Study & Evaluation Scheme

Of

Bachelor of Technology
Computer Science & Engineering

With Specialization in

Cloud Technology & Information Security
(In Collaboration with iNurture)

(Based on Choice Based Credit System)

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

COLLEGE OF COMPUTING SCIENCES AND INFORMATION TECHNOLOGY

TEERTHANKER MAHAVEERUNIVERSITY

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TEERTHANKER MAHAVEERUNIVERSITY

(EstablishedunderGovt.ofU.P.ActNo.30,2008)

Delhi Road, Bagarpur, Moradabad (U.P)

Study & Evaluation Scheme	
SUMMARY	
Institute Name	*College of Computing Sciences and Information Technology (CCSIT), Delhi Road, Moradabad*
Programme	*B.Tech. CSE (CTIS)*
Duration	*Four Years full time(Eight Semesters)*
Medium	*English*
Minimum Required Attendance	*75%*
Credits	
Maximum Credits	*180*
Minimum Credits Required for Degree	*172*

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 for program for B.TECH(CSE) 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.*
IMPORTANT NOTES:	
1	*The purpose of examination should be to assess the Course Learning Outcomes (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.*

Program Structure-B.Tech.(CTIS)

A. Introduction:

High-quality technical education is essential for the digital age and using technology is powerful way to enhance changing requirements of the corporate, business enterprises and society. B.Tech students should be equipped to work across time zones, languages, and cultures. Employability, innovation, theory to practice connectedness is the central focus of B.Tech curriculum. The curriculum is designed as such that the students can gain an in-depth mastery of the academic disciplines and applied functional areas necessary to meet the requirements of IT enterprises and the industry.

The institute emphasis on the following courses ***balanced with core and elective courses****:* The curriculum of B.Tech program emphasizes an intensive, flexible technical education with 113 credits of core courses (all types), 27 credits of electives and 40 credits of Lab Work and internship/projects. Total 180 credits are allotted for the B.Tech(CTIS) degree.

The programme structure and credits for B.Tech(CTIS) are finalized based on the stakeholders' requirements and general structure of the programme. Minimum number of classroom contact teaching credits for the B.Tech(CTIS) program will be 157 credits (one credit equals 10 hours); Project/internship will be of 15 credits. However, the minimum number of the credits for award of B.Tech(CTIS) degree will be 172 credits. Out of 154 credits of classroom contact teaching, 20 credits are to be allotted for Basic Science Courses (BSC), 17 credits are allotted to Engineering Science Courses (ESC), 19 credits are allotted to Humanities and Social Sciences including Management Courses (HSMC), 54 credits are allotted to Professional Core Courses (PCCC), 21 credits are allotted to Professional Elective Courses (PEC), 6 credits are allotted to Open Elective Courses(OEC), 3 credits are allotted to Mandatory Courses(MC) and rest of 25

credits for Laboratory Courses (LC).

The institute offers **B.Tech CSE with Specialization in Cloud Technology & Information Security** due to the amount of data that is being generated and the evolution in the field of online services. Cloud computing and security of online service has turned out to be a necessity for companies. All small and large organization want spend minimum amount on hardware resources so cloud computing provide the facility to minimize the cost of expenditures. All are looking for cloud and security experts those help to organization in their growth. This has led to a huge demand for Cloud experts and security experts all over the globe. Thus this degree course help our student to find good and relative job in this field.

Course handouts for students will be provided in every course. A course handout is a thorough teaching plan of a faculty taking up a course. It is a blueprint which will guide the students about the pedagogical tools being used at different stages of the syllabus coverage and more specifically the topic-wise complete plan of discourse, that is, how the faculty members treat each and every topic from the syllabus and what they want the student to do, as an extra effort, for creating an effective learning. It may be a case study, a role-play, a classroom exercise, an assignment- home or field, or anything else which is relevant and which can enhance their learning about that particular concept or topic. Due to limited availability of time, most relevant topics will have this kind of method in course handout.

B.Tech(CTIS) : Four-Year (8-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S.No.	**Type of Course**	**Credit Hours**	**Total Credits**
1	Basic Science Courses(BSC)	5 Courses of 4 Credit Hrs. each (Total Credit Hrs. 5X4)	20
2	Engineering Science Courses(ESC)	2 Courses of 4 Credit Hrs. each (Total Credit Hrs. 2X4) 3 Courses of 3 Credit Hrs. each (Total Credit Hrs. 2X3)	17
3	Humanities and Social Sciences including Management Courses(HMSC)	5 Courses of 3 Credit Hrs. each (Total Credit Hrs. 5X3) 1 Courses of 4 Credit Hrs. each (Total Credit Hrs. 1X4)	19
4	Professional Core Courses(PCC)	18 Courses of 3 Credit Hrs. each (Total Credit Hrs. 18X3)	54
5	Professional Elective Courses(PEC)	7 Courses of 3 Credit Hrs. each (Total Credit Hrs. 7X3)	21
6	Open Elective Courses(OEC)	2 Course of 3 Credit Hrs. each (Total Credit Hrs.1X3)	6
7	Mandatory Courses(MC)	1 Courses of 3 Credit Hrs. each (Total Credit Hrs. 1X3)	3
8	Laboratory Courses(LC)	9 Course of 2 Credit Hrs. each (Total Credit Hrs.8X2) 7 Course of 1 Credit Hrs. each (Total Credit Hrs.7X1)	25
9	Project(PROJ)	1 Course of 8 Credit Hrs. each (Total Credit Hrs. 1X8) 1 Course of 4 Credit Hrs. each (Total Credit Hrs. 1X4) 3 Course of 1 Credit Hrs. each (Total Credit Hrs. 3X1)	15
Total Credits			**180**

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

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 and adopted by our University.

The following is the course module designed for the B.Tech program:

Basic Science Courses (BSC): Basic Science courses include compulsory courses. Compulsory courses cater to all departments: it consists of Mathematic courses, Physics course, Chemistry course, Physics and Chemistry laboratories. The basic foundation is important for students because it will not only allow them to build upon existing skills, but they can also set the path for good career options. We offer basic science courses in semester I, II & III during the B.Tech program which common for all B.Tech first year students. There will be total 20 credits for basic science course offered.

Engineering Science Courses (ESC): Engineering Science completely opens the doors to different specializations. The goal of this course is to create engineers of tomorrow who possess the knowledge of all disciplines and can apply their interdisciplinary knowledge in every aspect. Engineering Science Courses including Basic Engineering courses such as Basic Workshop, Engineering Drawing, Engineering Basics of Electrical and Electronics. A strong foundation of engineering skill set is provided through these Engineering Science courses. We offer engineering science courses in semester I & II during the B.Tech program. There will be total 17 credits for engineering science course offered.

Humanities and Social Sciences including Management Courses (HMSC): All the Humanities and Social Science courses should compulsorily be studied by a student. These courses help students to their personal and social development. We offer Humanities and Social Sciences courses in semester I, II, III, IV & VI during the B.Tech program. There will be total 16 credits for Humanities and Social Sciences courses offered.

Professional Core Courses (PCC): Professional Core courses introducing the students to the foundation of engineering topics related to the chosen programme of study comprising of theory and Practical. These core courses are the strong foundation to establish Technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase. The core courses will provide more practical-based knowledge and collaborative learning models. . It will train the students to understand, analyze and implement their knowledge. It help to develop decision-making ability of student and contribute to the industry and community at large. We offer Professional Core courses in semester III, IV, V, VI & VII during the B.Tech program. There will be total 57 credits for Professional Core courses offered.

Professional Elective Courses (PEC): Professional elective course can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline or nurtures the student's proficiency/skill. We offer Professional elective courses in semester IV, V, VI, VII & VIII during the B.Tech program. There will be total 21 credits for Professional elective courses offered.

Open Elective Courses (OEC): An open elective course chosen generally from other discipline/ subject, with an intention to seek interdisciplinary exposure. We offer Open elective courses in semester VII & VIII during the B.Tech program. There will be total 6 credits for Open elective courses offered.

Mandatory Courses (MC): This is a compulsory course that does not have any choice and will be in 3 credits. Each student of B.Tech program has to compulsorily pass the course and acquire 3 credits. We offer Mandatory courses in semester Ist during the B.Tech program.

Laboratory Courses (LC): A laboratory oriented course which will provide a platform to students to enhance their practical knowledge and skills by development of small application/project. We offer Laboratory courses in semester I, II, III, IV, V, VI & VII during the B.Tech program. There will be total 25 credits for Open elective courses offered.

Project (PROJ): Every student must do one major project in the 8th Semester. The minimum duration of project is 6 months. Students can do their major project in Industry or R&D Lab or in house or combination of any two. There will be total 15 credits for Project course offered.

C. PROGRAMME OUTCOMES (POs):

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.
PO-13	**Entrepreneurship:** An Entrepreneurship cut across every sector of human life including the field of engineering, engineering entrepreneurship is the process of harnessing the business opportunities in engineering and turning it into profitable commercially viable innovation.
PO-14	**Interpersonal skills:** Interpersonal skills involve the ability to communicate and build relationships with others. Effective interpersonal skills can help the students during the job interview process and can have a positive impact on your career advancement.
PO-15	**Technology savvy/usage:** Being technology savvy is essentially one's skill to be smart with technology. This skill reaches far beyond 'understanding' the concepts of how technology works and encompasses the 'utilization' of such modern technology for the purpose of enhancing productivity and efficiency.

D. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developed by the end of Four-year **B.Tech(CTIS)**

PSO – 1	Understanding Cloud and Information Security concepts, techniques & tools used in IT industry.
PSO – 2	Apply the knowledge of programming skills to develop the application and write the scripts to perform the automation in cloud.
PSO – 3	Demonstrate the implementation of cloud with tools and technologies available from different vendors.
PSO – 4	Design the architectural solutions for cloud migration.

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 of technology specific tools for effective learning and implementation to fullest. We encourage students to implement different tools to develop various applications and projects based on the case studies.

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 UI designing, Technical presentation and S/w or H/W simulation etc. 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 from time to time. Graduate level programs may award Honors degree provided students earn earn pre-requisite credits through MOOCs

7. Special Guest Lectures (SGL) & Extra Mural Lectures (EML): 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 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, Reasoning and Aptitude 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 programs: Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice based insight to the students.

10. Special assistance programme for slow learners & fast learners: write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners?

11. Orientation program:

Purpose of the Student Orientation Program is to help new students adjust and feel comfortable in the new environment, inculcate in them the ethos and culture of the institution, help them build bonds with other students and faculty members, and expose them to a sense of larger purpose and self-exploration. The term induction is generally used to describe the whole process whereby the incumbents adjust to or acclimatize to their new roles and environment. In other words, it is a well-planned event to educate the new entrants about the environment in a particular institution, and connect them with the people in it. Student Orientation Program engages with the new students as soon as they come into the institution; regular classes start only after that. At the start of the induction, the incumbents learn about the institutional

policies, processes, practices, culture and values, and their mentor groups are formed.
The time during the Orientation Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. These are included under Proficiency Modules. There will be a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the Orientation program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

Activities to be covered

- Physical Activity
- Creative Arts and Culture
- Mentoring & Universal Human Values
- Familiarization with College, Dept./Branch
- Literary Activity
- Proficiency Modules
- Lectures & Workshops by Eminent People
- Visits in Local Area
- Extra-Curricular Activities in College
- Feedback and Report on the Program

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:** Students in college, need to career & personal counseling, who are still confused about what they want to do. Career Counselling helps them understand the career options that they have, and how to pursue them. Career Counselling helps them understand their own strengths and weaknesses and lets them know what career they would be suited for.

14. **Competitive exam preparation**: Unlike school or college academic tests, competitive exams require a different approach, a focused mindset, and a thorough understanding of subjects and concepts. University or Department help students about the exam the pattern, stages and the competition. Department conduct various exam preparation activity for students.

15. **Extracurricular Activities:** Organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience with care. 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:** Seminars and Workshops is also common when participating in extra-curricular academic and students' union activities. Seminar and Workshop is highly interactive, engaging and productive; designed to enhance both individual and group learning processes. Paper writing and research help student to develop abstract thinking and personal or professional growth.

17. **Formation of Student Clubs, Membership & Organizing & Participating events:** A club is "a group of students organized with a similar interest for a social, literary, technical, athletic, political, or other common purpose. Students have the opportunity and choose to join these groups for many reasons including: pursuit of individual interests; career networking

opportunities; social camaraderie; and technical activisms.

18. **Capability Enhancement & Development Schemes:** The University has these schemes to enhance the capability and holistic development of the students. The **capability enhancement** and **development schemes** are the stimulating factors in getting the **students** corporate-ready and become a responsible social citizen. To enhance the soft skills and employability skills of the students value added courses such as Communication Skills, Business Communication and Personality Enhancement are made an integral part of the curriculum of the students.

19. **Library Visit & Utilization of E-Learning Resources:** The library is the center of the intellectual and social activities of college. With its books suited to the interests and aptitude of students of different age group, with its magazines, periodicals and newspapers, it has a special call to the students who go there and quench their thirst for reading the material which cannot be provided to them in the class room. Today E-learning is a rapidly growing industry. Today's learners want relevant, mobile, self-paced, and personalized content. This need is fulfilled with the online mode of learning. E-learning offers the ability to share material in all kinds of formats such as videos, slideshows, word documents, and PDFs. Conducting webinars (live online classes) and communicating with professors via chat and message forums is also an option available to students.

Study & Evaluation Scheme
Program: B. Tech. CS&E (Specialization in CTIS)
SEMESTER – I

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	BSC	EAS116	Engineering Mathematics-I	3	1	0	4	40	60	100
2	BSC	EAS112	Engineering Physics	3	1	0	4	40	60	100
		EAS113	Engineering Chemistry							
3	ESC	EEE117	Basic Electrical Engineering	3	1	0	4	40	60	100
		EEC111	Basic Electronics Engineering							
4	MC	TMU101	Environmental Studies	2	1	0	3	40	60	100
5	HSMC	TMUGE101	English Communication – I	2	0	2	3	40	60	100
6	ESC	ICS101	Web Designing	2	0	2	3	40	60	100
7	LC	EAS162	Engineering Physics (Lab)	0	0	2	1	50	50	100
		EAS163	Engineering Chemistry (Lab)							
8	LC	EEE161	Basic Electrical Engineering (Lab)	0	0	2	1	50	50	100
		EEC161	Basic Electronics Engineering (Lab)							
9	LC	EME161	Engineering Drawing (Lab)	0	0	4	2	50	50	100
		EME162	Workshop Practice (Lab)							
	Total			**15**	**4**	**12**	**25**	**390**	**510**	**900**

SEMESTER – II

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	BSC	EAS211	Engineering Mathematics-II	3	1	0	4	40	60	100
2	BSC	EAS212	Engineering Physics	3	1	0	4	40	60	100
		EAS213	Engineering Chemistry							
3	ESC	EEE217	Basic Electrical Engineering	3	1	0	4	40	60	100
		EEC211	Basic Electronics Engineering							
4	ESC	ICS201	Programming in C	3	0	0	3	40	60	100
5	HSMC	TMUGE201	English Communication – II	2	0	2	3	40	60	100
6	LC	EAS262	Engineering Physics (Lab)	0	0	2	1	50	50	100
		EAS263	Engineering Chemistry (Lab)							
7	LC	EEE261	Basic Electrical Engineering (Lab)	0	0	2	1	50	50	100
		EEC261	Basic Electronics Engineering (Lab)							
8	LC	EME261	Engineering Drawing (Lab)	0	0	4	2	50	50	100
		EME262	Workshop Practice (Lab)							
9	LC	ICS251	Programming in C (Lab)	0	0	2	1	50	50	100
			Total	**14**	**3**	**12**	**23**	**400**	**500**	**900**

SEMESTER III

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	BSC	ICS301	Mathematics For Computer Science	3	1	0	4	40	60	100
2	PCC	ICS302	Data Structures Using C++	3	0	0	3	40	60	100
3	PCC	ICS303	Introduction To Cloud Computing	3	0	0	3	40	60	100
4	ESC	ICS304	Computer Architecture and Organizations	3	0	0	3	40	60	100
5	PCC	ICS305	OOPS with Java	3	0	0	3	40	60	100
6	HSMC	TMUGE301	English Communication-III	2	0	2	3	40	60	100
7	LC	ICS351	Data Structures Using C++ (Lab)	0	0	4	2	50	50	100
8	LC	ICS352	OOPS with Java (Lab)	0	0	4	2	50	50	100
9	PROJ	ICS353	Project	0	0	2	1	50	50	100
			Total	**17**	**1**	**12**	**24**	**390**	**510**	**900**

Additional Courses for Lateral Entry Students with Polytechnic/B.Sc background, to be taken in either IIIrd or IVth semester or all should pass with minimum of 40% marks if they have not taken these courses in their Polytechnic/B.Sc dgree: credits will not be added.

1	EME161/261	Engineering Drawing Lab	-	-	2	50	50	**100**
2	EME162/262	Workshop Practice (Lab)	-	-	2	50	50	**100**
3	TMU101	Environmental Studies	2	0	0	40	60	**100**

Value Added Course*

S.No.	**Course Category**	**Course Code**	**Course Name**	**Periods**			**Credits**	**Evaluation**		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	VAC-I	TMUGA301	Foundation in Quantitative Aptitude	2	1	0	0	40	60	100

*Value Added Courses (VAC) is an audit course. The result of this course will not be added to overall result of the programme. However, it will be compulsory to pass the course with minimum 45% including both faculty continuous & end semester examination.

SEMESTER IV

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC	ICS401	Data Base Management System	3	0	0	3	40	60	100
2	PCC	ICS402	Python Programming	3	0	0	3	40	60	100
3	PCC	ICS403	Computer Networks	3	0	0	3	40	60	100
4	PCC	ICS404	Operating Systems	3	0	0	3	40	60	100
5	HSMC	TMUGE401	English Communication -IV	2	0	2	3	40	60	100
6	LC	ICS451	Data Base Management System (Lab)	0	0	4	2	50	50	100
7	LC	ICS452	Python Programming lab(Lab)	0	0	4	2	50	50	100
8	PEC	-	Professional Elective Courses-I	3	0	0	3	40	60	100
	Total			**17**	**0**	**10**	**22**	**340**	**460**	**800**
****Industrial Training**										

Value Added Course*

S. No.	**Category code**	**Course Code**	**Course Name**	**Periods**			**Credi**	**Evaluation Scheme**		
				L	***T***	***P***		***Internal***	***External***	***Total***
1	VAC-II	TMUGA401	Analytical Reasoning	2	1	0	0	40	60	100

**At the end of Semester-IV Industrial Training for at least 45 days is mandatory which is to be assessed and evaluated in Semester-V under subject code ICS553 (Industrial Training Seminar).

SEMESTER V

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC	ICS 501	Knowledge Representation and Reasoning	3	0	0	3	40	60	100
2	PCC	ICS 502	Theory of Computation	3	0	0	3	40	60	100
3	PCC	ICS 503	Information and Network Security	3	0	0	3	40	60	100
4	PCC	ICS 504	Principles of Virtualization	3	0	0	3	40	60	100
5	HSMC	EHM501	HUMAN VALUES & PROFESSIONAL ETHICS	3	0	0	3	40	60	100
6	LC	ICS 551	Information and Network Security (Lab)	0	0	4	2	50	50	100
7	LC	ICS 552	Principles of Virtualization (Lab)	0	0	4	2	50	50	100
8	PROJ	ICS 553	Industrial Training Seminar	0	0	2	1	50	50	100
9	PEC	-	Professional Elective Courses-II	3	0	0	3	40	60	100
			Total	**18**	**0**	**10**	**23**	**390**	**510**	**900**

Value Added Course***

S.N	**Category code**	**Course Code**	**Course Name**	**Periods**			**Credits**	**Evaluation Scheme**		
				L	***T***	***P***		***Internal***	***External***	***Total***
1	VAC-III	TMUGA501	Modern Algebra and Data Management	2	1	0	0	40	60	100
2	VAC-IV	TMUGS501	Managing Self	2	1	0	0	50	50	100

SEMESTER VI

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC	ICS601	Software Engineering	3	0	0	3	40	60	100
2	PCC	ICS602	Ethical Hacking	3	0	0	3	40	60	100
3	PCC	ICS603	Virtualization and Cloud Security	3	0	0	3	40	60	100
4	PCC	ICS604	Linux Administration	3	0	0	3	40	60	100
5	LC	ICS651	Virtualization and Cloud Security(Lab)	0	0	4	2	50	50	100
6	LC	ICS652	Ethical Hacking (Lab)	0	0	2	1	50	50	100
7	HSMC	EHM601	Entrepreneurship	3	1	0	4	50	50	100
8	PEC	-	Professional Elective Courses-III	3	0	0	3	40	60	100
9	PEC	-	Professional Elective Courses-IV	3	0	0	3	40	60	100
			Total	**21**	**1**	**6**	**25**	**390**	**510**	**900**
****Industrial Training**										

Value Added Course*

S.N	**Category code**	**Course Code**	**Course Name**	**Periods**			**Credit**	**Evaluation Scheme**		
				L	***T***	***P***		***Internal***	***External***	***Total***
1	VAC-V	TMUGA601	Advance Algebra and Geometry	2	1	0	0	40	60	100
2	VAC-VI	TMUGS601	Managing Work and Others	2	1	0	0	50	50	100

**At the end of Semester-VI Industrial Training for at least 45 days is mandatory which is to be assessed and evaluated in Semester-VII under subject code ICS753 (Industrial Training Seminar).

