Machine Learning). The project shall be completed and submitted at least one month before the last teaching day of the VII semester, date of which shall be notified in the academic calendar. The assessment of performance of students should be made at least twice in the semester. In this semester student shall present the final project live as also using overheads project or power point presentation on LCD to the internal committee as also the external examiner. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Principal. The marking shall be as follows. Internal: 50 Marks By The Faculty Guide - 25 Marks By Committee Appointed By the Director – 25 Marks External: 50 Marks By External Examiner Appointed By the University – 50 Marks	

Course Code: **EHM801**	**Humanities and Social Sciences including Management courses-7** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **PROJECT MANAGEMENT FOR ENGINEERS**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding Project Management & its evaluation	
CO2.	Understanding and analyzing the technical feasibility of a project	
CO3.	Understanding financial system and analyzing the use of funding mechanism	
CO4.	Understanding the application of laws related to business and project execution	
CO5.	Understanding Financial Accounting and Financial Statements for business	
Course Content:		
Unit-1:	**Project Management & Sources of Funds:**Project Management- Introduction, Need, Phases and Processes of Project Management. **Financial Markets as Sources of Funds:** Money Market & Capital Market. Overview of Regulatory Framework of Financial System in India- SEBI, RBI, and NABARD.	**8 Hours**
Unit-2:	**Project Feasibility & Analysis:** Project Identification, Generation Of Ideas, SWOT Analysis, Screeningand Project Rating Index. Market & Demand Analysis: Collection of Data, Market Survey, Project Risk Analysis.	**8 Hours**
Unit-3:	**Project Technical Analysis:** Selection of Technology, Plant Capacity, Structures and Civil Work. Location- Factors, Costs, Availability of Resources. Environmental Aspects, Project Implementations. **Financial Analysis:** Project Cost, Cost of Production, Cost of Capital,Time Value of Money.	**8 Hours**
Unit-4:	**Regulatory Framework for Project:** Legal Environment of Business, Law of Contract- Meaning and Concepts, Contract of Agent and Agency, Power of Attorney, Consumer Protection Law-Introduction, Rights of Consumers, Complaints & its Remedies, Intellectual Property Law- Introduction, Rights from Patents & Copyright, Infringement its Remedies, Overview of Companies Act, Foreign Exchange Management Law, Labour Laws in India, Various Project Approvals from Local, State & Central Government.	**8 Hours**
Unit-5:	**Basics of Accounting for Project:** Introduction, Meaning of Account & Accountancy, Book-keeping, Accounting Process, Users of accounting information, Double Entry Accounting, Accounting Equation. Introduction to Trial Balance, Trading Account, Profit and Loss Account, Balance Sheet, Cash Flow and Fund Flow. Budget- Meaning of a Budget & Budgeting, Budgetary Control, Types of Budgets.	**8 Hours**

Text Books:	1. Chaudhary, S., Project Management, Tata Mc Graw Hill Publications	
Reference Books:	1. Bhole L.M., Financial Institutions and Markets, Tata McGraw-Hill 2. Srivastava, R.M & Nigam Divya, Management of Financial Institutions, Himalaya 3. Goyal B.B., Project Management: A Development Perspective, Deep & Deep Publications. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/110/104/110104073/ https://www.youtube.com/watch?v=gEhr0ZAL2zE	

Course Code: **EAI802**	**Professional Core Course-24** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **DEEP LEARNING – II**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the functions, types and design parameters for shallow neural network and its usage in machine learning.	
CO2.	Understanding major deep learning algorithms using RNN, the problem settings, and their applications to solve real world problems.	
CO3.	Analyzing the sentiments using NLP and further apply the concepts to determine the polarity of sentiments	
CO4.	Analyzing the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.	
CO5.	Developing deep learning algorithms using some advance concepts and try to solve real-world problems.	
Course Content:		
Unit-1:	**Machine Learning with Shallow Neural Networks:** Introduction, Neural Architectures for Binary Classification Models: Revisiting the Perceptron, Least-Squares Regression, Logistic Regression, Support Vector **Machines;**Neural Architectures for Multiclass Models: Multiclass Perceptron, Weston-Watkins SVM, Multinomial Logistic Regression (Softmax Classifier), Hierarchical Softmax for Many Classes; Backpropagated Saliency for Feature Selection; Matrix Factorization with Autoencoders.	**8 Hours**
Unit-2:	**RNN in Deep Learning:** Introduction, The Architecture of Recurrent Neural Networks, The Challenges of Training Recurrent Networks , Echo-State Networks, Long Short-Term Memory (LSTM), Gated Recurrent Units (GRUs), Applications of Recurrent **Neural Networks:** Automatic Image Captioning, Sequence-to-Sequence Learning and Machine Translation, Sentence-Level Classification, Token-Level Classification with Linguistic Features, Time-Series Forecasting and Prediction, Time-Series Forecasting and Prediction, Temporal Recommender Systems, Secondary Protein Structure Prediction, End-to-End Speech Recognition, Handwriting Recognition	**8 Hours**