SEMESTER VII

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PCC	ICS701	Cyber Forensics and Investigation	3	0	0	3	40	60	100
2	PCC	ICS702	Cloud Deployment	3	0	0	3	40	60	100
3	PCC	ICS703	Web Services	3	0	0	3	40	60	100
4	PROJ	ICS751	Mini Project (Lab)	0	0	8	4	50	50	100
5	LC	ICS752	Cyber Forensics and Investigation (Lab)	0	0	2	1	50	50	100
6	PROJ	ICS753	Industrial Training Seminar	0	0	2	1	50	50	100
8	PEC	-	Professional Elective Courses-V	3	0	0	3	40	60	100
8	PEC	-	Professional Elective Courses-VI	3	0	0	3	40	60	100
9	OEC	-	Open Elective Courses-I	3	0	0	3	40	60	100
	Total			**18**	**0**	**12**	**24**	**390**	**510**	**900**

SEMESTER VIII

S. No.	*Course Category*	*Course Code*	*Course Title*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	PROJ	ICS851	Industry Internship	0	0	28	14	150	150	300
OR										
1	PROJ	ICS851	Project	0	0	16	8	50	50	100
2	PEC	-	Professional Elective Courses-VII	3	0	0	3	40	60	100
3	OEC	-	Open Elective Courses-II	3	0	0	3	40	60	100
	Total			**6**	**0**	**16**	**14**	**130**	**170**	**300**

Semester Wise Groups of Professional Elective Courses (PEC):

SEMESTER-IV
Professional Elective Courses-I (Select any one)
(Select any one course from group no.1 given below)

S. No.	Course Category	Course Code	Course Title
1	PEC	ICS405	Server Side Scripting
		ICS406	Linux Shell Scripting

SEMESTER-V
Professional Elective Courses-II (Select any one)
(Select any one course from group no.1 given below)

S. No.	Course Category	Course Code	Course Title
1	PEC	ICS506	Database Administration
		ICS507	Storage and Data Center
		ICS508	Mobile App Development

SEMESTER-VI
Professional Elective Courses - III (Select any one)
(Select any one course from group no.1 given below)

S. No.	Course Category	Course Code	Course Title
1	PEC	ICS605	Cloud Migration
		ICS606	Server Administration
		ICS607	Hybrid Cloud

Professional Elective Courses - IV (Select Any One)
(Select any one course from group no.2 given below)

S. No.	Course Category	Course Code	Course Title
2	PEC	ICS608	Security Architecture
		ICS609	Security Incident Management
		ICS610	Database Security

SEMESTER-VII
Professional Elective Courses– V (Select any one)
(Select any one course from group no.1 given below)

S. No.	Course Category	Course Code	Course Title
1	PEC	ICS704	Security for Big Data
		ICS705	Information Security Management
		ICS706	Security Standards and Frameworks

Professional Elective Courses – VI (Select any one)
(Select any one course from group no.2 given below)

S. No.	Course Category	Course Code	Course Title
2	PEC	ICS707	Application Containerization
		ICS708	PowerShell Scripting
		ICS709	NoSQL Databases

SEMESTER-VIII
Professional Elective Courses – VII
(Select any one course from group no.1 given below)

S. No.	Course Category	Course Code	Course Title
1	PEC	ICS 801	Cloud Web Services
		ICS 802	Infrastructure Solutions on Cloud
		ICS 803	Cloud Architectural Patterns

Course Code: **EAS116**	**Specialization- CTIS** **B.Tech.- 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 A (Unit A is for building a foundation and shall not be a part of examination)** Some general theorem on deviation-Derivative of the sum or difference of two function, Derivative of product of two functions, Derivative of quotient, Derivative of Trigonometry function, Derivative of inverse Trigonometry function, Logarithms differential, Integration of 1/x, e^x, Integration by simple substitution. Integrals of the type f' (x), $[f(x)]^n$, $\frac{f'(x)}{f(x)}$, Integration of 1/x, e^x, tan x, cot x, sec x, cosec x , Integration by parts, Integration using partial fractions.	
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 **4.** Prasad C., *Engineering Mathematics for Engineers*, Prasad Mudralaya. **5.** Dass H.K., Engineering Mathematics Vol-I, S. Chand *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	**1.** https://www.youtube.com/watch?v=EGnI8WyYb3o **2.** https://www.youtube.com/watch?v=ksS_yOK1vtk&list=PLbRMhDVUMngfIrZCNOyPZwHUU1pP66vQW	

Course Code: EAS112	**Specialization- CTIS** **B.Tech.- 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 A(Unit A is for building a foundation and shall not be a part of examination)** Optics- Properties of light, Lance, Mirror, Focal length, Intensity, Power, Eye-piece, Work, Energy and its types, Waves, longitudinal and transverse waves, Time period, Frequency	
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:	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. 4. Engineering Physics, Bhattacharya & Tandon, Oxford University Press. 5. Optics, Ajay Ghatak, Tata Mc Graw-Hill. *** Latest editions of all the suggested books are recommended.**	

Additional electronic reference material:	1. https://www.youtube.com/watch?v=toGH5BdgRZ4&list=PLD9DDFBDC338226CA 6. https://www.youtube.com/watch?v=CuqsU7B1MtU	

Course Code: **EAS113**	**Specialization- CTIS** **B.Tech.- 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 concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.	
CO5.	**Applying** the concepts of 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, calgon etc.	**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. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	1. https://www.youtube.com/watch?v=RV-OyRTaIOI 5. https://www.youtube.com/watch?v=phhfkikb6Lw	

Course Code: **EEE117**	**Specialization- CTIS** **B.Tech.- 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. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.	
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. *** Latest editions of all the suggested books are recommended.**	
Additional electronic 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	**Specialization- CTIS** **B.Tech.- 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. 4. Millman & Halkias, Electronics Devices and Circuits, McGraw Hill. *** Latest editions of all the suggested books are recommended.**	

Additional electronic reference material:	1. https://www.youtube.com/watch?v=USrY0JspDEg 2. https://www.youtube.com/watch?v=Hkz27cFW4Xs	

Course Code: TMU101	**Specialization- CTIS** **B.Tech.- 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 for sustainable 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 and Environment:*** Concept of an Ecosystem- its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, 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; Land resources 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 Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India	**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 (Greenhouse Effect), Ozone Layer - Its Depletion and Control Measures, Photochemical Smog, Acid Rain 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 Communities & Environment:***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,	**8 Hours**

	Environmental communication & public awareness; Case study **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 Age Publishers Pvt. Ltd.	
Reference Books:	1. "Biodiversity and Conservation", Bryant, P. J., Hypertext Book 2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I.K. Publication 3. "Introduction to Environmental Engineering and Science", Masters, G. M., Prentice Hall India Pvt. Ltd. 4. "Fundamentals of Ecology", Odem, E. P., W. B. Sannders Co. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	1. https://www.youtube.com/watch?v=8tamfocnHb8 2. https://www.youtube.com/watch?v=YlE1DDo25IQ	

Course Code: **TMUGE101**	**Specialization- CTIS** **B.Tech.- 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:	**Introductory Session** • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasons of Fear of Failure, 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: Pronunciation 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. &Pushp Lata. "*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.	

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

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) ***(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 I & III)***	

***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: **ICS101**	**Specialization- CTIS** **B.Tech.- Semester-I** **WEB DESIGNING**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding about internet design principles and various protocols which is widely use in the Internet.	
CO2.	Understanding the use of different web development technologies.	
CO3.	Understanding the HTML document structure and its all tags.	
CO4.	Applying different cascading style sheet in web designing.	
CO5.	Creating interactive web page(s) using HTML, CSS and JavaScript.	
Course Content:		
Unit-1:	**Introduction to Internet:** Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture	**8 Hours**
Unit-2:	**Introduction to World Wide Web:** Evolution of Web, Static and Dynamic Web Sites, Web Applications, Web Development Technologies - HTML, CSS, JS, XML; Protocols - HTTP, secure HTTP, etc; URL, Web Browser, Web Server, Web Services	**8 Hours**
Unit-3:	**HTML:** Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button, Images	**8 Hours**
Unit-4:	**CSS:** Introduction to CSS, Syntax, Selectors ,Embedding CSS to Html, Formatting fonts, Text & background colour, Inline styles, External and Internal Style Sheets, Borders & boxing	**8 Hours**
Unit-5:	**XML:** Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema, XML Parser, Document Object Model (DOM), XML DOM..	**8 Hours**
Text Books:	1. Web Technologies - HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and Ajax, Black Book, by Dreamtech Press	
Reference Books:	1. HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010 2. HTML Black Book by Steven Holzner 3. Web Design with HTML, CSS, JavaScript and jQuery Set by Jon Duckett *** Latest editions of all the suggested books are recommended.**	
E-Content References	1. https://www.w3schools.com/html/ 2. https://www.tutorialspoint.com/css/index.htm 3. https://resources.mpi-inf.mpg.de/d5/teaching/ss03/xml-seminar/talks/xml%20for%20beginners.pdf	

LISTOFEXPERIMENTS

1. Design a simple web page with head, body and footer, with heading tags, image tag

2. Design a web site for book information, home page should contain books list, when particular book is clicked, information of the books should display in the next page.
3. Design a page to display the product information such as name, brand, price and etc with table tag
4. Design a web site for book information using frames, home page should contain two parts, left part should contain books list, and right part should contain book information.
5. Design a web page to capture the user information such as name, gender, mobile number, mail id, city, state, and country using form elements.
6. Design a web page with nice formatting like background image, text colors and border for text using external CSS.
7. Design a web page to perform mathematical calculations such as addition, subtraction, multiplication, and division
8. Design a web page to read data from an XML file and display the data in tabular format, take the data as employee information.
9. Design a web site for online purchase using CSS, JS and XML, web site should contain the following web pages.
    - Home page
    - Login page
    - Signup page
    - Product details page

Course Code: EAS162	**Specialization- CTIS** **B.Tech.- 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 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.	
Course Content:	**Note: Select any ten experiments from the following list.**	
LIST OF EXPERIMENTS	**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. **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.	
Text Books:	1. B.Sc.Practical Physics, Gupta and Kumar, Pragati Prakashan.	
Reference Books:	1. B.Sc.Practical Physics, Gupta and Kumar, Pragati Prakashan. 2. B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd. 3. B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd. *** Latest editions of all the suggested books are recommended.**	

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**	**Specialization- CTIS** **B.Tech.- 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.	
Course Content:	**Select any ten experiments from the following list.**	
LIST OF EXPERIMENTS	**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.	
Reference Books:	1. Agarwal R. K., Engineering Chemistry, Krishna Prakashan. *** Latest editions of all the suggested books are recommended.**	

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	Specialization- CTIS B.Tech.- 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.	
Course Content:	**Select any ten experiments from the following list.**	
List of Experiments	**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.	
Reference Books:	1. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. *** Latest editions of all the suggested books are recommended.**	

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.

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	**Specialization- CTIS** **B.Tech.- 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.	
Course Content:	**Minimum eight experiments should be performed-**	
List of Experiments	**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.	
Reference Books:	1. Sedra and Smith, Microelectronic Circuits, Oxford University Press. 2. Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International. *** Latest editions of all the suggested books are recommended.**	

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: EME161	Specialization- CTIS B.Tech.- 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.	
Course Content:	**All to be performed**	
List of Experiments	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 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.

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

Course Code: **EME162**	**Specialization- CTIS** **B.Tech.- 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.	
Course Content:	**Perform any ten experiments selecting at least one from each shop**	
List of Experiments	**Carpentry Shop**: 1. To prepare half-lap corner joint. 2. To prepare mortise & tenon joint. 3. To prepare a cylindrical pattern on woodworking lathe. **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 **Black Smithy Shop:** 1. To prepare a square rod from given circular rod 2. To prepare a square U- shape from given circular rod **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. **Sheet-metal Shop:** 1. To make round duct of GI sheet using 'soldering' process. 2. To prepare a tray of GI by fabrication **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. **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**	**Specialization- CTIS** **B.Tech.- 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. Das H.K., Engineering Mathematics Vol-II, S. Chand. ***Latest editions of all the suggested books are recommended.**	
Additional	1. https://www.youtube.com/watch?v=luJMl37-nso	

electronic reference material:	1. https://www.youtube.com/watch?v=NdouX5-KD6Y	

Course Code: EAS212	**Specialization- CTIS** **B.Tech.- 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 A(Unit A is for building a foundation and shall not be a part of examination)** Optics- Properties of light, Lance, Mirror, Focal length, Intensity, Power, Eye-piece, Work, Energy and its types, Waves, longitudinal and transverse waves, Time period, Frequency	
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:	1. F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill. 2. Concept of Modern Physics, Beiser, Tata McGraw-Hill. 3. Engineering Physics, Bhattacharya & Tandon, Oxford University Press. 4. H. K. Malik & A.K. Singh, Engineering Physics, McGraw-Hill, latest edition. *** Latest editions of all the suggested books are recommended.**	

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	**Specialization- CTIS** **B.Tech.- 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 concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.	
CO5.	**Applying** the concepts of 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, calgon etc.	**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. Chawla Shashi, Engineering Chemistry, Dhanpat Rai Publication. *** Latest editions of all the suggested books are recommended.**	
Additional	1. https://www.youtube.com/watch?v=RV-OyRTaIOI	

electronic reference material:	2. https://www.youtube.com/watch?v=phhfkikb6Lw	

Course Code: **EEE217**	**Specialization- CTIS** **B.Tech.- 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. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.	
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. W.H. Hayt & J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill. 5. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional electronic 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: EEC211	**Specialization- CTIS** **B.Tech.- 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. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	**1.** https://www.youtube.com/watch?v=USrY0JspDEg 4. https://www.youtube.com/watch?v=Hkz27cFW4Xs	

Course Code: ICS201	**Specialization- CTIS** **B.Tech.- Semester-II** **Programming in C**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the use of basic concepts involved in Computer Programming.	
CO2.	Understanding the concepts of design, implement, test, debug and document programs in C.	
CO3.	Understanding the concepts of pointers and its application in arrays.	
CO4.	Analyzing the use of functions and parameter passing options in it.	
CO5.	Creating a C program using function and pointer.	
Course Content:		
Unit-1:	**Basics of programming: Approaches** to Problem Solving, Concept of algorithm and flow charts, **Types of computer languages**:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker	**8 Hours**
Unit-2:	**Fundamental data types**- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity. **Fundamentals of C programming**: Structure of C program, writing and executing the first C program, components of C language. Standard I/O in C.	**8 Hours**
Unit-3:	**Conditional program execution:** Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements. **Pointers:** Introduction, declaration, applications	**8 Hours**
Unit-4:	**Arrays:** Array notation and representation, manipulating array elements, using multidimensional arrays. Structure, union, enumerated data types, **Functions:** Introduction, types of functions, functions with array, passing values to functions, recursive functions.	**8 Hours**
Unit-5:	**File Handling :** File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler. **C Preprocessor-** #define, #include, #undef, Conditional compilation directives. **C standard library and header files**: Header files, string functions, mathematical functions, Date and Time functions	**8 Hours**
Text Books:	1. Programming in ANSI C by Balaguruswamy, 3rd Edition, 2005, Tata McGraw Hill.	
Reference Books:	1. Let us C by Yashwant Kanetka, 6th Edition, PBP Publication. 2. The C programming Language by Richie and Kenninghan, 2004, BPB Publication. *** Latest editions of all the suggested books are recommended.**	
E-Content Reference	1. https://www.tutorialspoint.com/cprogramming/index.htm 2. http://cslibrary.stanford.edu/101/EssentialC.pdf	

Course Code: **TMUGE201**	**Specialization- CTIS** **B.Tech.- 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.	
CO3.	Applying correct vocabulary and tenses in sentence construction while writing and delivering presentations.	
CO4.	Analyzing different types of listening, role of Audience & Locale in presentation.	
CO5.	Drafting Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	**Functional Grammar** • Prefix, suffix and One words substitution • Modals • Concord	**10 Hours**
Unit-2:	**Listening Skills** • Difference between listening & hearing, Process and Types of Listening • Importance and Barriers to listening	**4 Hours**
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. Sood Madan "*The Business letters"* Goodwill Publishing House, New Delhi 3. Kumar Sanjay &Pushplata "*Communication Skills*" Oxford University Press, New Delhi. *** Latest editions of all the suggested books are recommended.**	
Additional	**1.** https://www.youtube.com/watch?v=A0uekze2GOU	

Electronic Reference Material	**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	

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.

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) ***(From Unit- I, IV & V)***	10 Marks (Oral Assignments) ***(From Unit- II &IV)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit- I, IV & V)***	20 Marks (External Viva)* ***(From 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: **EAS262**	**Specialization- CTIS** **B.Tech.- 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.	
Course Content:	**Note: Select any ten experiments from the following list.**	
LIST OF EXPERIMENTS	**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. **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.	
Text Books:	1. B.Sc.Practical Physics, Gupta and Kumar, Pragati Prakashan.	
Reference Books:	1. B.Sc.Practical Physics, Gupta and Kumar, Pragati Prakashan. 2. B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd. 3. B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd. *** Latest editions of all the suggested books are recommended.**	

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**	**Specialization- CTIS** **B.Tech.- 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.	
Course Content:	**Select any ten experiments from the following list.**	
LIST OF EXPERIMENTS	**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.	
Reference Books:	1. Agarwal R. K., Engineering Chemistry, Krishna Prakashan. *** Latest editions of all the suggested books are recommended.**	

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**	**Specialization- CTIS** **B.Tech.- 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.	
Course Content:	**Select any ten experiments from the following list.**	
List of Experiments	**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.	
Reference Books:	1. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. *** Latest editions of all the suggested books are recommended.**	

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.

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	Specialization- CTIS B.Tech.- 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.	
Course Content:	**Minimum eight experiments should be performed-**	
List of Experiments	**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.	
Reference Books:	1. Sedra and Smith, Microelectronic Circuits, Oxford University Press. 2. Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International. *** Latest editions of all the suggested books are recommended.**	

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: EME261	Specialization- CTIS B.Tech.- 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.	
Course Content:	**All to be performed**	
List of Experiments	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 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.

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**	**Specialization- CTIS** **B.Tech.- 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.	
Course Content:	**Perform any ten experiments selecting at least one from each shop**	
List of Experiments	**Carpentry Shop**: 1. To prepare half-lap corner joint. 2. To prepare mortise & tenon joint. 3. To prepare a cylindrical pattern on woodworking lathe. **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 **Black Smithy Shop:** 1. To prepare a square rod from given circular rod 2. To prepare a square U- shape from given circular rod **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. **Sheet-metal Shop:** 1. To make round duct of GI sheet using 'soldering' process. 2. To prepare a tray of GI by fabrication **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. **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: **ICS251**	**Specialization- CTIS** **B.Tech.- Semester-II** **Programming in C (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic terminology used in computer programming	
CO2.	Understanding the concepts of compile and debug programs in C language.	
CO3.	Applying the procedure oriented paradigm to design C program.	
CO4.	Creating a C programs involving decision structures, loops and functions.	
CO5.	Creating a C programs using array and pointer.	
Course Content:		
List of Experiments	**Part A** **1.** Printing the reverse of an integer. **2.** Printing the odd and even series of N numbers. **3.** Get a string and convert the lowercase to uppercase and vice--versa using getchar() and putchar(). **4.** Input a string and find the number of each of the vowels appear in the string. **5.** Accept N words and make it as a sentence by inserting blank spaces and a full stop at the end. **6.** Printing the reverse of a string. **Part B** **1.** Searching an element in an array using pointers. **2.** Checking whether the given matrix is an identity matrix or not. **3.** Finding the first N terms of Fibonacci series. **4.** Declare 3 pointer variables to store a character, a character string and an integer respectively. **5.** Input values into these variables. Display the address and the contents of each variable. **6.** Define a structure with three members and display the same. **7.** Declare a union with three members of type integer, char, string and illustrate the use of union. **8.** Recursive program to find the factorial of an integer. **9.** Finding the maximum of 4 numbers by defining a macro for the maximum of two numbers. **10.** Arranging N numbers in ascending and in descending order using bubble sort. **11.** Addition and subtraction of two matrices. **12.** Multiplication of two matrices. **13.** Converting a hexadecimal number into its binary equivalent. **14.** Check whether the given string is a palindrome or not. **15.** Demonstration of bitwise operations. **16.** Applying binary search to a set of N numbers by using a function. **17.** Create a sequential file with three fields: empno, empname, empbasic. Print all the details in a neat format by adding 500 to their basic salary.	
Reference Books:	1. Programming in ANSI C by Balaguruswamy, 3rd Edition, 2005, Tata McGraw Hill. 2. Let us C by Yashwant Kanetka, 6th Edition, PBP Publication. 3. The C programming Language by Richie and Kenninghan, 2004, BPB Publication. ***Latest editions of all the suggested books are recommended.**	

Course Code: ICS301	Specialization- CTIS B.Tech.- Semester-III **Mathematics for Computer Science**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the knowledge of computing and mathematics.	
CO2.	Understanding the computing requirements appropriate to the problem solution.	
CO3.	Understanding the concepts of functions and graph.	
CO4.	Understanding the basic principles of probability and random variable.	
CO5.	Applying mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.	
Course Content:		
Unit-1:	**Fundamentals**: Sets and subsets, operations on sets, Sequences. Logic: Propositions and Logical Operations, Conditional statements, Methods of proof, Mathematical Induction. **Counting:** Permutations and combinations, Pigeonhole Principle, Recurrence relations. Relations and Digraphs: Product sets and partitions, relations and digraphs, paths in relations and digraphs, properties of relations, equivalence relations, operations on relations, transitive closure and Warshall‟s algorithm.	**8 Hours**
Unit-2:	**Functions:** Functions for computer science, permutation functions, order relations and structures: partially ordered sets, extremal elements of partially ordered sets, lattices. **Graph Theory-I:** Graphs and graph models, graph terminology and special types of graphs, representing graphs and graph isomorphism, connectivity, Euler and Hamilton paths, Binary operations revisited, semi groups.	**8 Hours**
Unit-3:	**Graph Theory-II:** Coloring Graphs, K-coloring, Bipartite graphs, Planar graphs, Euler's formula, Hall's marriage theorem-A formal statement. **Statistical methods:** Correlation-Karl Pearson's, coefficient of correlation-problems. Regression analysis- lines of regression–problem. Curve fitting by the method of least squares- fitting the curves of the form, y = ax + b,y = ax2 + bx + c and y = ae bx.	**8 Hours**
Unit-4:	**Probability Theory**: Basic concepts of probability, Axiomatic and frequency definition of probability, Addition and multiplication law of probability, conditional probability and Baye's .Theorem (without proofs).	**8 Hours**
Unit-5:	**Random Variables:** Random variables, types of random variables,	**8 Hours**

	probability function, and cumulative distribution function, discrete probability distributions (Binomial and Poisson) and Continuous probability distributions (Exponential and Normal).	
Text Books:	1. Discrete and Combinatorial Mathematics, Ralph P Grimaldi, 5th Edition. Pearson Education.	
Reference Books:	1. Discrete Mathematical Structures, Kolman, Busby &Ross: 5th Edition, 2006. 2. Discrete Mathematics for Computer Science, Gary Haggard & John SchlipfCengage, Thomson 2006. 3. Higher Engineering Mathematics, B.V.Ramana, 26th Reprint Edition McGraw Hill Education (India) Private Limited, 2016. 4. Fundamentals of Mathematical Statistics by Kapoor &Gupta:Sultan Chand and Sons. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010/video-lectures/ 2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-spring-2015/readings/MIT6_042JS15_textbook.pdf	

Course Code: ICS302	**Specialization- CTIS** **B.Tech.- 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 basic data structures such as arrays, linked lists, stacks and queue.	
CO2.	Understanding the time and space complexities of algorithms.	
CO3.	Understanding the concept of linked list.	
CO4.	Understanding Non-linear Data Structures such as trees.	
CO5.	Applying various algorithms for solving problems like sorting, searching, insertion and deletion of data.	
Course Content:		
Unit-1:	**Introduction to C++ and Data Structures** Object oriented paradigm - Structured vs. Object Oriented Paradigm - Elements of Object Oriented Programming – Objects – Classes - Information and its Storage representation – Storage of Information – Data Structures – Types of Data Structures - Operations on data Structures. **Linear Data Structure Using Arrays and Pointers** Definition – Terminology – One dimensional Array – Memory Allocation – Operations – Applications - Array as an ADT - Sparse Matrices - Row and Column major representation – Representing Array using Pointers. **Sorting and Searching** Sorting - Types of Sorting – Insertion – Shell – Heap – Merge – Quick sort – radix Sort. Searching – Linear Search – Binary Search – Case Study	**8 Hours**
Unit-2:	**Stacks and Queues** Stacks – Definition – Applications of Stacks – Representation of Stack – Representation of Stack as an ADT - Array representation. Operations on Stacks - Recursion – Evaluation of Arithmetic Expressions – Conversion of Infix to Postfix Notation – Towers of Hanoi problem. Queues – Definition – Representation of queues - Array representation – Operations of queues - Types of Queues – Circular queue – Definition – Operations – Applications - Deque – Definition – Operations – Applications - Priority queue - Definition – Operations – Applications – Case Study.	**8 Hours**

Unit-3:	**Linked Lists** Definitions – Types – Single Linked lists – Representation as an ADT - Operations - Circular Linked list – Operation - Double Linked Lists – Operations - Circular double linked lists - Operations – Applications of Linked lists – Sparse Matrix Manipulation – Polynomial Representation and Manipulation – Case Study	**8 Hours**
Unit-4:	**Non- linear Data Structures – Trees** Trees – Definitions and Concepts – Types of Binary trees - Operations on Binary trees – Storage Representation and manipulation of Binary Trees – Linear - Linked and Threaded Storage Representation for Binary trees – Conversion of General trees to Binary trees – Sequential and other Representation of trees – Applications – Manipulation of Arithmetic Expressions. AVL Trees – Single & Double Rotation – Case Study	**8 Hours**
Unit-5:	**Graphs** Graphs and their Representation – Definition, Graph Terminology – Graph Abstract Data Types - Matrix Representation – List Structures – Other Representation - Operations – Traversals - Breadth First Search – Depth first Search – Spanning Trees – Applications – Topological Sorting – Case Study	**8 Hours**
Text Books:	1. Data Structures Using C++, VARSHA H. PATIL, Oxford University Press-2012.	
Reference Books:	1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Second Edition, Pearson Education Asia, 2002. 2. Data Structures, Algorithms and Applications in C++, SartajSahni, Second Edition, Universities Press India Private Limited, 2005. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	1. https://www.tutorialspoint.com/cplusplus/cpp_data_structures.htm 2. https://www.includehelp.com/data-structure-tutorial/ 3. https://www.youtube.com/watch?v=AT14lCXuMKI&list=PLdo5W4Nhv31bbKJzrsKfMpo_grxuLl8LU	

Course Code: ICS303	Specialization- CTIS B.Tech.- Semester-III **INTRODUCTION TO CLOUD COMPUTING**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concept of cloud, various types of clouds and their working	
CO2.	Understanding the need for migration on cloud and identify the economic considerations involved	
CO3.	Understanding the Standards, Organizations and Groups associated with Cloud Computing	
CO4.	Understanding the importance of IT governance in cloud computing	
CO5.	Analyzing the various Jurisdictional Issues Raised by Virtualization and Data Location.	
Course Content:		
Unit-1:	**Introduction:** Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private Public and hybrid clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, , Cloud computing delivery models and services (IaaS, PaaS, SaaS), obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, Practical applications of cloud computing.	**8 Hours**
Unit-2:	**Cloud Computing Companies and Migrating to Cloud:** Web-based business services, Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the 0Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud., Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies	**8 Hours**
Unit-3:	**Cloud Cost Management and Selection of Cloud Provider:** Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, Selecting the right scalable application. Considerations for selecting cloud solution. Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration.	**8 Hours**

Unit-4:	**Governance in the Cloud** Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations.	**8 Hours**
Unit-5:	**Ten cloud do an do nots.** Don't be reactive,do consider the cloud a financial issue, don't go alone, do think about your architecture, don't neglect governance, don't forget about business purpose, do make security the centerpiece of your strategy, don't apply the cloud to everything, don't forget about Service Management, do start with a pilot project.	**8 Hours**
Text Books:	1. Cloud Computing: Principles and Paradigms, RajkumarBuyya, James Broberg, Andrzej M. Goscinski,, John Wiley and Sons Publications, 2011	
Reference Books:	1. Brief Guide to Cloud Computing, Christopher Barnett, Constable & Robinson Limited, 2010 2. Handbook on Cloud Computing, BorivojeFurht, Armando Escalante, Springer, 2010 *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	1. https://www.javatpoint.com/cloud-computing-tutorial 2. https://www.youtube.com/watch?v=EN4fEbcFZ_E	

Course Code: ICS304	Specialization- CTIS B.Tech.- Semester-III **Computer Architecture and Organizations**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the register transfer and micro-operation.	
CO2.	Understanding the basic computer organization.	
CO3.	Understanding the various modes of data transfer.	
CO4.	Understanding the system architecture of multiprocessor and multicomputer.	
CO5.	Analyzing the memory organization and I/O systems.	
Course Content:		
Unit-1:	**Register Transfer and Micro-operation** Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer, Arithmetic Micro-operations: Binary Adder, Binary Adder-Subtractor, Binary Incrementer, Logic Micro-operations: List of Logic micro Operations, Shift Micro-operations (excluding H/W implementation), Arithmetic Logic Shift Unit.	**8 Hours**
Unit-2:	**Basic Computer Organization** Instruction Codes, Computer Registers: Common bus system, Computer Instructions: Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle. Register reference instructions. Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines, Design of Control Unit.	**8 Hours**
Unit-3:	**Central Processing Unit** Central Processing Unit: Introduction, General Register Organization, Stack Organization: Register stack, Memory stack; Instruction Formats, Addressing Modes. CISC & RISC	**8 Hours**
Unit-4:	**Computer Arithmetic & I/O Organization** Introduction, Addition and Subtraction, Multiplication Algorithms (Booth algorithm), Division Algorithms, Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors. Modes of Data Transfer, Priority Interrupt, Direct Memory Access,	**8 Hours**

Unit-5:	**Memory Organization** Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative, Memory, Cache Memory, Virtual Memory	**8 Hours**
Text Books:	1. Computer System Architecture by Morris Mano, PHI Publication	
Reference Books:	1. PC Hardware in a Nutshell by Barbara Fritchman Thompson, Robert Bruce Thompson, O'Reilly, 2nd Edition , 2010 2. Fundamentals of Computer Organization and Architecture by Mostafa AB-EL-BARR and Hesham EL-REWNI, John Wiley and Sons 3. Fundamental Of computer Organization by Albert Zomaya, 2010 Edition 4. Computer Organization and Architecture by William Stallings, PHI Publication *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	1. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/ 2. http://www.svecw.edu.in/Docs%5CITIIBTechIISemLecCOA.pdf	

Course Code: **ICS305**	**Specialization- CTIS** **B.Tech.- Semester-III** **OOPS WITH JAVA**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding of Java-based software code of medium-to-high complexity.	
CO2.	Understanding of the basic principles of creating Java applications with graphical user interface (GUI).	
CO3.	Understanding of the fundamental concepts of computer science: structure of the computational process, algorithms and complexity of computation.	
CO4.	Understanding the basic approaches to the design of software applications.	
CO5.	Applying various programming concepts to create a Java application.	
Course Content:		
Unit-1:	**Introduction:** History, Overview of Java, Object Oriented Programming, A simple Progsramme, Two control statements - if statement, for loop, using Blocks of codes, Lexical issues - White space, identifiers, Literals, comments, separators, Java Key words. Data types: Integers, Floating point, characters, Boolean, A closer look at Literals, Variables, Type conversion and casting, Automatic type promotion in Expressions Arrays. **Operators:**Arithmetic operators, The Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence. Control Statements: Selection Statements - if, Switch: Iteration Statements - While, Do-while, for Nested loops, Jump statements.	**8 Hours**
Unit-2:	**Classes:** Class Fundamentals, Declaring objects, Assigning object reference variables, Methods, constructors, "this" keyword, finalize ( ) method A stack class, Over loading methods, using objects as parameters, Argument passing, Returning objects, Recursion, Access control, Introducing final, understanding static, Introducing Nested and Inner classes, Using command line arguments. Inheritance: Inheritance basics, Using super, method overriding, Dynamic method Dispatch, using abstract classes, using final with Inheritance	**8 Hours**
Unit-3:	**Packages:** Definition, Access protection importing packages, Interfaces: Definition implementing interfaces. Exception Handling: Fundamental, Exception types, Using try and catch, Multiple catch clauses, Nested try Statements, throw, throws, finally, Java's Built - in exception, using	**8 Hours**

	Exceptions	
Unit-4:	**Multithreaded Programming** The Java thread model, The main thread, Creating a thread, Creating multiple thread, Creating a thread, Creating multiple threads, Using is alive() and Join(), Thread - Priorities, Synchronization, Inter thread communication, suspending, resuming and stopping threads, using multi-threading. 1/0 basics, Reading control input, writing control output, Reading and Writing files, Applet Fundamentals, the AWT package,AWT Event handling concepts The transient and volatile modifiers, using instance of using assert	**8 Hours**
Unit-5:	**JAVA Database Connectivity (JDBC):** Database connectivity: JDBC architecture, JDBC Drivers, the JDBC API: loading a driver, connecting to a database, Creating and executing JDBC statements, Handling SQL exceptions, Accessing result sets: Types of result sets, Methods of result set interface. An example JDBC application to query a database	**8 Hours**
Text Books:	1. Programming with Java- E. Balagurusamy	
Reference Books:	1. The complete reference Java –2: V Edition By Herbert Schildt Pub. TMH. 2. SAMS teach yourself Java – 2: 3rd Edition by Rogers Cedenhead and Leura Lemay Pub. Pearson Education. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material:	1. https://www.javatpoint.com/java-tutorial 2. https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf	

Course Code: TMUGE301	**Specialization- CTIS** **B.Tech.- 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.	Analysing different types of sentences like simple, compound and complex.	
CO5.	Drafting notice, agenda and minutes of the meeting.	
CO6.	Demonstrating 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)	**14 Hours**
Unit-2:	**Speaking Skills** • Art of public speaking • Common conversation • Extempore • Power Point Presentation (PPt) Skills**:** Nuances of presenting PPTs	**10 Hours**
Unit-3:	**Comprehension Skills** • Strategies of Reading comprehension: Four S's • How to solve a Comprehension (Short unseen passage: 150-200 words)	**6 Hours**
Unit-4:	**Professional Writing** a) Preparing Notice, Agenda & Minutes of the Meeting	**3 Hours**
Unit-5:	**Value based text reading:** Short story a) The Barber's Trade Union – Mulk Raj Anand	**7 Hours**
Text Books:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	1. Joseph, Dr C.J. & Myall E.G. "A Comprehensive Grammar of Current English" Inter University Press, Delhi 2. Wren & Martin "High School English Grammar and Composition" S.Chand&Co.Ltd., New Delhi. 3. Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. 4. Agrawal, Malti "Professional Communication" KrishanaPrakashan Media (P) Ltd. Meerut. *** Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material:	1. https://www.youtube.com/watch?v=6xFaXIwwq0s&list=PLzJaFd3A7DZtnTdtOxvjO3GLPd1WVe6oq 5. https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLwytTXNlljX6cEAsR1TsbKpEwGSJieaQ9	

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**		**100**
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)***	

***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: ICS351	Specialization- CTIS B.Tech.- 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.	Understanding appropriate data structures as applied to specified problem definition	
CO2.	Applying various programming approaches to solve data structure problems.	
CO3.	Analyzing various data structure algorithms.	
CO4.	Creating appropriate searching technique for given problem.	
CO5.	Creating appropriate sorting technique for given problem.	
Course Content:		
LIST OF EXPERIMENTS	1. To write programs implementing Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quicksort. 2. To write programs implementing Searching programs: Linear Search, Binary Search. 3. To write programs Array implementation of stack, Queue, Circular Queue, Linked List. 4. To write programs implementing Stack, Queue, Circular Queue, Linked List using dynamic memory allocation. 5. To write program implementing Binary tree. 6. To write programs implementing Tree Traversals (pre-order, in-order, post-order). 7. To write programs implementing graph traversal (BFS,DFS). 8. To write programs implementing minimum cost spanning tree, shortest path.	
Text Books:	1. Data Structures Using C++, VARSHA H. PATIL, Oxford University Press-2012.	
Reference Books:	1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Second Edition, Pearson Education Asia, 2002. 2. Data Structures, Algorithms and Applications in C++, SartajSahni, Second Edition, Universities Press India Private Limited, 2005. 3. Data Structures Using C++, D.S. MALIK, SECOND EDITION,Cengage Learning, 2009. *** Latest editions of all the suggested books are recommended.**	

Course Code: ICS352	Specialization- CTIS B.Tech.- Semester-III **OOPS WITH JAVA(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 OOPs in Java	
CO2.	Understanding the concepts abstract classes and string operations.	
CO3.	Applying the various programming concepts to solve given problems.	
CO4.	Creating a Java program to show working of classes and methods.	
CO5.	Creating the Applet using java programs.	
Course Content:		
LIST OF EXPERIMENTS	**Part A** **1.** Write a program to check whether two strings are equal or not. **2.** Write a program to display reverse string. **3.** Write a program to find the sum of digits of a given number. **4.** Write a program to display a multiplication table. **5.** Write a program to display all prime numbers between 1 to 1000. **6.** Write a program to insert element in existing array. **7.** Write a program to sort existing array. **8.** Write a program to create object for Tree Set and Stack and use all methods. **9.** Write a program to check all math class functions. **10.** Write a program to execute any Windows 95 application (Like notepad, calculator etc) **11.** Write a program to find out total memory, free memory and free memory after executing garbage Collector (gc). **Part B** **12.** Write a program to copy a file to another file using Java to package classes. Get the file names at run time and if the target file is existed then ask confirmation to overwrite and take necessary actions.	**8 Hours**

	13. Write a program to get file name at runtime and display number f lines and words in that file. **14.**Write a program to list files in the current working directory depending upon a given pattern. **15.**Create a textfileld that allows only numeric value and in specified length. **16.** Create a Frame with 2 labels, at runtime display x and y command-ordinate of mouse pointer in the labels.	
Text Books:	1. Programming with Java- E. Balagurusamy	
Reference Books:	1. The complete reference Java –2: V Edition By Herbert Schildt Pub. TMH. 2. SAMS teach yourself Java – 2: 3rd Edition by Rogers Cedenhead and Leura Lemay Pub. Pearson Education. *** Latest editions of all the suggested books are recommended.**	

Course Code: **ICS353**	**Specialization- CTIS** **B.Tech.- Semester-III** **Project**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding methodologies and professional way of documentation and communication.	
CO2.	Understanding about software development cycle with emphasis on different processes -requirements, design, and implementation phases.	
CO3.	Analyzing a software project and demonstrate the ability to communicate effectively in speech and writing.	
CO4.	Creating a new model over the selected field of research that will be useful for future activities.	
CO5.	Creating a project that help to gain confidence and technical knowledge.	
Course Content:		
Guidelines for Seminar:	• **Selection of topic:** All students who are pursuing B.Tech shall submit the proposed topic of the seminar in the first week of the semester to the course coordinator. Care should be taken that the topic selected does not directly relate to the Course of the courses being pursued. The course coordinator shall then forward the list to the concerned Seminar Committee. The topics will then be allocated to the students along with the name of the faculty guide. **Preparation of the seminar** 1. The student shall meet the guide for the necessary guidance for the seminar work. 2. During the next two to four weeks the student should read the primary literature germane to the seminar topic. Reading selection should continuously be informed to the guide. 3. After necessary collection of data and literature survey, the students must prepare a report. The report shall be arranged in the sequence consisting of the following:- a. Top Sheet of transparent plastic. b. Top cover. c. Preliminary pages. (i) Title page	

	(ii) Certification page. (iii) Acknowledgment. (iv) Abstract. (v) Table of Content. (vi) List of Figures and Tables. d. Chapters (Main Material). e. Appendices, If any. f. Bibliography/ References. g. Back Cover (Blank sheet). h. Back Sheet of Plastic (May be opaque or transparent).	
	For Guide If you choose not to sign the acceptance certificate, please indicate reasons for the same from amongst those given below: i) The amount of time and effort put in by the student is not sufficient; ii) The amount of work put in by the student is not adequate iii) The report does not represent the actual work that was done / expected to be done; iii) Any other objection (Please elaborate) **General points for the seminar** 1. The report should be typed on A4 sheet. The Paper should be of 70-90 GSM. 2. Each page should have minimum margins as under a. Left 1.5 inches b. Right 0.5 Inches c. Top 1 Inch d. Bottom 1 Inch (Excluding Footer, If any) 3. The printing should be only on one side of the paper 4. The font for normal text should Times New Roman, 12 size for text and 14 size for heading and should be typed in double space. The references may be printed in Italics or in a different font. 5. The Total Report should not exceed 30 pages including top cover and blank pages.	

	6. One copy completed in all respect as given above is to be submitted to the guide. That will be kept in departmental/University Library. 7. The power point presentation should not exceed 15 minutes which include 5 minutes for discussion/Viva. Seminar will be evaluated out of total 100 marks. In Internal Evaluation marks will be awarded out of 50 and in external evaluation also marks will be awarded out of 50 on the basis of vivavoce. Internal evaluation will be exercised by the Internal Evaluation Committee of college.	
Guidelines for Project:	Students will have to undergo industrial training of six weeks in any industry or reputed organization after the IV semester examination in summer. 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 prepare an exhaustive technical report of the training during the V semester which will be duly signed by the officer under whom training was undertaken 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 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 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.** 1. After completion of this course students will gain industrial experience of developing software or web based applications to solve real time problems of customers. 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: TMUGA301	**Specialization- CTIS** **B.Tech.- Semester-III** **Foundation in Quantitative Aptitude (Value Added Course)**	**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 relation, Ranking and 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.**	

Additional electronic reference material:	• https://www.indiabix.com/aptitude/questions-and-answers/	

Evaluation Scheme for Quantitative Aptitude Skill Enhancement:-

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

a. 20 marks best 2 out of CT1 + CT2 + CT3
b. 10 marks will be for Assignments.
c. 10 marks for attendance and practice sheets, at the end of semester, will be provided in the following manner.
d. 60 marks for final external exams.