Unit-3:	**Sentiment Analysis:** Introduction to text analysis, nature of text, culture, concordance, Content Analysis (of new Discourse), NLP, Frequency Analysis, Introduction to Sentiment Analysis, Prior Polarity, Sentiment (Emotion, Annotation & Prediction).	**8 Hours**
Unit-4:	**Deep Reinforcement Learning:** Introduction; Stateless Algorithms: Multi-Armed Bandits: Naïve Algorithm, -Greedy Algorithm, Upper Bounding Methods; The Basic Framework of Reinforcement Learning: Challenges of Reinforcement Learning, Simple Reinforcement Learning for Tic-Tac-Toe, Role of Deep Learning and a Straw-Man Algorithm; Bootstrapping for Value Function Learning: Deep Learning Models as Function Approximators, Neural Network for Atari Setting, On-Policy Versus Off-Policy Methods: SARSA, Modeling States Versus State-Action Pairs; Monte Carlo Tree Search.	**8 Hours**
Unit-5:	**Advanced Topics in Deep Learning :** Introduction; Attention Mechanisms: Recurrent Models of Visual Attention, Application to Image Captioning, Attention Mechanisms for Machine Translation; Neural Networks with External Memory: Neural Turing Machines; Generative Adversarial Networks (GANs): Training a Generative Adversarial Network, Comparison with Variational Autoencoder, Using GANs for Generating Image Data, Conditional Generative Adversarial Networks; Competitive Learning: Vector Quantization,KohonenSelf-Organizing Map; Limitations of Neural Networks: An Aspirational Goal: One-Shot Learning, An Aspirational Goal: Energy-Efficient Learning.	**8 Hours**
Text Books:	1 CosmaRohillaShalizi, Advanced Data Analysis from an Elementary Point of View, 2015.	
Reference Books:	1 Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2016. 2 Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015 ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs85/ https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs50/	

Course Code: **EAI803**	**Professional Elective Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **FORENSIC SCIENCE AND MACHINE LEARNING**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the Forensic Science procedures and their role in cyber computing	
CO2.	Understanding the importance of evidences, their types, recovery and preservation procedures	
CO3.	Understanding the steganography, cloaking and backup techniques for cyber security	
CO4.	Understanding the security threats and common security standards & techniques available to secure the computer resources	
CO5.	Understanding the key elements of Machine Learning for solving complex problems and application areas of ML	
Course Content:		
Unit-1:	**Forensic Science:** Introduction, Computer Forensic, Cyber Forensic, Investigation process, goal of the forensic investigation, Computer ethics, Cyber forensic tools, computer security incident, goal of incident response, incident response methodology, intrusion prevention system (IPS) & intrusion detection system (IDS).	**8 Hours**
Unit-2:	**Evidence Collection:** Definition of Evidence, volatile and non volatile evidences, evidence collection process, tools and utilities for evidence collection, File system, Data recovery, Evidence preservation, Bit stream backup, Stegnography, Cloaking techniques.	**8 Hours**
Unit-3:	**Security Issues:** Cyber Security, threats, security policies, Security technologies, Secure electronic transactions (SET), Secure socket layer (SSL), Digital signature, Attack and their types, Security standards, Hardware based security, software based security, firewall.	**8 Hours**
Unit-4:	**Machine Learning:** Introduction, History and emergence, Machine learning problems, Types of learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised Learning, Unsupervised learning, Competitive Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization.	**8 Hours**
Unit-5:	**Machine learning Applications:** ML for classification, cyber security tasks, network protection, end point protection, application security, penetration testing, malware data science, Environment setup, implementation using Ubuntu 16.4, Tensor flow, Training chat bot, Image matching and prediction, voice sampling.	**8 Hours**