S No	% Attendance <	Marks
1.	0-10	1
2.	10 -20	2
3.	20- 30	3
4.	30-40	4
5.	40-50	5
6.	50-60	6
7.	60 – 70	7
8.	70 – 80	8
9.	80 – 90	9
10.	90-100	10

From {CT 1, CT 2 and CT 3} Best 2 CT's Score (20) + Final External exam (60) + Attendance (10)+ Assignment(10) = 100 marks

Course Code: ICS401	**Specialization- CTIS** **B.Tech.- Semester-IV** **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 basic concepts of database management system.	
CO2.	Understanding the concepts DBMS and RDBMS.	
CO3.	Understanding various Structure Query Languages and various Normal forms to carry out Schema refinement.	
CO4.	Understanding various concurrency control protocols.	
CO5.	Creating Entity-Relationship Model for enterprise level databases.	
Course Content:		
Unit-1:	**Introduction: Purpose of Database System –-** Views of data – Data Models – Database Languages — Database System Architecture – Database users and Administrator – Entity– Relationship model (E-R model) – E-R Diagrams -- Introduction to relational databases	**8 Hours**
Unit-2:	**Relational Model**:The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals.	**8 Hours**
Unit-3:	Oracle data types, Data Constraints, Column level & table Level Constraints, working with Tables. Defining different constraints on the table, Defining Integrity Constraints in the ALTER TABLE Command, Select Command, Logical Operator, Range Searching, Pattern Matching, Oracle Function, Grouping data from Tables in SQL, Manipulation Data in SQL. Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), Sub queries Union, intersect & Minus Clause, Creating view, Renaming the Column of a view, Granting Permissions, - Updating, Selection, Destroying view Creating Indexes, Creating and managing User Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases	**8 Hours**
Unit-4:	**Database Design**: Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce Codd Normal Form-Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.	**8 Hours**
Unit-5:	**Transactions**:Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit -	**8 Hours**

	Save Points – SQL Facilities for recovery –Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Deadlock- Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency.	
Text Books:	1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Fifth Edition, Tata McGraw Hill, 2006	
Reference Books:	1. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2003. 2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson/Addision Wesley, 2007. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.javatpoint.com/dbms-tutorial 2. http://www.ddegjust.ac.in/studymaterial/mca-3/ms-11.pdf	

Course Code: ICS402	**Specialization- CTIS** **B.Tech.- Semester-IV** **Python Programming**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic concepts of python programming.	
CO2.	Understanding the concepts of Python statements and expressions.	
CO3.	Understanding Python data structures – lists, tuples & dictionaries.	
CO4.	Applying control flow and functions concept in Python for solving problems.	
CO5.	Applying files, exception, modules and packages in Python for solving problems.	
Course Content:		
Unit-1:	**Introduction to Python Environment** History and development of Python, Why Python? Grasping Python's core philosophy, Discovering present and future development goals, Working with Python : Getting a taste of the language, Understanding the need for indentation, Working at the command line or in the IDE, Visualizing Power, Using the Python Ecosystem for Data Science, Accessing scientific tools using SciPy, Performing fundamental scientific computing using NumPy, Performing data analysis using pandas, Implementing machine learning using Scikit- learn, Plotting the data using matplotlib, Parsing HTML documents using Beautiful Soup, Setting Up Python for Data Science, Getting Continuum Analytics Anaconda, Getting Enthought Canopy Express, Getting pythonxy, Getting WinPython, Installing Anaconda on Windows, Linux and MAC.	**8 Hours**
Unit-2:	**Data Structures, Looping and Branching** Working with Numbers and Logic, Performing variable assignments, Doing arithmetic, Comparing data using Boolean expressions, Creating and Using Strings, Interacting with Dates, Creating and Using Functions, Calling functions in a variety of ways, Using Conditional and Loop Statements, Making decisions using the if statement, Choosing between multiple options using nested decisions, Performing repetitive tasks using for, Using the while statement, Storing Data Using Sets, Lists, and Tuples : Performing operations on sets, Working with lists, Creating and using Tuples, Defining Useful Iterators, Indexing Data Using Dictionaries.	**8 Hours**
Unit-3:	**Data Management** Working with Real Data, Working with Real Data, Uploading small amounts of data into memory, Streaming large amounts of data into memory, Sampling data, Accessing Data in Structured Flat- File Form, Sending Data in Unstructured File	**8 Hours**

	Form, Managing Data from Relational Databases, Interacting with Data from NoSQL Databases, Accessing Data from the Web, Juggling between NumPy and pandas, Validating Your Data, Removing duplicates, Manipulating Categorical Variables, Dealing with Dates in Your Data, Dealing with Missing Data, Slicing and Dicing: Filtering and Selecting Data, Concatenating and Transforming Working with HTML Pages, Working with Raw Text, Working with Graph Data.	
Unit-4:	**Data Transformation** Understanding classes in Scikit- learn, Playing with Scikit- learn, Defining applications for data science, Performing the Hashing Trick, Using hash functions, Demonstrating the hashing trick, Working with deterministic selection, Considering Timing and Performance, Benchmarking with timeit, Working with the memory profiler, Performing multicore parallelism, Demonstrating multiprocessing.	**8 Hours**
Unit-5:	**Python for Statistics** Exploring Data Analysis, The EDA Approach, Defining Descriptive Statistics for Numeric Data, Measuring central tendency, Measuring variance and range, Working with percentiles, Defining measures of normality, Counting for Categorical Data, Understanding frequencies, Creating contingency tables, Creating Applied Visualization for EDA, Inspecting boxplots, Performing t- tests after boxplots, Observing parallel coordinates, Graphing distributions, Plotting scatterplots, Using covariance and correlation, Using nonparametric correlation, Considering chi-square for tables, Using the normal distribution, Creating a Z- score standardization, Transforming other notable distributions, Detecting Outliers in Data, Clustering, Reducing dimensionality.	**8 Hours**
Text Books:	1. Python for Data Science for Dummies - Luca Massaron and John Paul Mueller, John Wiley & Sons, Inc.	
Reference Books:	1. Python for Data Analysis - Wes McKinney, O'Reilly Media, Inc. 2. Data Science from Scratch - Joel Grus, O'Reilly Media, Inc. 3. Python Scripting for Computational Science - Hans Petter Langtangen *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.tutorialspoint.com/python_data_science/index.htm 2. http://dl.booktolearn.com/ebooks2/computer/python/9781498742092_Data_Science_and_Analytics_with_Python_2b29.pdf	

Course Code: ICS403	Specialization- CTIS B.Tech.- Semester-IV **Computer Networks**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of Network fundamentals.	
CO2.	Understanding the basics of Network Devices and their uses.	
CO3.	Understanding the concepts of various Network Layers and its importance.	
CO4.	Understanding the various Network Technologies and Topologies.	
CO5.	Understanding Network Operating Systems and Troubleshooting Network.	
Course Content:		
Unit-1:	**Networking Fundamentals** Basics of Network & Networking, Advantages of Networking, Types of Networks, Network Terms- Host, Workstations, Server, Client, Node, Types of Network Architecture- Peer-to-Peer & Client/Server, Workgroup Vs. Domain. Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology, Types of Transmission Media, Communication Modes, Wiring Standards and Cabling- straight through cable, crossover cable, rollover cable, media connectors (Fibre optic, Coaxial, and TP etc.) Introduction of OSI model, Seven layers of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, TCP, UDP, IP, ICMP, ARP/RARP, Comparison between OSI model & TCP/IP model. Overview of Ethernet Addresses	**8 Hours**
Unit-2:	**Basics of Network Devices** Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, And Other Networking Devices, Repeater, CSU/DSU, and modem, Data Link Layer: Ethernet, Ethernet standards, Ethernet Components, Point-to-Point Protocol(PPP),PPP standards, Address Resolution Protocol, Message format, transactions, Wireless Networking: Wireless Technology, Benefits of Wireless Technology, Types of Wireless Networks: Ad-hoc mode, Infrastructure mode, Wireless network Components: Wireless Access Points, Wireless NICs, wireless LAN standards: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, wireless LAN modulation techniques, wireless security Protocols: WEP,WPA, 802.1X, Installing a wireless LAN.	**8 Hours**

Unit-3:	**Basics of Network, Transport and Application Layers** Network Layer: Internet Protocol (IP), IP standards, versions, functions, IPv4 addressing, IPv4 address Classes, IPv4 address types, Subnet Mask, Default Gateway, Public & Private IP Address, methods of assigning IP address, IPv6 address, types, assignment, Data encapsulation, The IPv4 Datagram Format, The IPv6 Datagram Format, Internet Control Message Protocol (ICMP), ICMPv4, ICMPv6, Internet Group Management Protocol (IGMP),Introduction to Routing and Switching concepts, Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets, Application Layer: DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3/IMAP, NTP	**8 Hours**
Unit-4:	**WAN Technology** What Is a WAN?, WAN Switching, WAN Switching techniques Circuit Switching, Packet Switching etc., Connecting to the Internet : PSTN, ISDN, DSL, CATV, Satellite-Based Services, Last Mile Fiber, Cellular Technologies, Connecting LANs : Leased Lines, SONET/SDH, Packet Switching, Remote Access: Dial-up Remote Access, Virtual Private Networking, SSL VPN, Remote Terminal Emulation, Network security: Authentication and Authorization, Tunneling and Encryption Protocols, IPSec, SSL and TLS, Firewall, Other Security Appliances, Security Threats	**8 Hours**
Unit-5:	**Network Operating Systems and Troubleshooting Network** Network Operating Systems: Microsoft Operating Systems, Novell NetWare, UNIX and Linux Operating Systems, Macintosh Networking, Trouble Shooting Networks: Command-Line interface Tools, Network and Internet Troubleshooting, Basic Network Troubleshooting : Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution, Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools.	**8 Hours**
Text Books:	1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011	
Reference Books:	1. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008 2. CCNA Exploration Course Booklet: Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010. 3. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013 *** Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material	1. https://www.javatpoint.com/computer-network-tutorial 2. https://www.geeksforgeeks.org/computer-network-tutorials/ 3. https://www.youtube.com/watch?v=QKfk7YFILws	

Course Code: ICS404	Specialization- CTIS B.Tech.- Semester-IV **Operating Systems**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the fundamental concepts in Operating system	
CO2.	Understanding evolution of OS over the years and different components of OS	
CO3.	Understanding the significant functions of OS like Process management, storage and memory management etc.	
CO4.	Understanding the necessary information of the OS while developing programs, working with applications and etc.	
CO5.	Analysing the different type of Operating System and their working.	
Course Content:		
Unit-1:	**Introduction to Operating System** Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines	**8 Hours**
Unit-2:	**Process Management** **Processes**: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. **Threads:** Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models. **Process Synchronization:** Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions **Deadlocks:** System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	**8 Hours**
Unit-3:	**Storage Management** **Memory Management**: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. **Virtual Management**: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation **File-System Interface**: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics.	**8 Hours**
Unit-4:	**File-System Implementation**:	**8 Hours**

	File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery **Disk Managemen**t: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation	
Unit-5:	**Protection and Security** **Protection**: Goals of Protection, Domain of Protection, Access Matrix, and Implementation of Acess Matrix, Revocation of Access Rights, Capability- Based Systems, and Language – Based Protection. **Security:** Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.	**8 Hours**
Text Books:	1. Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992. 2. Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education. 3. Silberschatz / Galvin / Gagne, Operating System,6thEdition,WSE (WILEY Publication)	
Reference Books:	1. William Stallings, Operating System, 4th Edition, Pearson Education. 2. H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education 3. Nutt: Operating Systems, 3/e Pearson Education 2004.. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.javatpoint.com/os-tutorial 2. http://mailamtamilartscollege.com/EContent/ComputerScience/OPERATING-SYSTEM.pdf	

Course Code: **TMUGE401**	**Specialization- CTIS** **B.Tech.- 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.	Analysing different types of interviews.	
CO6.	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** i. Proposal: Significance, Types, Structure & AIDA ii. 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 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:	1. Raman Meenakshi & Sharma Sangeeta, *"Technical Communication-Principles & Practice"* Oxford University Press, New Delhi. 2. Mohan K. & Sharma R.C., "*Business Correspondence of Report Writing",*TMH, New Delhi. 3. Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. 4. Kumar Sanjay &Pushplata "*Communication Skills*" Oxford University Press, New Delhi. 5. Agrawal, Malti "*Professional Communication*" KrishanaPrakashan Media (P) Ltd. Meerut. *** Latest editions of all the suggested books are recommended.**	
Additional	1. https://www.languagetutorial.org/learn-english/	

Electronic Reference Material	2. https://www.talkenglish.com/speaking/listbasics.aspx	

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: ICS451	Specialization- CTIS B.Tech.- Semester-IV **Database Management System (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the database language commands to create simple database.	
CO2.	Understanding the database using queries to retrieve records.	
CO3.	Understanding PL/SQL Commands for processing database.	
CO4.	Applying the JOIN, UNION and GROUPBY techniques in DBMS operation.	
CO5.	Creating solutions using database concepts for real time requirements.	
Course Content:		
List of Experiments:	1. Create User in Oracle Database and grant and revoke the privileges and use of commit save point role back command. 2. Create the following: • Synonym sequences and Index • Create alter and update views. 3. Create PL/SQL program using cursors, control structure, exception handling 4. Create following: • Simple Triggers • Package using procedures and functions. 5. Create the table for • COMPANY database • STUDENT database and Insert five records for each attribute. 6. Illustrate the use of SELECT statement 7. Conditional retrieval - WHERE clause 8. Query sorted - ORDER BY clause 9. Perform following: • UNION, INTERSECTION and MINUS operations on tables. • UPDATE, ALTER, DELETE, DROP operations on tables 10. Query multiple tables using JOIN operation. 11. Grouping the result of query - GROUP BY clause and HAVING clause 12. Query multiple tables using NATURAL and OUTER JOIN operation	

Course Code: ICS452	Specialization- CTIS B.Tech.- Semester-IV **Python Programming (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding various solutions to simple computational problems using Python programs.	
CO2.	Applying conditional statements and loops in Python to Solving problems.	
CO3.	Applying various python programming concept to design GUI application.	
	Creating Python programs by defining functions and calling them.	
CO4.	Creating Python lists, tuples and dictionaries for representing compound data.	
Course Content:		
List of Experiments:	1. Write a python code to find given number is prime or not 2. Write a python code to find LCM and GCM of a given list 3. Write a python code to find mean and standard deviation of a given list of numbers 4. Write a python code to add and delete element from a dictionary using functions 5. Write a python code to print 10 student details using class and lists 6. Write a python code to find student from a given list using class 7. Write a python code to inherit employee class to student class 8. Write a python code to build simple GUI calculator 9. Write a python code to build web page with student registration form 10. Write a python code to build web pages with sign-in and sing-up forms 11. Write a python code to build Rest api for product 12. Write a python code to build Ajax enabled web application for product	

Course Code: ICS405	**Professional Elective Courses - I** **Specialization- CTIS** **B.Tech.- Semester-IV** **Server Side Scripting**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of Server side scripting.	
CO2.	Understanding about various technologies use to design server side application.	
CO3.	Understanding the concepts of various databases use for dynamic web application.	
CO4.	Applying the Node.js functions to design application.	
CO5.	Analyzing the various Node.js Frameworks.	
Course Content:		
Unit-1:	**Introduction** The capabilities of Node.js, Why should you use Node.js?, Threaded versus event-driven architecture, Embracing advances in the JavaScript language, Node.js-the micro service architecture and easily testable systems, Node.js and Twelve-Factor app model, System requirements, Installing Node.js using package managers, Editors and debuggers, Running and testing commands.	**8 Hours**
Unit-2:	**Modules, HTTP Servers and Clients** Defining a module, Finding and loading CommonJS and JSON modules using require, Finding and loading ES6 modules using import, Hybrid CommonJS/Node.js/ES6 module scenarios, npm- the Node.js package management system, The yarn package management system, HTTP Servers and Clients, Sending and receiving events with EventEmitters, HTTP server application, ES2015 multiline and template strings, Web application frameworks, Getting started with Express, Calculating the Fibonacci sequence with an Express application, Making HTTP Client requests.	**8 Hours**
Unit-3:	**Application Design** Promises, async functions, and Express router functions, Express and the MVC paradigm, Creating the Notes application, Theming your Express application, Scaling up; running multiple Notes instances, Problem; the Notes app isn't mobile friendly, Mobile-first paradigm, Using Twitter Bootstrap on the Notes application, Flexbox and CSS Grids, Mobile-first design for the Notes application, Building a customized Bootstrap	**8 Hours**
Unit-4:	**Data Storage, Authentication and Dynamic Interaction** Data storage and asynchronous code, Logging, Using the ES6 module format, Storing notes in the file system, Storing notes with the Level UP data store, Storing notes in SQL with	**8 Hours**

	SQLite3, Storing notes the ORM way with Sequelize, Storing notes in MongoDB, Creating a user information micro service, Securely keeping secrets and passwords, The Notes application stack, Introducing Socket.IO, Initializing Socket.IO with Express, Real-time updates on the Notes homepage, Inter-user chat and commenting for Notes	
Unit-5:	**Deploying and Testing** Notes application architecture and deployment considerations, Traditional Linux Node.js service deployment, Node.js micro service deployment with Docker, Assert – the basis of testing methodologies, Testing a Notes model, Using Docker to manage test infrastructure, Testing REST backend services, Automating test results reporting, Frontend headless browser testing with Puppeteer.	**8 Hours**
Text Books:	1. David Herron, "Node.js Web Development", Fourth Edition, 2018	
Reference Books:	1. Ethan Brown, "Web Development with Node and Express", 2014 2. Node.js Complete Reference Guide by Valentin Bojinov, David Herron, Diogo Resende December 2018,Packt Publishing *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://developer.mozilla.org/enUS/docs/Learn/Serverside/First_steps/Introduction 2. http://w3schools.sinsixx.com/web/web_scripting.asp@output=print.htm	

Course Code: **ICS406**	**Professional Elective Courses - I** **Specialization- CTIS** **B.Tech.- Semester-IV** **Linux Shell Scripting**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of Shell Scripting and basic commands.	
CO2.	Understanding the concepts of Process management and monitoring tools.	
CO3.	Understanding the concepts of Arithmetic Operations in Shell Scripts.	
CO4.	Applying variables in a shell script to make program interactive.	
CO5.	Applying the concepts of loops and Functions to develop scripts.	
Course Content:		
Unit-1:	**Introduction to Shell Scripting** Working with Shell Scripting: Comparison of shells, Tasks done by shell, Working in shell, Learning basic Linux commands, Our first script – Hello World, Compiler and interpreter – difference in process, When not to use scripts, Various directories, Working more effectively with shell – basic commands, Working with permissions. Process Management, Job Control, and Automation: Introducing process basics, Monitoring processes using ps, Process management, Process monitoring tools – top, iostat, and vmstat, Understanding "at", Understanding "crontab".	**8 Hours**
Unit-2:	**Expressions and Variables** Text Processing and Filters in Your Scripts: Text filtering tools, IO redirection, Pattern matching with the vi editor 46 Pattern searching using grep. Working with Commands: Learning shell interpretation of commands, Command substitution, Command separators, Logical operators, pipes. Exploring Expressions and Variables: Understanding variables, Working with environment variables, Working with read-only variables, Working with command line arguments (special variables, set and shift, getopt), Understanding getopts, Understanding default parameters, Working with arrays.	**8 Hours**
Unit-3:	**Operators and Operations in Shell Scripts** Tricks with Shell Scripting: Interactive Shell scripts – reading user input,	**8 Hours**

	The here document and the << operator, The here string and the <<< operator, File handling, Debugging. Performing Arithmetic Operations in Shell Scripts: Using a command declare for arithmetic, Using the let command for arithmetic, Using the expr command for arithmetic, Binary, octal, and hex arithmetic operations, A floating-point arithmetic.	
Unit-4:	**Working with loops and Functions** Automating Decision Making in Scripts: Checking the exit status of commands, Understanding the test command, Conditional constructs – if else, Switching case, Implementing simple menus with select, Looping with the for command, Exiting from the current loop iteration with the continue command, Exiting from a loop with a break, Working with the do while loop, Using until, Piping the output of a loop to a Linux command, Running loops in the background, The IFS and loops. Working with Functions: Understanding functions, Passing arguments or parameters to functions, Sharing the data by many functions, Declaring local variables in functions, Returning information from functions, Running functions in the background, Creating a library of functions.	**8 Hours**
Unit-5:	**Advanced Scripting** Using Advanced Functionality in Scripts: Understanding signals and traps, Using the trap command, Ignoring signals, Using traps in function, Running scripts or processes even if the user logs out, Creating dialog boxes with the dialog utility. System Startup and Customizing a Linux System: System startup, inittab, and run levels, User initialization scripts. Pattern Matching and Regular Expressions with sed and awk: The basics of regular expressions, sed – noninteractive stream editor, Using awk.	**8 Hours**
Text Books:	1. Learning Linux Shell Scripting 2nd Edition by Ganesh Sanjiv Naik (Author)	
Reference Books:	3. Mastering Linux Shell Scripting Second Edition by Mokhtar Ebrahim Andrew Mallett 4. The Linux Command Line, 2nd Edition A Complete Introduction William Shotts,2019 *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. http://linuxcommand.org/lc3_writing_shell_scripts.php 2. https://www.shellscript.sh/first.html 3.https://www.guru99.com/introduction-to-shell-scripting.html	

Course Code: TMUGA-401	**Specialization- CTIS** **BTech- Semester-IV** **Analytical Reasoning** **(Value Added Course)**	**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 Syllogisms and 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.**	
Additional Electronic Reference Material:	• https://www.tutorialspoint.com/reasoning/reasoning_analytical.htm • https://www.wiziq.com/tutorials/analytical-reasoning	

Evaluation Scheme for Quantitative Aptitude Skill Enhancement:-

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

a. 20 marks best 2 out of CT1 + CT2 + CT3
b. 10 marks will be for Assignments.
c. 10 marks for attendance and practice sheets, at the end of semester, will be provided in the following manner.
d. 60 marks for final external exams.

S No	% Attendance <	Marks
1.	0-10	1
2.	10 -20	2
3.	20- 30	3
4.	30-40	4
5.	40-50	5
6.	50-60	6
7.	60 – 70	7
8.	70 – 80	8
9.	80 – 90	9
10.	90-100	10

From {CT 1, CT 2 and CT 3} Best 2 CT's Score (20) + Final External exam (60) + Attendance (10)+ Assignment(10) = 100 marks

Course Code: ICS501	**Specialization- CTIS** **B.Tech- Semester-V** **Knowledge Representation and Reasoning**	**L-3 T-0 P-0 C-3**
Course Objective:	**On completion of the course, the students will be :**	
CO1.	Understanding the key concepts of knowledge representation.	
CO2.	Understanding the concepts of knowledge representation techniques and different notations.	
CO3.	Understanding about ontologies as a KR paradigm and applications of ontologies.	
CO4.	Applying various KR techniques for problem solving.	
CO5.	Analyzing the various theorem used in KR and Statistical analysis.	
Course Content:		
Unit-1:	**The Key Concepts &Logical Agents:** Knowledge- Representation- Reasoning- Why knowledge representation and reasoning-Role of logic- Historical background of Logic-Representing knowledge in logic- Varieties of logic-Name-Type-Measures-Unity Amidst diversity. Knowledge Based Agents-Propositional Logic: Syntax -Semantics -A Simple Knowledge Base –Inference-Equivalence, Validity, And Satisfiability .Reasoning Patterns In Propositional Logic-Resolution-Forward And Backward Chaining .Effective Propositional Inference-A Complete Backtrack Lung Algorithm -Local-Search Algorithms-Hard Satisfiability Problems. Agents Based On Propositional Logic.	**8 Hours**
Unit-2:	**First Order Logic:** Syntax And Semantics Of First Order Logic-Models For First-Order Logic-Symbols And Interpretations –Terms-Atomic Sentences -Complex Sentences –Quantifiers-Equality .Using First-Order Logic-Assertions And Queries In First-Order Logic-The Kinship Domain -Numbers, Sets, And Lists-The Wumpus World .Knowledge Engineering In First-Order Logic-The Knowledge Engineering Process -The Electronic Circuits Domain	**8 Hours**
Unit-3:	Propositional Vs. First-Order Inference-Inference Rules For Quantifiers-Reduction To Propositional Inference-Unification And Lifting-A First-Order Inference Rule-Unification-Storage And Retrieval .Forward Chaining-First-Order Definite Clauses-A Simple Forward-Chaining Algorithm-Efficient Forward Chaining .Backward Chaining-A Backward Chaining Algorithm-Logic Programming- Implementation Of Logic Programs -Redundant Inference And Infinite Loops-Constraint Logic Programming-Resolution-Conjunctive Normal Form For First-Order Logic-The Resolution Inference Rule-Completeness Of Resolution-Dealing With Equality-Resolution Strategies-Theorem Provers.	**8 Hours**
Unit-4:	**Ontology &Processes and Contexts:** Ontological Engineering-Ontological categories,-Philosophical background,-Top-level categories,-Describing physical entities- Defining abstractions- Sets-Collections- Types and Categories- Space and Time. Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change. Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.	**8 Hours**
Unit-5:	**Statistical Reasoning & Knowledge Representation:** Introduction-Probability and Bayes theorem-Advantage and disadvantages of Bayes theorem -Rule based system-Bayes network-Dempster shafer theory-Fuzzy logic-knowledge representation issues-Symbolic reasoning under uncertainty-Non-monotonic reasoning introduction. Categories and Objects -Actions, Situations. And Events -The Ontology Of Situation	**8 Hours**

	Calculus -Describing Actions In Situation Calculus-Solving The Representational Frame Problem -Solving The Inferential Frame Problem-Time And Event Calculus-Generalized Events-Processes-Intervals- Fluents And Objects-A Formal Theory Of Beliefs-Knowledge And Belief-Knowledge Time And Action-The Internet Shopping World-Reasoning Systems For Categories-Semantic Networks-Description Logics-Reasoning With Default Information.	
Text Books:	1. "Artificial Intelligence A Modern Approach", Second Edition By Russell S., Norvig P	
Reference Books:	1. Artificial-Intelligence-By-Rich-And-Knight. 2. F. Van Harmelen, V. Lifschitz, And B. Poter, Handbook Of Knowledge Representation, Elsevier, Amsterdam, 2008. 3. D. Poole, Artificial Intelligence: Foundations Of Computational Agents, Cambridge University. 4. Ronald j.Brachman, Hector j, Levesque : knowledge Representation and Reasoning, Morgan Kaufmann, 2004 *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://web.stanford.edu/class/cs227/Lectures/lec01.pdf 2. https://www.cs.ru.nl/P.Lucas/teaching/KeR/ 3.https://www.cin.ufpe.br/~mtcfa/files/in1122/Knowledge%20Representation%20and%20Reasoning.pdf	

Course Code: **ICS502**	**Specialization- CTIS** **B.Tech- Semester-V** **Theory of Computation**	**L-3** **T-0** **P-0** **C-3**
Course Outcome:	**On completion of the course, the students will be :**	
CO1.	Understanding the mathematical models for representing finite state systems.	
CO2.	Understanding the various applications of regular expressions and the properties of regular languages.	
CO3.	Understanding the concepts of PDA.	
CO4.	Applying the parse trees and analyze the ambiguity of grammar.	
CO5.	Applying the various grammars to design computational machine.	
Course Content:		
Unit-1:	**Introduction to Finite Automata**: Introduction to finite automata, the central concepts of automata theory, Deterministic finite automata – definition, how a DFA processes strings, notations for DFA's Non-deterministic finite automata – definition, extended transition function, the language of an NFA **Finite Automata, Regular Expressions: An application** – Text search, finding strings in a Text, NFA for text search, a DFA to recognize a set of keywords, Finite automata with Epsilon transitions, exercise problems, Finite automata and regular expressions - from DFA's to regular expressions, converting DFA's to regular expressions by eliminating states, Applications of regular expressions	**8 Hours**
Unit-2:	**Regular languages, Properties of Regular Languages:** Regular Languages, Applications of regular expressions, properties of regular languages- proving languages not to be regular, the pumping lemma for regular languages , Closure properties of regular languages – closure of regular languages under Boolean operations-union, complementation, intersection & difference , Equivalence and minimization of automata	**8 Hours**
Unit-3:	**Context free grammars and languages**: Definition of context-free grammars, derivations using a grammar, leftmost and rightmost derivations, the language of a grammar and sentential forms, exercise problems, Parse trees – constructing a parse tree, the yield of a parse tree, inference, derivations and parse trees, Applications of context free grammars – Markup languages, XML and document-type definitions, Ambiguity in grammars and languages – ambiguous grammars. **Properties of context free languages**: Normal forms for context free grammars – eliminating useless symbols, computing the generating and reachable symbols, Eliminating-productions, eliminating unit productions, Chomsky normal form (CNF), exercise problems, The pumping lemma for context free languages, Closure properties of context free languages.	**8 Hours**
Unit-4:	**Pushdown automat**e: The languages of a PDA – acceptance by final state, acceptance by empty stack Informal introduction, formal definition of PDA, a graphical notation for PDA's, The languages of a PDA – from empty stack to final state, from final state to empty stack, Equivalence of PDA's and CFG's – from grammars to PDA, from PDA's to grammars	**8 Hours**

Unit-5:	**Introduction to Turing machines:** Problems that computers cannot solve, The Turing machine the quest to decide all mathematical questions, notation for the Turing machine, instantaneous descriptions for Turing machines, Programming techniques for Turing machines – storage in the state, multiple subroutines, exercises tracks **Undecidable:** A language that is not recursively enumerable, an undecidable problem that is RE, Post's correspondence problem, other undecidable problems, Exercises	**8 Hours**
Text Books:	1. Introduction to Automata theory, Languages and Computation, John E. Hopcroft, Rajeev Motwani Jeffery D. Ullman, Third Edition Pearson education. 2007	
Reference Books:	**1.** Fundamentals of the Theory of computation, Principles and Practice, Raymond Greenlaw, H. James Hoover, Morgan Kaufmann,1998 **2.** Introduction to languages and theory of computation, John Martin, , Tata McGraw Hill, 2007 **3.** Introduction to Computer theory, Daniel I A Cohen, 2nd Edition, John Wiley & Sons. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	**1. https://www.javatpoint.com/automata-tutorial** **2. https://www.includehelp.com/toc/** **3. https://www.youtube.com/playlist?list=PLz8TdOA7NTzTdFM93ak-qBVpX1aMFuw9c**	

Course Code: **ICS503**	**Specialization- CTIS** **B.Tech- Semester-V** **Information and Network Security**	**L-3** **T-0** **P-0** **C-3**
Course Outcome:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of IT security, Threats, Vulnerabilities, Impact and control measures.	
CO2.	Understanding the concepts of network security and identifying common issues.	
CO3.	Applying various algorithms and processes used in cryptography for authenticating users, securing information and communication.	
CO4.	Analysing the importance of asset management and Digital Rights Management.	
CO5.	Creating the security policies and access controls for an organization.	
Course Content:		
Unit-1:	**Introduction to Information Security**: Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System; Balancing Information Security and Access; Implementing IT Security, The System Development Life cycle, Security professional in the organization	**8 Hours**
Unit-2:	**Network Security:** Basic concept of network security: Computer security, Network security, Trusted and untrusted networks, unknown attack, network attack. Securing computer network: Hardware, Software. Forms of protection. VPN Security: need of VPN, role of VPN for an enterprise, use of tunnelling with VPN, working with VPN, authentication mechanism in VPN, types of VPN and their usage Network Security Issues and Vulnerabilities, Security best practices	**8 Hours**
Unit-3:	Network attacks, Need for intrusion monitoring and detection, intrusion detection for information system security: intrusion detection methodologies, categories of IDS, characteristics of IDS, role of router in IDS, challenges for IDS, implementing IDS, future of IDS. Examining firewall in the context of IDS, Network Intrusion Prevention, IPS signature categories, IPS system configuration	**8 Hours**
Unit-4:	**Introduction to Cryptography**: Introduction to Cryptography and Cryptanalysis, Classical Encryption Techniques – Substitution Techniques, Transposition Techniques, Permutation Method. Advanced Encryption Techniques and Security Issues – RC4, One-time Pad, RSA, DES, Triple DES, AES and Diffie Hellman	**8 Hours**
Unit-5:	**Access Control:** User Identity and Access Management- Account Authorization, Access and Privilege Management, System and Network Access Control. Operating Systems Access Controls, Monitoring Systems Access Controls, Intrusion Detection System, Event logging, Cryptography. Physical Security: Identify Assets to be Protected, Perimeter Security, Firewalls, Prevention and Detection Systems, Safe Disposal of Physical Assets. Email Security: PGP, MIME, IP Security: IP security overview, Case study.	**8 Hours**
Text Books:	1. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009).	
Reference Books:	1. Information Security Risk Analysis- Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012. 2. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013).	

	3. Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 5 editions (2015). 4. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008 ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.forcepoint.com/cyber-edu/network-security 2. https://www.cisco.com/c/en_in/products/security/what-is-network-security.html	

Course Code: ICS504	**Specialization- CTIS** **B.Tech- Semester-V** **Principle of Virtualisation**	**L-3 T-0 P-0 C-3**
Course Outcome:	**On completion of the course, the students will be :**	
CO1.	Understanding the concept of Virtualization and its need.	
CO2.	Understanding the various Virtualization Techniques.	
CO3.	Understanding configuration of various applications used for Virtualization.	
CO4.	Applying System Settings to implement Virtualization.	
CO5.	Creating Virtual machines and client settings.	
Course Content:		
Unit-1:	**Basics of Virtualization:** Understanding Virtualization, Need of Virtualization and Virtualization Technologies: Server Virtualization, Storage Virtualization, I/O Virtualization, Network Virtualization, Client Virtualization, Application virtualization, Desktop virtualization, Understanding Virtualization Uses: Studying Server Consolidation, Development and Test Environments , Helping with Disaster Recovery	**8 Hours**
Unit-2:	**Deploying and Managing an Enterprise Desktop Virtualization Environment**: configure the BIOS to support hardware virtualization; Install and configure Windows Virtual PC: installing Windows Virtual PC on various platforms (32-bit, 64-bit), creating and managing virtual hard disks, configuring virtual machine resources including network resources, preparing host machines; create, deploy, and maintain images	**8 Hours**
Unit-3:	**Deploying and Managing a Presentation Virtualization Environment:** Prepare and manage remote applications: configuring application sharing, package applications for deployment by using RemoteApp, installing and configuring the RD Session Host Role Service on the server	**8 Hours**
Unit-4:	**Accessing Published Applications:** Access published applications: configuring Remote Desktop Web Access, configuring role-based application provisioning, configuring Remote Desktop client connections. Configure client settings to access virtualized desktops: configuring client settings	**8 Hours**
Unit-5:	**Understanding Virtualization Software:** List of virtualization Software available .VMware- introduction to VSphere, ESXi, VCenter Server and Vsphere client. Creating Virtual Machine.. Introduction to HYPER-V role. Create Virtual Machines. Create Hyper-v virtual networking, Use virtual Machine Snapshots. Monitor the performance of a Hyper-v server, Citrix XEN Desktop fundamentals	**8 Hours**

Text Books:	**1.** Virtualization with Microsoft Virtual Server 2005 by TwanGrotenhuis, RogierDittner, Aaron Tiensivu, Ken Majors, Geoffrey Green, David Rule, Andy Jones, Matthijs ten Seldam, Syngress Publications, 2006	
Reference Books:	**1.** Virtualization--the complete cornerstone guide to virtualization best practices, Ivanka Menken, Gerard Blokdijk, Lightning Source Incorporated, 2008 2. Virtualization: From the Desktop to the Enterprise, Chris Wolf, Erick M. Halter, EBook, 2005 ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.geeksforgeeks.org/virtualization-cloud-computing-types/ 2.https://www.tutorialspoint.com/virtualization2.0/virtualization2.0_overview.htm	

Course Code: **EHM501**	**Specialization- CTIS** **B. Tech- Semester-V** **HUMAN VALUES & PROFESSIONAL ETHICS**	**L-3** **T-0** **P-0** **C-3**
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.	Analysing 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.	**8 Hours**

	Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	
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 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.	**8 Hours**
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 ek Parichay, 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. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://scanftree.com/tutorial/human-values-professional-ethics/chapter-2/ 2. https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf	

Course Code: **ICS551**	**Specialization- CTIS** **B.Tech- Semester-V** **Information and Network Security (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Outcome:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic concepts of information and network security.	
CO2.	Analyzing Asymmetric and Symmetric Crypto algorithms.	
CO3.	Creating the security policies and configure Firewall for network security.	
CO4.	Creating the security policies and configure of Virtual Private Network and Router.	
CO5.	Creating the security policies and configure Intrusion Detection System.	
List of Experiments:	1. To demonstrate the security policies and configuration of Firewall 2. To demonstrate the security policies and configuration of Virtual Private Network 3. To demonstrate the security policies and configuration of Router 4. To demonstrate the security policies and configuration of Intrusion Detection System 5. To perform Online and Offline Banner Grabbing 6. To perform Port Scanning using Super Scan 7. Active and Passive finger printing using XPROBE2 8. Generate Password Hashes using open SSL 9. Setup a Honeypot and monitor the Honeypot on the Network 10. To perform an experiment to use DUMPSEC 11. Perform an Audit Log Analysis in a Network. 12. Demonstrate Asymmetric, Symmetric Crypto algorithm, Hash and Digital Signature using JCRYPT tool or any other equivalent tool.	

Course Code: **ICS552**	**Specialization- CTIS** **B.Tech- Semester-V** **Principles of Virtualization (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Outcome:	**On completion of the course, the students will be :**	
CO1.	Understanding the working of advanced performance tool.	
CO2.	Applying the tool for testing the performance of CPU and Memory.	
CO3.	Analyzing troubleshooting and monitoring the performance of vSphere Storage.	
CO4.	Creating and configuring Virtual Machines.	
C05.	Creating and configuring ESXi 6.0 Server.	
Course Content:		
List of Experiments:	**Hardware Requirements:** 1. CPU: Intel i5 Processor /AMD [Intel VT/ AMD-V] 2. Network Card: 1Gbps 3. Memory: 16 GB 4. Storage: 500 GB **Software Requirements:** 1. Windows Server 2012 R2/2016 2. ESXi 6.0[Hypervisor] 3. vCenter Server 6.0 4. vSphere Client 5. Google Chrome/ IE with Flash Player installed. 6. VMware PowerCli **Online Labs:** http://docs.hol.vmware.com/ https://labs.hol.vmware.com/HOL/catalogs/catalog/681 **List of Lab Exercises:** 1. Installing and configuring ESXi 6.0 Server 2. Installing and configuring vCenter Server 6.0 3. Creating and configuring Virtual Machines 4. Creating and configuring standard and distributed switch 5. Creating and configuring vSphere storage 6. Installing and upgrading VMware PowerCLI 7. Automate the configuration activities for vCenter Server	

	8. Automate the configuration activities for ESXi Server 9. Automate the configuration activities for Virtual Machines. 10. Troubleshooting and monitoring the performance of vSphere Storage 11. Testing the performance of CPU and Memory 12. Working with advanced performance tool	

Course Code: **ICS553**	**Specialization- CTIS** **B.Tech- Semester-V** **Industrial Training Seminar**	**L-0** **T-0** **P-2** **C-1**
Course Outcome:	**On completion of the course, the students will be :**	
CO1.	Understanding the past and present of the disciplines by exploring their purpose, practice, and philosophy.	
CO2.	Understanding of advanced research methodologies in the field, including theory, interdisciplinary approaches, and the analysis of available primary sources.	
CO3.	Understanding historical and recent trends in theory and method and be able to identify and explain major trends and issues in industry and research.	
CO4.	Understanding the privileges and obligations associated with a career as a professional	
C05.	Demonstrate through short written assignments and critical reviews the ability to synthesize and assess the arguments of scholarly articles and monographs at the level of professionals in the field.	
Course Content:		
	Students will have to undergo industrial training of minimum four weeks in any industry or reputed organization after the IV semester examination in summer. 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 prepare an exhaustive technical report of the training during the V semester which will be duly signed by the officer under whom training was undertaken 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 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 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: **ICS506**	**Professional Elective Courses – II** **Specialization- CTIS** **B.Tech- Semester-V** **Database Administration**	**L-3** **T-0** **P-0** **C-3**
Course Objective:	**On completion of the course, the students will be :**	
CO1.	Understanding the types of SQL Server Editions and Features.	
CO2.	Understanding the Backup types and Disaster Recovery options for SQL Server.	
CO3.	Understanding the types of Indexes and SQL Server protocols.	
CO4.	Understanding the SQL Server agent properties.	
CO5.	Applying the various methods for migration from other platforms.	
Course Content:		
Unit-1:	**Introduction to SQL Server:** Microsoft SQL Server 2017 technology Overview: Understanding SQL Server DE, SQL Server integration services, SQL Server Analysis Services, SQL Server Reporting Services, Machine learning services, SQL Server Agent. Preparing for installation: Edition comparison, Preinstallation tasks, installation options, Checking the completed installation, Understanding SQL Server patching, Post-installation configuration, Creating a performance baseline.	**8 Hours**
Unit-2:	**Backup and Disaster Recovery:** Backup and Recovery: Data structures and transaction logging, Recovery model, Backup types, Advanced backup scenarios, Preparing for restore, Executing restores, SQL Server options for high availability and disaster recovery, Configuring replication on SQL Server, Database mirroring, Log shipping. Securing Your SQL Server: SQL Server service accounts, Authentication and Authorization, Encrypting SQL Server data	**8 Hours**
Unit-3:	**SQL Server Performance and Monitoring:** Indexing and Performance: Activity Monitor, Performance Monitor, SQL Server Profiler and SQL Trace, Extended Events, Data collection, Query Store, Types of indexes, Indexing considerations, SQL Server protocols, Performance monitoring and tuning	**8 Hours**
Unit-4:	**Migration and Automation:** Migration and Upgrade: Migration requirements, Upgrade scenarios, Pre-upgrade checks, Performing the upgrade, Migration from other platforms. Automation: SQL Server Agent service setup, Setting up SQL Server Agent Properties, Database mail setup, Maintenance plan wizard, maintenance plan designer, SQL Server Agent objects,.	**8 Hours**
Unit-5:	**High Availability and In-Memory OLTP:** High Availability Features: Installing Windows Server Failover Cluster, Always On Failover Cluster Instances, Always On Availability Groups. In-Memory OLTP: Data storage differences in OLTP, Request processing differences in OLTP, Cooperation of disk-based and memory-based, In-memory OLTP limitations, Preparing for In-memory OLTP, Creating In-Memory OLTP objects, In-Memory OLTP usage scenarios	**8 Hours**

Text Books:	1. "SQL Server 2017 Administrator's Guide By Marek Chmel, Vladimir Muzny	
Reference Books:	1. Exam Ref 70-764 Administering a SQL Database Infrastructure 1st Edition by Victor Isakov (Author) 2. SQL Server 2017 Administration Inside Out 1st Edition, by William Assaf (Author), Randolph West (Author), Sven Aelterman (Author), Mindy Curnutt (Author) *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.oracletutorial.com/oracle-administration/ 2. https://docs.oracle.com/cd/B10501_01/server.920/a96521/part1.htm 3. https://intellipaat.com/blog/tutorial/oracle-dba-tutorial/ 4. https://www.oracle-dba-online.com/	

Course Code: **ICS507**	**Professional Elective Courses – II** **Specialization- CTIS** **B.Tech- Semester-V** **Storage and Data Center**	**L-3** **T-0** **P-0** **C-3**
Course Objective:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of Storage and Data Center.	
CO2.	Understanding the advantages and functionality of NAS and SAN.	
CO3.	Understanding the concepts of Data Center Consolidation and its phases.	
CO4.	Applying various tools and methods for data Backups and Disaster Recovery.	
CO5.	Analyzing various Storage devices and technologies.	
Course Content:		
Unit-1:	**Introduction to Information Storage:** Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing **Data Center Environment**: Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application **Data Protection (RAID):** RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison.	**8 Hours**
Unit-2:	**Network-Attached Storage:** General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance , File-Level Virtualization. **Fibre Channel Storage Area Networks:**Fibre Channel Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN. **IP SAN and FCoE**: iSCSI, FCIP, FCoE **RAID and Storage Networking Technologies :** Implementation of RAID - Software RAID - Hardware RAID -RAID Array Component -RAID Levels - Striping -Mirroring - RAID Impact on Disk-Performance - Introduction to Direct Attached Storage – Types of DAS – Introduction to SAN – Components of SAN – FC connectivity – FC topologies – Introduction to NAS – NAS components – NAS Implementation – NAS File sharing.	**8 Hours**
Unit-3:	**Introduction to Business Continuity:** Information Availability, BC	**8 Hours**

	Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. **Backup and Archive:** Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture.	
Unit-4:	**Reasons for Data Center Consolidation:** Reasons for Data Center Consolidation, Consolidation Opportunities. **Data Center Consolidation Phases:** Phase 1: Study and Document the Current Environment, Phase 2: Architect the Target Consolidated Environment, Phase 3: Implement the New Architecture, Phase 4: Control and Administer the Consolidated. **Best Practices in IT:** Defining Best Practices, Deploying Best Practices, Benefits of Best Practices, Systems Management Best Practices, Server Cluster Best Practices, Data Storage Best Practices, Network Management Best Practices, Documentation Best Practices, Network Diagram Documentation, Documentation Formats.	**8 Hours**
Unit-5:	**Cluster Architecture:** Asymmetric Two-Node Clusters, Symmetric Two-Node Clusters, Complex Cluster Configurations, Failover Policies, Best Practices. **Cluster Requirements:** Required Hardware Cluster Components, Cluster Software Requirements, What Happens During Service Failover, Cluster Installation Checklist. **Designing Cluster-Friendly Applications**: Automating Operations, Controlling Application Failover Time, Reducing Data Loss During Failover, Minimizing Application Failures, Designing Node-Independent Applications, Minimizing Planned Downtime, Restoring Client Connections	**8 Hours**
Text Books:	1. Information Storage and Management (Storing Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments) 2nd Edition by Soma sundaram Gnana sundaram Alok Shrivastava.	
Reference Books:	1. Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, ISCSI, INFINIB and FOCE by Ulf Troppens. 2. Storage Management in Data Centers: Understanding, Exploiting, Tuning, and Troubleshooting Veritas Storage Foundation by Volker Herminghaus and Albrecht Scriba.	