Text Books:	1. Incident Response and Computer Forensic by Kelvin Mandia, McGraw-Hill Education; 3rd edition (August 1, 2014)	
Reference Books:	1. File System Forensic Analysis by Brian Carrier, Publisher: Addison-Wesley Professional 2. Firewalls and Internet Security: Repelling the Wily Hacker, Second Edition, Addison 3. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.coursera.org/learn/forensic-science https://www.youtube.com/watch?v=0c1QpkmN3Hs	

Course Code: **EAI804**	**Professional Elective Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **Reinforcement Learning**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the elements of Reinforcement Learning and in what aspects it is similar or different from Machine Learning	
CO2.	Understanding the challenges before Reinforcement Learning and role of OpenAI to resolve them	
CO3.	Applying Tensor Flow framework for implementing policy gradients, learning buffers in Convolution Neural Network (CNN)	
CO4.	Analyzing the impact of dynamic programming algorithms and Monte Carlo methods on learning of RL models	
CO5.	Analyzing the performance of Bandit algorithms, Markov decision and Markov reward process	
Course Content:		
Unit-1:	**Introduction to Reinforcement Learning:** Branches of Machine Learning, What is Reinforcement Learning?, The Reinforcement Learning Process, Elements of Reinforcement Learning.	**8 Hours**
Unit-2:	RL Agent Taxonomy, Reinforcement Learning Problem, Introduction to OpenAI Gym	**8 Hours**
Unit-3:	**Bandit Algorithms and Markov Decision Process:** Bandit Algorithms, Markov Process, Markov Reward Process, Markov Decision Process	**8 Hours**
Unit-4:	**Dynamic Programming & Temporal Difference Methods:** Introduction to Dynamic Programming, Dynamic Programming Algorithms, Monte Carlo Methods, Temporal Difference Learning Methods	**8 Hours**
Unit-5:	**Deep Q Learning:** Policy Gradients, Policy Gradients using TensorFlow, Deep Q learning, Q learning with replay buffers, target networks, and CNN	**8 Hours**
Text Books:	1. R. S. Sutton and A. G. Barto, "Reinforcement Learning - An Introduction", MIT Press. 1998.	
Reference Books:	1. Reinforcement Learning Course. Available at: https://www.edureka.co/reinforcement-learning-course 2. Kai Arulkumaran et.al., "Deep Reinforcement Learning – A Brief Survey, IEEE Processing Magazine, November 2017. 3. Nikhil Buduma, "Fundamentals of Deep Learning", O'Reilly, 2017. ***Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106143/ https://www.youtube.com/watch?v=2pWv7GOvuf0	

Course Code: **EAI805**	**Professional Elective Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **SENSOR TECHNOLOGY**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concept of sensors signals, sensor classification, sensor characteristics and unit of measurement of different sensors.	
CO2.	Understanding the concept of physical characteristics of sensors like sensing of electric charge, Fields, Potentials, Magnetism, Induction, Resistance, temperature and thermal properties of material, dynamic models of sensor elements.	
CO3.	Understanding the concept of Input Characteristics of Interface Circuits like Amplifiers, Analog to Digital Converters, Digitization processing, data transmission and batteries for law power sensors.	
CO4.	Understanding the concept of different types of sensor with different types of sensors application.	
CO5.	Understanding the concept of different sensor materials, uses of Nano-Technology to create sensors and smart sensors.	
Course Content:		
Unit-1:	**Sensors Fundamentals and Characteristics-** Sensors, Signals and Systems; Sensor Classification; Units of Measurements; Sensor Characteristics	**8 Hours**
Unit-2:	Physical Principles of Sensing Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material; Heat Transfer; Light; Dynamic Models of Sensor Elements	**8 Hours**
Unit-3:	Interface Electronic Circuits Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors 7 20-22%	**8 Hours**
Unit-4:	Sensors in Different Application Area Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors	**8 Hours**
Unit-5:	Sensor Materials and Technologies Materials, Surface Processing, Nano-Technology.Smart Sensors-Primary sensors, Excitation, Amplification, The Automation.	**8 Hours**
Text Books:	1. J. Fraden, Handbook of Modern Sensors:Physical, Designs, and Applications, AIP Press, Springer.	
Reference Books:	1. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi 2. Mechatronics- Ganesh S. Hegde, Published by University	