	3. Blade Servers and Virtualization: Transforming Enterprise Computing While Cutting Costs by Barb Goldworm and Anne Skamarock 4. Administering Data Centers: Servers, Storage, and Voice over IP By KailashJayaswal ISBN-13: 978-0471771838. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.vskills.in/certification/tutorial/cloud-computing/data-center-and-workload-management/ 2. https://whatis.techtarget.com/reference/Data-Center-Learning-Guides	

Course Code: **ICS508**	**Professional Elective Courses – II** **Specialization- CTIS** **B.Tech- Semester-V** **Mobile App Development**	**L-3** **T-0** **P-0** **C-3**
Course Objective:	**On completion of the course, the students will be :**	
CO1.	Understanding the concept of Android OS and Android architecture.	
CO2.	Understanding about Kotlin code to simplify application development.	
CO3.	Analyzing various UI elements of Android app.	
CO4.	Creating menus, alerts and option menus.	
CO5.	Creating a simple android media application.	
Course Content:		
Unit-1:	Introduction, History, Features, Android Architecture, Versions/Evolution, Dalvik VM, Installing Android Studio (latest Version), Android Studio Environment, First Android Application, Application Folder Structure, Manifest file, R.java file, Activity, Activity life cycle, Application Components, Resource Files.	**8 Hours**
Unit-2:	Layout, Linear Layouts, Relative Layout, Table Layout, Constraint Layout, View, TextView, EditText, Button, Events & Listeners, Image Button, floating Button, AutoCompleteTextView, RadioButton, RadioGroup, ToogleButton, CheckBox, Spinner, ProgressBar. Toast, Alert Dialogs, Custom Alert Dialog.	**8 Hours**
Unit-3:	ListView, ArrayAdapter, GridView, TableView, Custom ListView, Menus, Option Menu, Context Menu, Popup Menu TimePicker, DatePicker.	**8 Hours**
Unit-4:	Preferences, Shared Preferences, Internal Storage, External Storage, SQLite Database, Content Providers, Media API, Audio, Video, Camera.	**8 Hours**
Unit-5:	Introduction, Setting Up Kotlin Environment, Data Types, Control Statements, Classes & Objects, Interfaces, Extensions, Generics, Enums, Simple Android App using Kotlin, Unit Testing, Instrumentation Testing, Activity Testing, Publishing App to Google Play Store	**8 Hours**
Text Books:	1. Professional Android 4 Development by Reto Meier, John Wiley and Sons, 2012	
Reference Books:	1. Android Application Development Cookbook, by Wei-Meng Lee, John Wiley and Sons, 2013 2. Beginning Android 4, by Grant Allen, Apress, 2011. 3. Android in Action, Third Edition, by W. Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, 2012. *** Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material	1. https://www.tutorialspoint.com/mobile_development_tutorials.htm 2. https://developer.android.com/training/basics/firstapp 3. http://nohaushop.dk/images/shopdownloadfiles/rad-mobile-tutorials.pdf	

Course Code: TMUGA-501	**Specialization- CTIS** **B.Tech- Semester-V** **Modern Algebra and Data Management** **(Value Added Course)**	**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.**	
Additional Electronic Reference Material	• https://mathcs.clarku.edu/~djoyce/ma225/algebra.pdf • http://www.ddegjust.ac.in/studymaterial/mca-3/ms-11.pdf	

Evaluation Scheme for Quantitative Aptitude Skill Enhancement:-

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

e. 20 marks best 2 out of CT1 + CT2 + CT3
f. 10 marks will be for Assignments.
g. 10 marks for attendance and practice sheets, at the end of semester, will be provided in the following manner.
h. 60 marks for final external exams.

S No	% Attendance <	Marks
11.	0-10	1
12.	10 -20	2
13.	20- 30	3
14.	30-40	4
15.	40-50	5
16.	50-60	6
17.	60 – 70	7
18.	70 – 80	8
19.	80 – 90	9
20.	90-100	10

From {CT 1, CT 2 and CT 3} Best 2 CT's Score (20) + Final External exam (60) + Attendance (10)+ Assignment(10) = 100 marks

Course Code: **TMUGS-501**	**Specialization- CTIS** **BTech- Semester-V** **Managing Self** **(Value Added Course)**	**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**
Text Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education	
Reference Books:	1. Tracy, Brian, Time Management (2018), Manjul Publishing House 2. Hill, Napolean, Think and grow rich (2014), Amazing Reads 3. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub	

	4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Burne, Eric, Games People Play (2010), Penguin UK *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.hloom.com/resumes/creative-templates/ 2. https://www.mbauniverse.com/group-discussion/topic.php 3. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression	

Evaluation Scheme: Faculty led Continuous Evaluation

- Evaluation of **"Managing Self"** and **"Managing Work and Others"** will follow the continuous evaluation method.
- Students will be evaluated on the score of 100 on the pattern prescribed by the University for Conduction of Practical Courses.

a) **Internal:** 50 marks for Internal evaluation following the continuous evaluation method, which includes:

   a. 40 marks for Class Performance (Every class activity will carry 8 marks; each students can participate in maximum of 5 activities)

   b. 10 marks for Attendance and involvement in the activities

b) **External:** 50 marks for External evaluation at the time of external exams (Based on Observations, GDs and PIs and other assessment tools).

Course Code: **ICS601**	**Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Software Engineering**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.	
CO2.	Understanding the concepts of various software models.	
CO3.	Understanding the concepts of developing quality software.	
CO4.	Applying current theories, models, and techniques that provide a basis for the software lifecycle.	
CO5.	Applying various techniques and tools necessary for engineering practice.	
C06	Apply various testing to improve software quality.	
Course Content:		
Unit-1:	**Software Product and Process**-Introduction – S/W Engineering Paradigm – Verification – Validation – Life Cycle Models – System Engineering – Computer Based System – Business Process Engineering, Overview – Product Engineering Overview.	**8 Hours**
Unit-2:	**Software Requirements:-** Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary.	**8 Hours**
Unit-3:	**Analysis, Design Concepts and Principles :-** Systems Engineering - Analysis Concepts - Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Real Time Software Design – System Design – Real Time Executives – Data Acquisition System – Monitoring And Control System	**8 Hours**
Unit-4:	**Testing:-** Taxonomy Of Software Testing – Types Of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based On Data Flow Mechanisms – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques	**8 Hours**
Unit-5:	**Software Project Management :-** Measures And Measurements – ZIPF's Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools.	**8 Hours**
Text Books:	1. Roger S. Pressman, "Software Engineering – A practitioner's Approach", Sixth Edition, McGraw-Hill International Edition, 2005	
Reference Books:	1.Software Architecture in Practice (3rd Edition) by Len Bass (Author), Paul Clements (Author), Rick Kazman (Author)	

	2. Software Engineering: The Current Practice by Vaclav Rajlich (Author) 3. Ian Sommerville, "Software engineering", Seventh Edition, Pearson Education Asia, 2007 *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf 2. https://dinus.ac.id/repository/docs/ajar/Sommerville-Software-Engineering-10ed.pdf	

Course Code: **ICS602**	**Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Ethical Hacking**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the various Hacking Methodology	
CO2.	Understanding about vulnerability over the network and websites.	
CO3.	Understanding the Importance of Firewalls and various security measures	
CO4.	Understanding the Report writing and Mitigation concepts.	
CO5.	Applying various tools to identify network security problems.	
Course Content:		
Unit-1:	**Introduction to Ethical Hacking:** Hacking Methodology, Process of Malicious Hacking, and Foot printing and scanning: Foot printing, scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs. White Box Techniques	**8 Hours**
Unit-2:	**Hacking Methodology:** Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques	**8 Hours**
Unit-3:	**Web and Network Hacking:** SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security	**8 Hours**
Unit-4:	**Report writing & Mitigation**: Introduction to Report Writing & Mitigation, requirements forlow level reporting & high level reporting of Penetration testing results	**8 Hours**
Unit-5:	**Linux Hacking:** Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls Demonstration of vulnerabilities and Mitigation of issues identified including tracking.	**8 Hours**
Text Books:	1. The CEH Prep Guide: The Comprehensive Guide to Certified Ethical Hacking, by Ronald L. Kurtz (Author), Russell Dean Vines, Wiley Publications, First Edition	
Reference Books:	1. The Hacker Playbook 2: Practical Guide to Penetration Testing by Peter Kim. 2. Hacking: The Art of Exploitation by Jon Erickson	
Additional Electronic Reference Material	1. https://www.tutorialspoint.com/ethical_hacking/ethical_hacking_tutorial.pdf 2.http://index-of.es/Hack/Hacking%20For%20Beginners%20-%20a%20beginners%20guide%20for%20learning%20ethical%20hacking.pdf 3. https://hackingresources.com/hacking-security-ebooks/	

Course Code: ICS603	**Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Virtualisation and Cloud Security**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the modern security concepts as they are applied to cloud computing.	
CO2.	Understanding the compliance issues that arise from cloud computing.	
CO3.	Applying various methods to generate cloud control matrix.	
CO4.	Analysing the security issues related to multi-tenancy.	
CO5.	Analysing the security of virtual systems.	
Course Content:		
Unit-1:	**Introduction to Virtualization & Cloud:** Virtualization and Cloud computing concepts, Private cloud Vs Public cloud, IAAS, PAAS & SAAS concepts, Virtualization security concerns, Hypervisor Security, Host/Platform Security, Security communications, Security between Guest instances, Security between Hosts and Guests	**8 Hours**
Unit-2:	**Cloud Security:** Cloud Security vulnerabilities and mitigating controls, Cloud Trust Protocol, Cloud Controls Matrix. Complete Certificate of Cloud Security Knowledge (CCSK)	**8 Hours**
Unit-3:	**Cloud Trust Protocol & Transparency:** Introduction to Cloud Trust Protocol & Transparency, Cloud Trust Protocol and Transparency, Transparency as a Service, Concepts, Security, Privacy & Compliance aspects of cloud.	**8 Hours**
Unit-4:	**Cloud Controls Matrix &Top Cloud Threats:** Introduction to Cloud Controls Matrix & Top Cloud Threats, Cloud Controls Matrix	**8 Hours**
Unit-5:	**Trusted Cloud Initiative architecture**: Trusted Cloud Initiative architecture and reference model, requirements of Security as a Service (SecaaS) model and Top Security threats to the cloud model	**8 Hours**
Text Books:	1. Cloud Security – A comprehensive Guide to Secure Cloud Computing by Ronald L. Krutz and Russel Dean Vines	
Reference Books:	**1.** Virtualization--the complete cornerstone guide to virtualization best practices, Ivanka Menken, Gerard Blokdijk, Lightning Source Incorporated, 2008 2. Virtualization: From the Desktop to the Enterprise, Chris Wolf, Erick M. Halter, EBook, 2005 ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://arxiv.org/pdf/1807.11016 2.http://web.kaust.edu.sa/Faculty/MarcoCanini/classes/CS240/F17/slides/L3-cloud-VM.pdf	

Course Code: **ICS604**	**Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Linux administration**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic set of commands and utilities in Linux/UNIX systems.	
CO2.	Understanding the important Linux/UNIX library functions and system calls.	
CO3.	Understanding the inner workings of UNIX-like operating systems.	
CO4.	Understanding of the steps involved installing Linux Operating System	
CO5.	Applying various Unix commands used in system processing and management.	
Course Content:		
Unit-1:	**Fundamentals of Linux:** Development of Linux, Linux Distributions. Structure of Linux Operating System, Logging In and General Orientation, The X Window System, KDE, GNOME. Navigating the File Systems, Managing Files, File Permission and Access, Shell Basics, Shell Advanced Features, File Name Generation. Common Unix commands	**8 Hours**
Unit-2:	**Administration of Linux OS** Installing Linux, Configuring Disk Devices, Creating and Managing File Systems, File System Backup, Kickstart Installation, Linux Boot Loaders, Linux Kernel Management, Managing User Accounts, Understanding File Listing, Ownership and Permission, Managing Software using RPM, Connecting to Network, Linux Network Services, Setting up a Printer	**8 Hours**
Unit-3:	**Input and Output Redirection** Input Redirection, Output Redirection, Error Redirection, Filter, Pipes. Networking in Linux: Network Connectivity, IP address, Accessing Remote system, Transferring files, and Internet configuration. Process Control: Identifying Process, Managing Process, Background Processing, Putting jobs in Background. Offline File Storage: Storing files to Media Booting process and User	**8 Hours**
Unit-4:	**Linux Basic networking and naming service**: Introduction to Networking, Networking, Internet Network Services, Dynamic DNS, Electronic Messaging, Apache , NIS and Network File Sharing: NIS, Network File Sharing, SAMBA. Security: Defining System Security Policies,	**8 Hours**

	System Authentication Services and Security, Securing Services, Securing Data and Communication	
Unit-5:	**The Unix File System** Inodes - Structure of a regular file – Directories - Conversion of a path name to an inode - Super block - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open – Read - Write - Lseek – Close - File creation - Creation of special files - Changing directory and root - changing owner and mode – stat and fstat - pipes - Dup - Mounting and Un mounting file systems - Link and Un link.	**8 Hours**
Text Books:	1. The Complete Reference, Linux Sixth Edition by Richard Petersen.	
Reference Books:	2. Red Hat ®Enterprise Linux® 6 Administration by Sander van Vugt 3. Linux System Administration by Paul Cobbaut. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://linux-training.be/linuxsys.pdf 2. https://www.tutorialspoint.com/linux_admin/linux_admin_tutorial.pdf 3. https://www.gocit.vn/files/Linux.Administration.A.Beginners.Guide .6th.Edition.www.gocit.vn.pdf	

Course Code: **ICS651**	**Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Virtualisation and Cloud Security (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the Installation and Configuration of ESXI Server	
CO2.	Analyzing the security policies and roles of vSphere.	
CO3.	Creating a security group for networking.	
CO4.	Creating rules for web application access.	
C05.	Creating of Micro Segmentation and Distributed firewall.	
Course Content:		
List of Experiments:	1. Installation and Configuration of ESXI Server 2. Configuring security policies and roles in vSphere. 3. Improved IP Discovery Mechanism for Virtual Machines and SpoofGuard 4. Creating a web security group 5. Creating a security group for networking 6. Configuring rules for web application access 7. Configuration of logical switch. 8. Configuration of Dynamic Distributed Routing. 9. Configuration of Micro Segmentation and Distributed firewall. 10. Installation and Configuration of vCenter 11. Creating Template in vCenter 12. Auditing in Windows Server	

Course Code: **ICS652**	**Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Ethical Hacking (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concept of network security and vulnerability.	
CO2.	Applying penetration test using standard hacking tools in an ethical manner.	
CO3.	Applying various tools and methods use for security and vulnerability assessment.	
CO4.	Analyzing legal and ethical issues related to vulnerability and penetration testing.	
C05.	Analyzing best practices in security concepts to maintain confidentiality, integrity and availability of computer systems.	
Course Content:		
List of Experiments:	1. Passive Reconnaissance using "Who is" and Online tools 2. Active Reconnaissance using "Sampad" and web site details 3. Full Scan, Half Open Scan and Stealth scan using "nmap" 4. UDP and Ping Scanning using "Advance Lan Scanner" and "Superscan" 5. Packet crafting using "Packet creator" tools 6. Exploiting NetBIOS vulnerability 7. Creating and Analyzing spoofed emails 8. Creating and Analyzing Trojans 9. OS password cracking	

Course Code: EHM601	**Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Entrepreneurship**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding knowledge and skills needed to run a business successfully	
CO2.	Understanding the financing and accounting.	
CO3.	Understanding the basic support to Entrepreneurs.	
CO4.	Applying current information, theories, models, techniques and practices in all of the major business disciplines.	
CO5.	Analyzing situations and constructing and selecting viable solutions to solve problems.	
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. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill.	
Reference Books:	1. Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2nd Edition Dream tech.	

	2. Rajeev Roy, 'Entrepreneurship', Oxford University Press. 3. 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	1. https://www.cmu.edu/swartz-center-for-entrepreneurship/education-and-resources/project-olympus/pdf/entrepreneurship-101.pdf 2.https://www.uv.es/bcjauveg/docs/LibroCuervoRibeiroRoigIntroduction.pdf	

Internal Evaluation	External Evaluation	Total Marks
50 Marks	**50 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	External evaluation will be performed by the external examiner on the basis of following parameters: • Report • Presentation • VIVA	

Course Code: **ICS605**	**Professional Elective Courses- III** **Specialization- CTIS** **B.Tech - Semester-VI** **Cloud Migration**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the migration strategy that can be used in a given scenario.	
CO2.	Applying various methods used in cloud services migration.	
CO3.	Applying the steps involved in migrating Large scale services to the cloud.	
CO4.	Analyzing the migrating services to AWS cloud using a cloud adoption framework.	
CO5.	Analyzing various migrating strategies that can be used for a given case study scenario.	
Course Content:		
Unit-1:	**Getting started with moving to cloud:** Introduction to Cloud Migration – Migrating Business Application to Public Cloud Services, Common Migration Strategies, Cloud Transformation Maturity Model, and Moving Organization to Cloud – Strategies and techniques, Migration Plan.	**8 Hours**
Unit-2:	**Cloud Migration Plan** :- Introduction to Migration Plan – Migration plan considerations – Time Management, Security, Vendor Selection, Selecting the deployment model, Validating the services to be moved to cloud, Effectiveness of cloud migration, Migration and deployment options, Optimization and Cost Management in an effective cloud migration, Business continuity after Migration, Case Study on Cloud Migration	**8 Hours**
Unit-3:	**Migrating Services to Cloud:** Migrating Services to AWS, Cloud Adoption Framework, Successful Migration, and Understanding On-premises cost, Migration cost considerations, Migration options.	**8 Hours**
Unit-4:	**Migrating Large scale services to the cloud:** Three Step processes for large scale services, Successful Migrations, Handling Failures, Risks involved in working at a big scale migration, Pre-release and deployment considerations, Monitoring and Alerting, Mitigation.	**8 Hours**
Unit-5:	**Migration Case Studies**:-Migrating Web applications to AWS cloud, Migrating Batch Processes to the cloud, Migrating Backend Processing	**8 Hours**

	pipeline to the cloud, migrating from an End-of-Life Data Center to AWS.	
Text Books:-	1. Migrating Large-Scale Services to the Cloud by Eric Passmore	
Reference Books	1. Cloud Migration Tools Second Edition Kindle Edition by Gerardus Blokdyk (Author) 2. Optimizing Cloud Migration, by Andy Still, O'Reilly ***Latest editions of all the suggested books are recommended**	
Additional Electronic Reference Material	1. https://www.mitre.org/sites/default/files/publications/pr-17-4029-planning-management-methods-migration-to-cloud-environment.pdf 2.https://www.cbronline.com/wpcontent/uploads/dlm_uploads/2018/01/Cloud-Migration-Guide.pdf	

Course Code: ICS606	**Professional Elective Courses- III** **Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Server Administration**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the various services of Server 2012.	
CO2.	Understanding the concepts of file management.	
CO3.	Applying various group policies to maintain and manage server.	
CO4.	Analyzing the server performance.	
CO5.	Creating the AD domains in server 2012.	
Course Content:		
Unit-1:	**Installing and Configuring Windows Server 2012:-** Introduction, Selecting a Windows Server 2012 Edition, Supporting Server Roles and Features, Server Licensing, Installing Windows Server 2012: System Requirement, Performing a Clean Installation, Working with Installation Partitions, Server Core Defaults, Server Core Capabilities, Completing Post-Installation Tasks, Converting Between GUI and Server Core, Upgrade paths, Installing Windows Server Migration Tools, Configuring NIC Teaming, Configuring local storage, Configuring WDS to install OS through networking	**8 Hours**
Unit-2:	**Securing Files and Disks.** How to Securing Files, Encryption files with EFS, Configuring EFS, Using the Cipher Command, Sharing Files Protected with EFS with others, Configuring EFS with Group Policies, Configuring EFS Recovery Agent, Managing EFS Certificates, Encrypting Files with BitLocker, Configuring BitLocker Encryption, configuring BitLocker to Go, Configuring BitLocker Policies, Managing BitLocker Certificates	**8 Hours**
Unit-3:	**Configuring File and Share Access Permissions** Designing a File-Sharing Strategy, Arranging Shares, Controlling Access, Mapping Drives, Creating Folder Shares, Assigning Permissions, Understanding the windows Permission Architecture and Basic, Advanced Permissions, Allowing and Denying Permissions, Inheriting Permissions, Understanding Effective Access, Setting Share Permissions, Understanding NTFS Authorization, Assigning Basic NTFS Permissions, Understanding Resource Ownership, Combining Share and NTFS Permissions, Installing File Server Resource Manager, Using, creating, changing Quotas, Managing Files with File Screening, Creating File Groups, Creating a File Screen, Creating a File Screen Exception, Creating a File screen Template. Storage Reports Management	**8 Hours**
Unit-4:	**Configuring DNS Zones and Records** Understanding DNS, Understanding DNS Names and Zones, Understanding the Address Resolution Mechanism, configuring and Managing DNS Zones, Installing DNS, Configuring Primary and Secondary Zones, Configuring Active Directory-Integrated Zones, configuring Zone Delegation, configuring Stub Zones, configuring Caching-Only Servers, Configuring Forwarding and Conditional Forwarding, Configuring DNS Record types, creating and Configuring DNS Resource Records, Start of Authority(SOA) Records, Name Server(NS)	**8 Hours**

	Records, Host(A and AAAA) Records, Canonical Name(CNAME) Records, Pointer(PTR) Records	
Unit-5:	**Implementing Patch Management and Monitoring Server Performance** Understanding windows Updates and Automatic Updates, Deploying Windows Server Update Services(WSUS), How to Install and Configure WSUS, Configuring WSUS Synchronization, Configuring WSUS Computer Groups, Configuring Group Policies for Updates, Configuring Client-Side Targeting, Approving Updates, Viewing Reports, Administrating WSUS with Commands, Troubleshooting Problems with Installing Updates. Introducing the Microsoft Management Console(MMC), Server Manager, Event Viewer, Understanding Logs and Events, Adding and Filtering Events, Managing Performance, Task Manager, Resource Monitor, Configuring Data Collector Sets (DCS), Monitoring the Network using Netstat and protocol analyzers	**8 Hours**
Text Books:-	1. Windows Server 2012: A Handbook for Professionals by Aditya Raj (Author)	
Reference Books	1. Administering Widows Server 2012 by Patrick Regan 2. Mastering Windows Server 2012 R2 by Mark Minasi, Kevin Greene, Christian Booth, and Robert Butler 3. Administering Windows Server 2012 (Certification Guide) by Orin Thomas ***Latest editions of all the suggested books are recommended**	
Additional Electronic Reference Material	1. https://www.vmware.com/pdf/vi3_301_201_admin_guide.pdf 2. https://itacademy.csc.liv.ac.uk/node/11 3.https://www.tutorialspoint.com/windows_server_2012/windows_server_2012_tutorial.pdf	

Course Code: **ICS607**	**Professional Elective Courses- III** **Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Hybrid Cloud**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the Hybrid cloud and its management.	
CO2.	Understanding the On-Premises Service Integration with cloud service.	
CO3.	Understanding the Architectural Considerations for Hybrid Cloud.	
CO4.	Applying the best practices to manage Hybrid cloud resources.	
C05.	Analyzing the workloads and deployment of applications on Cloud.	
Course Content:		
Unit-1:	**The Hybrid Cloud** Explaining Hybrid Cloud, Services for Hybrid Cloud environment, Requirements for cloud Integration, Hybrid Cloud Management – Cloud Service management, Impact of Virtualization in Hybrid Cloud, Hybrid Cloud service Management Plan	**8 Hours**
Unit-2:	**Managing Hybrid Cloud Environment** Managing and Integrating Data, Managing Hybrid Workloads, Architectural Considerations, Development and Deployment in a Hybrid Cloud, Virtualization and the Hybrid Cloud.	**8 Hours**
Unit-3:	**Hybrid Cloud Strategy** Planning Hybrid Cloud Strategy – Identifying Starting points, Plan for providing resources, supporting dynamic lifecycle, Complexity in cloud, Balancing costs and benefits, managing data storage in cloud – Hybrid cloud storage considerations, Support for storage growth and changes, Hybrid Cloud Resources, Hybrid Cloud Best Practices, Do's and Don'ts of Hybrid Cloud	**8 Hours**
Unit-4:	**Azure as a Platform for Hybrid Cloud** Execution Models – Websites, cloud services, Virtual machines, Data Management – SQL database, Storage Tables, Blobs, CDN, Big data, Messaging and Integration Components – Service Bus, Virtual Network, Traffic Manager, BizTalk services, Media and Mobile services, Supporting services – Caching, Identity Management, Private Cloud Components and services to build Hybrid Cloud**.**	**8 Hours**
Unit-5:	**Hybrid Options in Windows Azure** On-Premises Service Integrated with cloud service – Using Windows azure	**8 Hours**

	services bus and virtual networks, Cloud services integrated with On-Premise service – Application on premise integration with Azure storage, Cloud Bursting and test cloud infrastructure, Disaster Recovery (DR) Site, Service bus as an Integration Hub, Enabling Modern applications, and Virtual desktops in Windows Azure.	
Text Books:-	1. Judith Hurwitz, Marcia Kaufman, Fern Halper, Daniel Kirsch," Hybrid Cloud for Dummies", John Wiley & Sons Inc., 2nd Edition, 2012.	
Reference Books	1. Danny Garber, "Windows Azure Hybrid Cloud", ", John Wiley & Sons Inc., 2013. 2. Designing and Building a Hybrid Cloud, by Philip Trautman, O'Reilly ***Latest editions of all the suggested books are recommended**	
Additional Electronic Reference Material	1. https://cdw-prod.adobecqms.net/content/dam/cdw/on-domain-cdw/brands/intel/intel-hybrid-cloud-brief.pdf 2. https://www.omg.org/cloud/deliverables/CSCC-Practical-Guide-to-Hybrid-Cloud-Computing.pdf	

Course Code: ICS608	**Professional Elective Courses- III** **Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Security Architecture**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding fundamental concepts of information and network security.	
CO2.	Understanding security principles for building a sustainable security architecture.	
CO3.	Apply appropriate tools and techniques while designing the network security infrastructure.	
CO4.	Analyzing the importance of managing the security architecture using policies, processes and framework for effective and efficient security.	
C05.	Creating the security roles, regulations and policies to implement the proper security management.	
Course Content:		
Unit-1:	**Unit 1: Introduction to Security Architecture** Origins of Architecture, managing complexity, information systems architecture, security architecture, benefits of an architectural approach to information security, need for a holistic approach, security architecture model – SABSA, matrix, case studies.	**8 Hours**
Unit-2:	**Phased Approach to build Security Architecture** Security Architecture – business drivers and traceability, using SABSA model to define a development process, strategy and concept phase, design phase, implementation phase, manage and measure phase, an overview of enterprise security architecture, case studies.	**8 Hours**
Unit-3:	**Contextual and Conceptual Security Architecture:-** Business context, aligning business objectives with security architecture, operational risk and impact assessment, an influence of business processes, workflow, the organizational structure on security architecture, location and time dependencies, security architectural layering, entity model and trust framework, security domain model, case studies	**8 Hours**
Unit-4:	**Security Architecture Design** Logical-information flow, policies and services, application and system environment, security management and lifecycle, Physical-rules, mechanisms, policies, standards and procedure, user, platform and network infrastructure, Component-products and tools, Operations, case studies	**8 Hours**
Unit-5:	**Management of Security Architecture** Need for Security Management, best practices and maturity models, policy enforcement and compliance, components of security architecture management, product evaluation, managing service providers and third-party security risks, balancing needs, requirements, risks and costs, the impact of cloud, IoT and AI technologies on security architecture, case studies	**8 Hours**
Text Books:-	**1.** Enterprise Architecture and Information Assurance: Developing a Secure Foundation by James A. Scholz, Auer Bach Publications; 1 edition, 2013	
Reference	**1.** Network Security Architectures (Networking Technology) n by Sean Convery.	

Books	**2.** Threat Modeling: Designing for Security (MISL-WILEY) by Adam Shostack, Wiley, 2014. **3.** Designing Security Architecture Solutions by Jay Ramachandran ***Latest editions of all the suggested books are recommended**	
Additional Electronic Reference Material	1. https://www.securityforum.org/uploads/2016/05/Security-Architecture-Executive-Summary-v2.pdf 2. Research Paper: DOI: 10.3390/s141222754 3.https://www.cisco.com/c/dam/global/en_dz/assets/expoegypt2010/assets/docs/transformation_e-Government_haider_pasha.pdf	

Course Code: ICS609	**Professional Elective Courses- IV** **Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Security Incident Management**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the process involved in pre and post incident response.	
CO2.	Understanding the Disaster recovery operations and Disaster response phase.	
CO3.	Understanding the Incident response plan and Information security policy.	
CO4.	Apply the Data collection and possible indicator of incident.	
C05.	Analyzing various techniques, types of contingency planning elements required to handle security incident.	
Course Content:		
Unit-1:	**Need for CSIRM** Introduction to incidence response, stages involved in incidence response: Preparation to detection and Analysis, Post incident activities, Skills required to handle Incident response, Incident evidence, incident response tools, importance of communication protocol, key internal and external stakeholders, law enforcement, and role of media, team structure and roles – important considerations.	**8 Hours**
Unit-2:	**Handling a Cyber Security Incident** Overview of risk management, Contingency Planning and its Components: Business impact analysis, Incident response plan, Disaster Recovery plan, Business continuity plan, Contingency planning timeline. Information security policy in development contingency plan, incident handling infrastructure and facilities requirements, incident handling checklist, documentation and reporting	**8 Hours**
Unit-3:	**Planning for Organizational readiness** Beginning the contingency planning process, contingency planning elements, and contingency planning policy, Budgeting for contingency operation: Incident response Budgeting, Disaster recovery budgeting, Business continuity budgeting, Crisis management budgeting. Contingency strategies, Data and application resumption: Redundancy based backup and recovery, Database backup, Real-time protection.	**8 Hours**
Unit-4:	**Detection and decision making** Detecting incidents: Possible indicator of incident, probable indicators of incident. Process and services, incident decision making: Data collection while detecting incident, challenges in intrusion detection. Organizing and preparing CSIRT: Building CSIRT,	**8 Hours**

	High level procedure for contingency plan, outsourcing incident response	
Unit-5:	**Recovery and maintenance** Recovery: Identify and resolve vulnerabilities, restore data, restore services and process. Maintenance: After action review, plan review and maintenance. Preparation and implementation: Disaster recovery planning functions. Disaster recovery operations and maintenance: Facing key challenges, preparation. Disaster response phase: Recovery phase, Resumption phase, Restoration phase.	**8 Hours**
Text Books:-	**1.** Computer Incident Response and Forensics Team Management: Conducting a By Leighton Johnson, 2014.	
Reference Books	1. The Computer Incident Response Planning Handbook: Executable Plans for Protecting Information at Risk (English, Paperback, McCarthy N. K.)Voice over IP: Protocols and Standards, Rakesh Arora. 2. Principles of Incident Response and Disaster (Paperback) by Michael E. Whitman, Herbert J. Mattord. ***Latest editions of all the suggested books are recommended**	
Additional Electronic Reference Material	1.https://www.cybersecuritycoalition.be/content/uploads/cybersecurity-incident-management-guide-EN.pdf 2. Information security incident management: Current practice as reported in the literature. DOI: 10.1016/j.cose.2014.05.003 3. https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-61r2.pdf	

Course Code: ICS610	**Professional Elective Courses- IV** **Specialization- CTIS** **B.Tech (CTIS)- Semester-VI** **Database Security**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the different models of database Security Architecture.	
CO2.	Applying and contrast database management system facilities for establishing access.	
CO3.	Applying database auditing for security and reliability.	
CO4.	Analyzing how to adjust policies and practices based on feedback mechanisms using different security models.	
C05.	Analyzing common strategies used to exploit database infrastructure.	
Course Content:		
Unit-1:	**Concepts of Database Management System** Introduction to SQL concepts, SQL language statement: DML, DDL, DCL, TCL. Concept of NoSQL Databases, Advantages of NoSQL: Elastic Scaling, Big Data, Goodbye DBAs', Economics/Cost, Flexible Data models. Least privileges, Understanding permissions, Creating schemas for security, Cross-database Security.	**8 Hours**
Unit-2:	**Database Security Lifestyle** Database security lifecycle: Create, Store, Use, Share, Archive and Destroy, Data risk assessment, Analyse data threats, Risks and vulnerabilities, Understand the need for a database security architecture, Database security architecture, Implement a feedback mechanism, Understand how to adjust policies and practices based on feedback mechanisms using different security models.	**8 Hours**
Unit-3:	**Administration of Users** Introduction to administration of users, Defining and using profiles, Designing and Implementing password policies, Authentication and Authorization, Gathering and revoking user privileges, Privilege in Oracle and SQL server, Creating, Assigning and Revoking user roles, Creating roles with Oracle and SQL Server	**8 Hours**
Unit-4:	**Database Exploitation and Defense** Understanding SQL injection, Identifying vulnerabilities, Exploitation and Information gathering, Real data extraction using statement exploits, UNION, Condition, and Large scale extraction, Exploitation of privileges and password, Protecting SQL Server against DOS, Protecting SQL Server against SQL injection, Securing dynamic SQL from injection	**8 Hours**

Unit-5:	**Database security Auditing and Testing** Security Auditing, Classification of Audit, Gal of Audit, Process of Audit, Database auditing: Preparation and planning for a database security audit, Reporting a database security audit, Auditing – Using the profiler to audit SQL server access, Auditing using DML trigger, Auditing using DDL triggers, Configuring SQL server auditing, Security testing, Testing methodology	**8 Hours**
Text Books:-	1. Database Security and Auditing: Protecting Data Integrity and Accessibility by Sam Afyouni, May-2005 (Paperback)	
Reference Books	1. Securing Information and Communications Systems - Principles, Technologies, and Applications by Steven Furnel 2. Database Security by Alfred Basta, Melissa Zygola, 2012 (Paperback) 3. Microsoft SQL Server 2012 Security Cookbook by Rudi Bruchez, 2012 (Paperback) ***Latest editions of all the suggested books are recommended**	
Additional Electronic Reference Material	1. https://www.cs.uct.ac.za/mit_notes/database/pdfs/chp12.pdf 2. http://samples.jbpub.com/9781284056945/DBICHAP8.pdf	

Course Code: TMUGA-601	**Specialization- CTIS** **BTech- Semester-VI** **Advance Algebra and Geometry** **(Value Added Course)**	**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.**	
Additional Electronic Reference Material	• https://www.math.stonybrook.edu/~aknapp/download/a2-alg-inside.pdf • https://www.jmilne.org/math/CourseNotes/AG.pdf	

Evaluation Scheme for Quantitative Aptitude Skill Enhancement:-

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

a. 20 marks best 2 out of CT1 + CT2 + CT3
b. 10 marks will be for Assignments.
c. 10 marks for attendance and practice sheets, at the end of semester, will be provided in the following manner.
d. 60 marks for final external exams.

S No	% Attendance <	Marks
1.	0-10	1
2.	10 -20	2
3.	20- 30	3
4.	30-40	4
5.	40-50	5
6.	50-60	6
7.	60 – 70	7
8.	70 – 80	8
9.	80 – 90	9
10.	90-100	10

From {CT 1, CT 2 and CT 3} Best 2 CT's Score (20) + Final External exam (60) + Attendance (10)+ Assignment(10) = 100 marks

Course Code: **TMUGS-601**	**Specialization- CTIS** **BTech- Semester-VI** **Managing Work and Others** **(Value Added Course)**	**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.	Analysing 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 *** Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material	1. https://www.hloom.com/resumes/creative-templates/ 2. https://www.mbauniverse.com/group-discussion/topic.php 3. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression	

Evaluation Scheme: Faculty led Continuous Evaluation

- Evaluation of **"Managing Self"** and **"Managing Work and Others"** will follow the continuous evaluation method.
- Students will be evaluated on the score of 100 on the pattern prescribed by the University for Conduction of Practical Courses.

c) **Internal:** 50 marks for Internal evaluation following the continuous evaluation method, which includes:

a. 40 marks for Class Performance (Every class activity will carry 8 marks; each students can participate in maximum of 5 activities)

b. 10 marks for Attendance and involvement in the activities

d) **External:** 50 marks for External evaluation at the time of external exams (Based on Observations, GDs and PIs and other assessment tools).

Course Code: ICS701	**Specialization- CTIS** **B. Tech- Semester-VII** **Cyber Forensics and Investigation**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the overview of Digital Forensics and Professional Conduct.	
CO2.	Understanding the network traffic flows within and outside the network.	
CO3.	Understanding the expert witness and writing report considering the cyber law.	
CO4.	Analyzing the File Systems and Windows Registry for forensic investigation process.	
CO5.	Analyzing the phishing mail in Email forensics.	
Course Content:		
Unit-1:	**Computer Forensics:** An overview of Digital Forensics, Preparing for Digital Investigations: Following Legal Processes, Understanding Private-Sector Investigations. Maintaining Professional Conduct, Preparing a Digital Forensics Investigation, Procedures for Private-Sector High-Tech Investigations, Understanding Data Recovery Workstations and Software, Conducting an Investigation.	**8 Hours**
Unit-2:	**Data acquisition and incident scenes:** Understanding Storage Formats for Digital Evidence, Validating Data Acquisitions: Linux validation and Windows validation method. Processing Crime and Incident Scenes, Understanding File Systems, Examining NTFS Disk, Understanding the Windows Registry, examining the windows swap file, Log analysis in windows forensic, Windows forensic tools.	**8 Hours**
Unit-3:	**Network and cloud forensic:** Network forensic overview, establishment procedure for network forensic, securing a network, developing procedure for network forensic, collecting network traffic data, examining and analyzing network traffic data, legal challenges in cloud forensic, technical challenges in cloud forensic, acquisition in cloud forensic, conducting cloud investigation.	**8 Hours**
Unit-4:	**Email and social media forensic:** Exploring the role of email in investigation, exploring the role of client and server in email, investigating E-mail crimes and violations: examining E-Mail messages, Examining E-mail headers, Examining additional email files, tracing an Email messages, Understanding Email server, Applying digital forensic to social media, E-mail case studies.	**8 Hours**
Unit-5:	**Forensic report writing and ethics for expert witness:** Understanding the importance of reports, guidelines for writing report, generating report using forensic software, Applying ethics and code to expert witness, organizations with code of ethics, Ethical Difficulties in Expert Testimony, An Ethics Exercise	**8 Hours**
Text Books:	1. Guide to Computer Forensics and investigations, Fifth Edition, Bill Nelson, 2015 **(Paperback)**.	
Reference Books:	**1.** Guide to Computer Forensics and investigations, Fifth Edition, Bill Nelson, 2015 **(Paperback)** **2.** Cyber Forensics: Second Edition by Jr., Albert Marcella, Doug Menendez **(Paperback)**.	

	*** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. http://index-of.es/Varios-2/Computer%20Forensics%20and%20Cyber%20Crime%20An%20Introduction.pdf 2. pdfdrive.com/computer-forensics-books.html	

Course Code: **ICS702**	**Specialization- CTIS** **B. Tech- Semester-VII** **Cloud Deployment**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the components of Openstack.	
CO2.	Understanding the Installation and configuration of the Openstack components.	
CO3.	Understanding the resource creation in Openstack.	
CO4.	Applying the various steps to troubleshoot Openstack components.	
CO5.	Analyzing the performance of cloud by monitoring the Openstack components**.**	
Course Content:		
Unit-1:	**Introduction to OpenStack:** Architecture and Component Overview: outlines a list of components that make up an OpenStack installation and what they do; OpenStack architecture, Dashboard, Keystone ,Glance , Neutron Nova Cinder Swift Ceilometer, Heat RDO Installation: is a step-by-step walkthrough to install OpenStack using the RDO distribution; RDO Installation, Installing RDO using Packstack, Preparing nodes for installation, Installing Packstack and generating an answer file. Identity Management: is about Keystone, the OpenStack component that manages identity and authentication within OpenStack; Services and endpoints, Hierarchy of users, tenants, and roles, Creating a user, Creating a tenant, Granting a role, Logging in with the new user, Interacting with Keystone in the dashboard, Endpoints in the dashboard.	**8 Hours**
Unit-2:	**OpenStack Management:** Image Management: is about Glance, the OpenStack component that stores and distributes disk images for instances to boot from; Glance as a registry of images, Downloading and registering an image, using the web interface, Building an image. Network Management: About Neutron, the OpenStack component that manages networking resources; Networking and Neutron, Network fabric, Open vSwitch configuration, VLAN, GRE tunnels, VXLAN tunnels, Creating a network, Web interface management, External network access, Preparing a network, Creating an external network, Web interface external network setup. Instance Management: discusses Nova, the OpenStack component that manages virtual machine instances; Managing flavours, Managing key pairs, Launching an instance, Managing floating IP addresses, Managing security groups, Communicating with the instance, Launching an instance using the web interface**.**	**8 Hours**
Unit-3:	**Openstack Storage:** Block Storage: talks about Cinder, the OpenStack component that manages block storage; Creating and using block storage, Attaching the block storage to an instance, Managing Cinder, volumes in the web interface, Backing storage, Cinder types, GlusterFS setup.	**8 Hours**

	Object Storage: discusses Swift, the OpenStack component that manages object storage; Architecture of a Swift cluster, Creating and using object storage, Object file management in the web interface, Using object storage on an instance, Ring files, Creating ring files. Telemetry: discusses Ceilometer, the OpenStack component that collects telemetry data; Understanding the data store, Definitions of Ceilometer's configuration terms, Pipelines, Meters, Samples, Statistics, Alarms, Graphing the data.	
Unit-4:	**Openstack Automation:** Orchestration: is about Heat, the OpenStack component that can Orchestrate resource creation within an OpenStack cloud; About orchestration, Writing templates: The AWS CloudFormation format, The Heat Orchestration Template (HOT) format; Launching a stack, Auto scaling instances with Heat, LBaaS setup, Web interface. Scaling Horizontally: discusses building OpenStack to be run on off-the shelf hardware; Scaling compute nodes, Installing more control and networking, Scaling control and network services, Load-balancing keystone, Additional Keystone tuning, Glance load balancing, Scaling other services, High availability, Highly available database and message bus.	**8 Hours**
Unit-5:	**Openstack Monitoring and Troubleshooting:** Monitoring: Monitoring defined, Installing Nagios, Adding Nagios host checks, Nagios commands, Monitoring methods, Non-OpenStack service checks, Monitoring control services, Monitoring network services, Monitoring compute services. Troubleshooting: The debug command line option, Tail the server logs, Troubleshooting Keystone and authentication, Troubleshooting Glance image management, Troubleshooting Neutron networking, Troubleshooting Nova launching instances, Troubleshooting post-boot metadata, Troubleshooting console access, Troubleshooting Cinder block storage, Troubleshooting Swift object storage, Troubleshooting Ceilometer Telemetry, Troubleshooting Heat orchestration, Getting more help.	**8 Hours**
Text Books:	1. OpenStack Essentials by Dan Radez (Author).	
Reference Books:	1. OpenStack Cloud Computing Cookbook, 4th Edition by Kevin Jackson (Author), Cody Bunch (Author), Egle Sigler (Author), James Denton (Author) 2. OpenStack for Architects, 2nd Edition by Ben Silverman (Author), Michael Solberg (Author) 3. Mastering OpenStack by Omar Khedher , Chandan Dutta Chowdhury *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://cloudcomputing.ieee.org/images/files/education/studygroup/Cloud_Service_and_Deployment_Models.pdf	