	Science Press (An imprint of Laxmi Publication Private Limited). ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ee41/ https://nptel.ac.in/courses/106/105/106105166/	

Course Code: EAI806	**Professional Elective Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **IOT SECURITY**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concept of security concern with IoT Applications, secure IoT Architecture, types of attacks, maintaining privacy of data gathered by smart IoT devices.	
CO2.	Understanding the concept of cryptography like encryption, decryption, Hashes, digital signature, security key management, IoT node authentication etc.	
CO3.	Understanding the concept of identification by authorization, IAM architecture, Publish-Subscribe schemes.	
CO4.	Understanding the concept of privacy preservation using lightweight and robust schemes, Trust models and preventing unauthorized access in data dissemination.	
CO5.	Analyzing the concept of cloud security in which data is gathered from different IoT devices by different cloud security controls and Enterprise-IoT cloud security architecture.	
Course Content:		
Unit-1:	Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT - Insufficient Authentication/Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT. Vulnerabilities – Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption – Attack & Fault trees	**8 Hours**
Unit-2:	**CRYPTOGRAPHIC FUNDAMENTALS FOR IOT:** Cryptographic primitives and its role in IoT – Encryption and Decryption – Hashes – Digital Signatures – Random number generation – Cipher suites – key management fundamentals – cryptographic controls built into IoT messaging and communication protocols – IoT Node Authentication	**8 Hours**
Unit-3:	**IDENTITY & ACCESS MANAGEMENT SOLUTIONS FOR IOT:** Identity lifecycle – authentication credentials – IoT IAM infrastructure – Authorization with Publish / Subscribe schemes – access control	**8 Hours**
Unit-4:	**PRIVACY PRESERVATION AND TRUST MODELS FOR IOT:** Concerns in data dissemination – Lightweight and robust schemes for Privacy protection – Trust and Trust models for IoT – self-organizing Things - Preventing unauthorized access.	**8 Hours**
Unit-5:	**CLOUD SECURITY FOR IOT:** Cloud services and IoT – offerings related to IoT from cloud service providers – Cloud IoT security controls – An enterpriseIoT cloud security architecture – New directions in cloud enabled IoT computing	**8 Hours**

Text Books:	1. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren 2. Securing the Internet of Things Elsevier	
Reference Books:	1. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/108/108/108108123/ https://nptel.ac.in/courses/106/105/106105195/	

Course Code: **EAI808**	**Professional Elective Course-3** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **ROBOTICS**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the need of automation and basic structure, control system & different controllers used in Robotics	
CO2.	Understanding the importance of sensors and actuators in design of Robots	
CO3.	Understanding the process of image processing, image analysis and training to develop vision system for Robots	
CO4.	Understanding the methods of Robot programming with their limitations	
CO5.	Developing robotic applications by using Arduino UNO, Raspberry Pi and Python	
Course Content:		
Unit-1:	**Introduction:** Automation And Robotics, Basic Structure Of Robots, Concepts About Basic Control System, Control Loops Of Robotic Systems, Different Types Of Controllers- Proportional, Integral, Differential, PID Controllers. (SLE: Types of Drive Systems And Their Relative Merits)	**8 Hours**
Unit-2:	**Automation and Robotics:** Position Sensors – Velocity Sensors –Shaft Decoders, Inertial Sensors, Force Sensors, Torque Sensors, Solid State Gyroscope, Proximity And Range Sensors, Actuators – Power Transmission Systems. Introduction To Manipulator Kinematics In Cartesian, Cylindrical And Spherical Coordinate Space.	**8 Hours**
Unit-3:	**Types of End Effectors:** The Sensing And Digitizing Function In Machine Vision – Image Processing And Analysis – Training And Vision System – Robotic Applications, Introduction: Arduino UNO, Raspberry Pi And Hands-on- Programming On – Arduino and Introduction To Python.	**8 Hours**
Unit-4:	**Methods of Robot Programming:** Lead Through Programming Methods – A Robot Program A A Path In Space – Motion Interpolation – WAIT, SIGNAL, And DELAY Commands – Branching – Capabilities And Limitation Of Lead Through Methods – The Textual Robot Languages – Generations Of Robot Programming Languages – Robot Language Structure – Constants, Variables, And Other Data Objects – Motion Commands –End Effector and Sensor Commands – Computations And Operations – Program Control And Subroutines – Communications And Data Processing – Monitor Mode Commands.	**8 Hours**
Unit-5:	Introduction to Robot Intelligence and Task Planning- State Space Search – Problem Reduction – Use Of Predicate Logic – Means – End Analysis – Problem –Solving – Robot Learning- Robot Task Planning Expert Systems	**8 Hours**

	And Knowledge Learning, Hands-on few functionality related to robotics.	
Text Books:	**1.** Mikell P Groover- Et. Al, Industrial Robotics, Technology, Programming And Applications, Mcgraw Hill.	
Reference Books:	**1.** Automation, Production Systems And Computer Integrated Manufacturing M.P.Groover, Pearson Education. 5th Edition, 2009. **2.** An Introduction To Automated Process Planning Systems- Tiess Chiu Chang And Richard A. Wysk **3.** Robotics, Control Vision AnDintelligence- Fu, Lee And Gonzalez. Mcgraw Hill International, 2nd Edition.2007 **4.** Introduction To Robotics- John J. Craig, Addison Wesley Publishing , 3rd Edition, 2010. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/107/106/107106090/ https://onlinecourses.nptel.ac.in/noc19_me74/preview	

Course Code: **ECS814**	**Professional Core Course-25** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **BLOCK CHAIN TECHNOLOGY**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding of the history of Block-chain, different models and protocols	
CO2.	Understanding the basic of crypto-currency and different algorithms used in it.	
CO3.	Understanding the concept of Bitcoin and analysis of its properties using mathematical induction	
CO4.	Understanding the concept of Ethereum, Ethereum Virtual Machine (EVM) and smart concepts	
CO5.	Understanding the concept of Zero Knowledge proofs and protocols	
Course Content:		
Unit-1:	The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS)	**8 Hours**
Unit-2:	Cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography	**8 Hours**
Unit-3:	Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.	**8 Hours**
Unit-4:	Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts	**8 Hours**
Unit-5:	(Trends and Topics) - Zero Knowledge proofs and protocols in Blockchain - Succinct non-interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash.	**8 Hours**
Text Books:	1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.	
Reference Books:	1. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}. 2. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048) . (serious beginning of discussions related to formal models for bitcoin	

	protocols). 3. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles). 4. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916) ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105184/ https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/	

Course Code: **EAI753**	**Lab Course-22** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **DEEP LEARNING -II LAB**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the concepts to perform the exploratory data analysis	
CO2.	Applying dialog generation using Deep reinforcement learning	
CO3.	Applying the learnt concepts for performing the face recognition using modern deep learning methods such as CNN.	
CO4.	Applying RNN for text and document summarization.	
CO5.	Developing the deep neural network for solving the real-world task of recognizing images.	
	LIST OF EXPERIMENTS	
	Student can work on the given fields with deep learning as mini project. Other topics can also be taken with prior approval of supervisors. 1.Feature Exploration. 2.Image Recognition. 3.Face Recognition. 4.Document Characterization. 5.Text Summarization with Deep Learning. 6.Dialog Generation with Deep Learning.	

Course Code: **EAI852**	**Project / Industrial Training/Seminar-4** **Specialization- Artificial Intelligence, Machine Learning & Deep Learning** **B.Tech (CSE) Semester VIII** **PROJECT WORK PHASE-II**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the process of Project development.	
CO2.	Applying the knowledge to develop applications based on deep learning.	
CO3.	Applying the learning to develop applications on different platforms like Window, Web based or Mobile based applications to specific set of problem and their solutions.	
CO4.	Developing face recognition models using NN	
CO5.	Developing methods for text summarization and classification	
	Description	
	Students should devote themselves to prepare something tangible, which could be a working model of their thoughts based on their subject of choice (Preferably on Deep Learning). The project shall be completed and submitted at least one month before the last teaching day of the VIII semester, date of which shall be notified in the academic calendar. The assessment of performance of students should be made at least twice in the semester . In this semester student shall present the final project live as also using overheads project or power point presentation on LCD to the internal committee as also the external examiner. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Principal. The marking shall be as follows. Internal: 50 Marks By The Faculty Guide - 25 Marks By Committee Appointed By the Director – 25 Marks External: 50 Marks By External Examiner Appointed By the University – 50 Marks	