Course Code: **ICS703**	**Specialization- CTIS** **B. Tech- Semester-VII** **Web Services**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of Web Services and XML.	
CO2.	Understanding WSDL and UDDI for web services.	
CO3.	Understanding Resource Orient Architecture, services and user accounts.	
CO4.	Applying various Web Services using SOAP.	
CO5.	Creating AJAX based clients to consume Web Services.	
Course Content:		
Unit-1:	**Web Services Overview:** What Is a Web Service? The Web Service Opportunity, Trends in e-business, Why Do We Need a Web Services Approach?, Service-Oriented Architectures, Web Services Interoperability Stacks XML Primer: Origins of XML, Document- Versus Data-Centric XML, XML Instances, XML Namespaces, Document Type Definitions, XML Schemas, Processing XML.	**8 Hours**
Unit-2:	**Simple Object Access Protocol (SOAP):** Evolution of XML Protocols, Simple Object Access Protocol (SOAP), Doing Business with SkatesTown, Inventory Check Web Service, SOAP Envelope Framework, Taking Advantage of SOAP Extensibility, SOAP Intermediaries, Error Handling in SOAP, SOAP Data Encoding, Architecting Distributed Systems with Web Services, Purchase Order Submission Web Service, SOAP Protocol Bindings. Using SOAP for e-Business: Web Services Security, Enterprise Application Integration, Quality of Service	**8 Hours**
Unit-3:	**Describing Web Services:** Why Service Descriptions?, Role of Service Description in a Service-Oriented Architecture, Well Defined Service, History of IDLs, Web Services Definition Language (WSDL), WSDL and Java, Future Service Description Efforts. Discovering Web Services: The Role of Service Discovery, The Role of Registries, UDDI, Private UDDI Registries, What's New in UDDI Version 2.0?, Using WSDL with UDDI.	**8 Hours**
Unit-4:	**The Resource-Oriented Architecture:** Resource-Oriented What Now?, What's a Resource?, URIs, Addressability, Statelessness, Representations, Links and Connectedness, The Uniform Interface. Designing Read-Only Resource-Oriented Services: Resource Design, Turning Requirements Into Read-Only Resources, Figure Out the Data Set ,Split the Data Set into Resources, Name the Resources, Design Your Representations, Link the Resources to Each Other, The HTTP Response 1,Designing Read/Write Resource-Oriented Services, User Accounts as Resources, Custom Places, A Look Back at the Map Service.	**8 Hours**

Unit-5:	**Ajax Applications as REST Clients:** From AJAX to Ajax, The Ajax Architecture, A del.icio.us Example, The Advantages of Ajax, The Disadvantages of Ajax, REST Goes Better, Making the Request, Handling the Response, JSON, Cross-Browser Issues and Ajax Libraries, Subverting the Browser Security Model Frameworks for RESTful Services: Ruby on Rails, Restlet, Django.	**8 Hours**
Text Books:	**1.** Building Web Services with Java: Making Sense of XML,SOAP, WSDL, and UDDI by Steve Graham, Simeon Simeonov, Toufic Boubez, Doug Davis, Glen Daniels, Yuichi Nakamura, Ryo Neyama, 2001	
Reference Books:	**1.** Web Services Essentials: Distributed Applications with XML-RPC, SOAP, UDDI & WSDL by Ethan Cerami **2.** Java Web Services: Up and Running by Martin Kalin **3.** RESTful Web Services by Leonard Richardson and Sam Ruby, 2007 *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.tutorialspoint.com/webservices/index.htm 2. https://www.javatpoint.com/web-services-tutorial 3. https://www.youtube.com/watch?v=oTzNRv6X51o	

Course Code: **ICS751**	**Specialization- CTIS** **B. Tech- Semester-VII** **Mini Project (Lab)**	**L-0** **T-0** **P-8** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understand methodologies and professional way of documentation and communication.	
CO2.	Understanding practical knowledge within the chosen area of technology for project development.	
CO3.	Applying technical knowledge to solve the real-life problems.	
CO4.	Analyzing programming projects with a comprehensive and Systematic approach.	
CO5.	Developing effective communication skills for presentation of project related activities.	
Course Content:		
	The students will undertake a mini project as part of their VIIth semester. The students can do independent projects or can take up projects in groups of two or more depending on the complexity of the project. The maximum group size will be four and in case of team projects there should be a clear delineation of the responsibilities and work done by each project member. The projects must be approved by the mentor assigned to the student. The mentors will counsel the students for choosing the topic for the projects and together they will come up with the objectives and the process of the project. From there, the student takes over and works on the project.	**l.[**
Bridge Course:	The bridge course ensures that all the students have the correct prerequisite knowledge before their industry interface. The purpose of a bridge course is to prepare for a healthy interaction with industry and to meet their expectations. It would be difficult to establish standards without appropriate backgrounds and therefore to bridge this gap, students are put through a week mandatory classroom participation where faculty and other experts will give adequate inputs in application based subjects, IT and soft skills.	
The Project:	Each student will be allotted a Faculty Guide and an Industry Guide during the internship/project work. Students need to maintain a Project Diary and update the project progress, work reports in the project diary. Every student must submit a detailed project report as per the provided template. In the case of team projects, a single copy of these items must be submitted but each team member will be required to submit an individual report detailing their own contribution to the project. Each student/group should be allotted a supervisor and periodic internal review shall be conducted which is evaluated by panel of examiners.	
	Project Evaluation Guidelines:	

	The Project evaluator(s) verify and validate the information presented in the project report. The break-up of marks would be as follows: 1. Internal Evaluation 2. External Assessment 3. Viva Voce	
	Internal Evaluation: Internal Evaluator of project needs to evaluate Internal Project work based on the following criteria: • Project Scope , Objectives and Deliverables • Research Work, Understanding of concepts • Output of Results and Proper Documentation • Interim Reports and Presentations– Twice during the course of the project	**8 Hours**
	External Evaluation: The Project evaluator(s) perform the External Assessment based on the following criteria. • Understanding of the Project Concept • Delivery Skill • The Final Project Report • Originality and Novelty	

Course Code: **ICS752**	**Specialization- CTIS** **B. Tech- Semester-VII** **Cyber Forensics and Investigation (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the dismantling and re-building PCs in order to access the storage media safely	
CO2.	Applying FTK Imager tool for Data Acquisition.	
CO3.	Applying Power Data Recovery Tool for Recovering deleted data from USB.	
CO4.	Analysing Memory of Windows and Linux machine using volatility framework.	
CO5.	Creating image of logical/physical drive by using FTK Tool.	
Course Content:		
List of Experiments:	1. Dismantling and re-building PCs in order to access the storage media safely 2. Data Acquisition or Dead Analysis using the tools such as FTK Imager, Linux DD, IXI_Imager etc 3. Monitoring of Computer System using Key Logger & Report Generation 4. Finding MD5 & SHA values of multiple file by using FTK Tool 5. Creating image of logical/physical drive by using FTK Tool 6. Recovering deleted data from USB by using Power Data Recovery Tool 7. Recovering the data from formatted USB/disk by using Power Data Recovery Tool Preservation of gathered information or image files using the tools such Cryptool or Quick Hash. 8. Evidence or Digital Foot Print Preservations using Software Write Blockers or Windows Registry for Windows platform 9. Memory analysis of Windows and Linux machine using volatility framework	

	10. Website forensic analysis using FAW ((Forensic Acquisition of Website) 11. Network Forensic using XPLICO tool 12. Log file analysis use Log Analyzer tool. 13. Cloud forensics using FROST and UFED Cloud Analyzer 14. Email header forensic using MailXaminer and eMailTracker Pro 15. Storage media analysis of mobile phone using Autopsy or Sleuth Kit 16. Operating System Forensic using SANS INVETIGATIVE FORENSIC TOOLKIT (SIFT).	

Course Code: **ICS753**	**Specialization- CTIS** **B. Tech- Semester-VII** **Industrial Training Seminar**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the past and present of the disciplines by exploring their purpose, practice, and philosophy.	
CO2.	Understanding of advanced research methodologies in the field, including theory, interdisciplinary approaches, and the analysis of available primary sources.	
CO3.	Understanding the privileges and obligations associated with a career as a professional	
CO4.	Understanding historical and recent trends in theory and method and be able to identify and explain major trends and issues in industry and research.	
CO5.	Applying technical skill to solve industry problems.	
Course Content:		
	Students will have to undergo industrial training of minimum four weeks in any industry or reputed organization after the VI semester examination in summer. The evaluation of this training shall be included in the VII 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 VI semester and shall be the nodal officer for coordination of the training. Students will prepare an exhaustive technical report of the training during the VII semester which will be duly signed by the officer under whom training was undertaken 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 VII semester will present his report about the training before a committee constituted by the Director of 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 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: **ICS704**	**Professional Elective Courses - V** **Specialization- CTIS** **B. Tech- Semester-VII** **Security for Big Data**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the need and importance of security and privacy for Big Data Analytics.	
CO2.	Understanding fundamental concepts of security, privacy and threats to Big Data.	
CO3.	Applying the Big Data Evidence in forensics investigation to present evidence inside the Courtroom.	
CO4.	Applying the Big Data Governance Certifications.	
CO5.	Analyzing the expert witness and writing report considering the cyber law.	
Course Content:		
Unit-1:	**Security for Big Data Analytics:** Introduction to Big Data Analytics, Differences between Traditional Analytics and Big Data Analytics, Big Data Ecosystem, The Need for Big Data Analytics in Cyber Security, Applying Big Data Analytics in Cyber Security, Challenges for Big Data Analytics to Cyber Security.	**8 Hours**
Unit-2:	**Threats to Data Security and Privacy:** Current threat landscape, threats modeling, attack trees, attack libraries, impact of threats on security and privacy, top 10 data breaches, advanced persistent threat, emerging threats, mapping threats and vulnerabilities to risks, advanced persistent threats, best practices to enhance and security of Big Data.	**8 Hours**
Unit-3:	**Privacy and Security Policy for Big Data:** Security and privacy issues: Data sharing and Data mining, Privacy in statistical data base. Security and Privacy approach in Big Data: Authentication and Encryption protocols. Privacy preserving techniques, K-Anonymity, Differential privacy concept, Effect of applying differential privacy in analytics. Big Data Security Policy, Big Data Security-Access Controls, Data usage agreement policies, Security operations policies**.**	**8 Hours**
Unit-4:	**Big Data Forensic:** Introduction to Big Data Forensics: Metadata preservation, Collection methods, Collection Verification. Understanding Hadoop, Managing Files in Hadoop, Identifying Big Data Evidence, and Collecting Hadoop distributed File system Data: Collecting a Cluster System, Physical versus remote collections. Analysis preparation.	**8 Hours**
Unit-5:	**Big Data Governance Framework:** Need of Big Data Governance, Big Data Governance Certifications, Strategic Data Governance, Tactical Data Governance, Data Quality management, Meta Data Management, Big Data Governance Rules, Data Governance Council.	**8 Hours**

Text Books:	1. Big Data Analytics in Cyber security by Onur Savas, Julia Deng, 2017 **(Paperback)**	
Reference Books:	1. Big Data Analytics in Cyber security by Onur Savas, Julia Deng, 2017 2. Big Data Governance: Modern Data Management by Peter Ghavami, 2016 3. Privacy and Security Policies in Big Data by Sharvari Tamane, Vijender Kumar Solanki. **(Paperback)** 4. Big Data Forensics - Learning Hadoop Investigations Joe Sremack, August 2015**(Paperback)**. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://www.edureka.co/blog/big-data-tutorial 2.https://www.simplilearn.com/tutorials/big-data-tutorial/what-is-big_data?source=sl_frs_nav_playlist_video_clicked	

Course Code: **ICS705**	**Professional Elective Courses - V** **Specialization- CTIS** **B. Tech- Semester-VII** **Information Security Management**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding how security is integrated with IT governance.	
CO2.	Understanding the best practices and cultural aspects associated with IT Governance.	
CO3.	Applying the risk IT framework of ISACA and CISCO security matrix in the organizations.	
CO4.	Analyzing the roles and responsibilities of strategy and steering committee.	
CO5.	Analyzing the need for using standard frameworks in establishing robust information security and risk management.	
Course Content:		
Unit-1:	**IT Governance-Part 1:** Introduction & Concepts, Origin of Governance, Corporate Governance, Best Practices for IT Governance, Role of Governance in Information Security, Six Outcomes of effective Security Governance, benefits of good governance, Cultural aspects in governance.	**8 Hours**
Unit-2:	**IT Governance-Part 2:** IT Governance-Roles and Responsibilities, Role of IT Strategy Committee and Security Steering Committee, Standard IT Balanced Scorecard. Val IT framework of ISACA, Governance in multi-department and multi-country enterprises, Importance of Governance in establishing a sustainable Security Culture in the organization.	**8 Hours**
Unit-3:	**Information Systems Strategy:** Role of Strategic Planning for IT, Strategic Direction and Alignment of Security Strategy with Business Objectives, Role of CISO, Security Metrics Program.	**8 Hours**
Unit-4:	**Risk Management Program:** Develop a Risk Management Program. Risk Management Process, Roles and Responsibilities, Risk-IT Framework of ISACA, Strategic Security decisions using Risk Management.	**8 Hours**
Unit-5:	**Security Management:** Introduction, Performance Optimization, Management Information Security Forum, Segregation of Duties, Frameworks, Security Program Effectiveness, Continuous Assessment and Improvement, In-sourcing versus Out-sourcing, Impact of ISM program across the organization.	**8 Hours**
Text Books:	1. Information Security Governance by S.H. Solms, Rossouw Solms, Springer; 1st Edition. 2nd Printing, 2008 edition (12 December 2008).	

Reference Books:	1. IT Governance: An International Guide to Data Security and ISO27001/ISO27002 by Alan Calder, Steve Watkins, Kogan Page; 6 editions (3 September 2015). 2. ISACA publications on COBIT, RiskIT and ValIT. 3. Information Security Governance: Guidance for Information Security Managers by W. Krag Brotby and IT Governance Institute, Isaca (2 June 2008). 4. IT Governance: How Top Performers Manage IT Decision Rights for Superior Results by Weill, Harvard Business Review Press; First edition (1 June 2004). *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://cnii.cybersecurity.my/main/resources/ISMS.pdf 2. https://www.pitt.edu/~dtipper/2825/ISO_Article.pdf 3. https://core.ac.uk/download/pdf/36682669.pdf	

Course Code: **ICS706**	**Professional Elective Courses - V** **Specialization- CTIS** **B. Tech- Semester-VII** **Security Standards Frameworks**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding how security is implemented as a management system.	
CO2.	Understanding the role of ISO 27001 for securing organizations.	
CO3.	Understanding the need for using standards and frameworks for an effective and efficient information security program.	
CO4.	Analyzing the best practices available to secure Payment transactions through PCI-DSS.	
CO5.	Analyzing the purpose and scope of HIPPA in management process.	
Course Content:		
Unit-1:	**ISO 27001:** Auditing: Principles of auditing, Conducting and Managing an Audit Program. Auditing Activities: Scoping and Pre audit Survey, Planning and preparation, Fieldwork, Analysis, Reporting, Closure, Competence and evaluation of auditors: Auditor competence, Information Security Management System Audit Testing: Information security management system, Management responsibility, Internal ISMS audits, Management review of the ISMS, ISMS improvement.	**8 Hours**
Unit-2:	**Information Security Audit Check Listing:** Security Policy, Organising information security, Asset management, Human resources security, Physical and environmental security, Communications and operations management, Access control, Information systems acquisition, development and maintenance, Information security incident management, Business continuity management, Compliance.	**8 Hours**
Unit-3:	**PCI DSS:** Scope of PCI DSS Requirements, Best Practices for Implementing PCI DSS into Business-as-Usual Processes, PCI DSS Assessment Process, PCI DSS Requirements: Build and Maintain a Secure Network and Systems, Protect Cardholder Data, Maintain a Vulnerability Management Program, Implement Strong Access Control Measures, Regularly Monitor and Test Networks, Maintain an Information Security Policy.	**8 Hours**
Unit-4:	**Hipaa - Purpose and Scope:** HIPAA Security Rule, Security Rule Goals and Objective, Security Rule Organization, Administrative Safeguards: Security Management Process, Assigned Security Responsibility, Workforce Security, Information Access Management, Security Awareness and Training, Security Incident Procedures, Contingency Plan, Evaluation, Business Associate Contracts and Other Arrangements.	**8 Hours**
Unit-5:	**Physical and Technical Safeguards:** Physical Safeguards: Facility Access Controls, Workstation Use, Workstation Security, Device and Media Controls, Technical Safeguards: Access Control, Audit Controls, Integrity, Person or Entity Authentication,	**8 Hours**

	Transmission Security, Organizational Requirements: Business Associate Contracts or Other Arrangements, Requirements for Group Health Plans.	
Text Books:	1. Information Security Policy Development for Compliance: ISO/IEC 27001, NIST SP 800-53, HIPAA Standard, PCI DSS V2.0, and AUP V5.0, Barry L. Williams, Auerbach Publications; 1 edition (6 March 2013).	
Reference Books:	**1.** Foundations of Information Security Based on ISO27001 and ISO27002 (Best Practice) by Hans Baars et.al. Van Haren Publishing; 3rd Revised edition (15 April 2015). 2. IT Governance: An International Guide to Data Security and ISO27001/ISO27002 by Alan Calder, Steve Watkins, Kogan Page; 6 editions (3 September 2015). *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. http://itm.iit.edu/netsecure11/RobertSlade_SecFrameworks.pdf 2.http://www.alntechnology.com/sites/default/files/isfpdf%20%28rombus%29.pdf	

Course Code: **ICS707**	**Professional Elective Courses – VI** **Specialization- CTIS** **B. Tech- Semester-VII** **Application Containerization**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the Dockers architecture and its components.	
CO2.	Understanding about images and repository in Dockers.	
CO3.	Understanding about Dockers Orchestration and Service discovery features.	
CO4.	Analyzing the Containerized applications and implement continuous integration using Dockers.	
CO5.	Creating images and containers using Dockers API.	
Course Content:		
Unit-1:	**Getting Started with Docker:** Introduction to Dockers, Containers vs Virtual Machines, Docker Architecture, Docker Components, Installing Docker, Working with Docker Containers, Introduction to Swarm mode and Micro services.	**8 Hours**
Unit-2:	**Docker Images and Repositories:** Docker Image Layers, Listing Docker Images, Pulling Images, Searching Images, Building Docker Images – Using Commands, Using Docker File, Working with Docker file, pushing image to the Docker Hub, Deleting an Image, Running Docker Registry.	**8 Hours**
Unit-3:	**Containerized Applications:** Docker to build and test a web application, Docker for Continuous Integration, Managing Multi-configuration job, Building services with Docker – Application, Application Server and Multi-container application stack, managing containers without SSH.	**8 Hours**
Unit-4:	**Docker Networking and Docker APIs:** Introduction to Docker Networking, None Network, Bridge Network, Host Network, Overlay Network, Container Networks with Docker Compose. The Docker APIs, Engine API, Managing images and containers with API, Authenticating the Docker Engine API.	**8 Hours**
Unit-5:	**Docker Orchestration and Service Discovery:** Docker Compose, Consul, Service Discovery and Docker, Docker Swarm, Orchestration alternatives and components – Fleet and etcd, Kubernetes, Apache Mesos, Helios, Centurion.	**8 Hours**
Text Books:	1. James Turnbull, "The Docker Book: Containerization is the new virtualization", Docker Inc.	

Reference Books:	1. Gene Kim, Patrick Debois, John Willis, Jez Humble, John Allspaw, "The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations ", IT Revolution Press, First Edition, October 2016 2. Jeff Nickoloff, "Docker in Action" , Manning Publication Co., First Edition, 2016. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-190.pdf 2. https://cyberlearn.hes-so.ch/pluginfile.php/2600529/mod_resource/content/1/Containers.pdf	

Course Code: ICS708	**Professional Elective Courses - VI** **Specialization- CTIS** **B. Tech- Semester-VII** **PowerShell Scripting**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understand the features of Windows PowerShell.	
CO2.	Understanding the use of cmdlets for other server administration tasks.	
CO3.	Understanding the purpose of the Windows PowerShell pipeline and to manipulate arrays and hash tables	
CO4.	Understanding about error handling for a script.	
CO5.	Applying various Windows PowerShell commands.	
Course Content:		
Unit-1:	**Introduction to Windows PowerShell:** Overview and background of Windows PowerShell, Understanding command syntax, Finding commands, Active Directory administration cmdlets, Network configuration cmdlets, Other server administration cmdlets. Understanding the pipeline, Selecting, sorting, and measuring objects, Filtering objects out of the pipeline, Enumerating objects in the pipeline, Sending pipeline data as output, Passing the pipeline data, Advanced considerations for pipeline data.	**8 Hours**
Unit-2:	**PowerShell Adapters and Management Tools :** Using PSProvider, Using PSDrives, Creating files and folders on a remote computer, Creating a registry key for your future scripts, Create a new Active Directory group. Understanding WMI and CIM, Querying data by using WMI and CIM, Making changes with WMI/CIM, Querying information by using WMI, Querying information by using CIM, Invoking methods. Using variables, Manipulating variables, Manipulating arrays and hash tables, working with variable types, using arrays, Using hash tables.	**8 Hours**
Unit-3:	**PowerShell scripting:** Introduction to scripting, Scripting constructs, Importing data from files, Setting a script, Processing an array with a foreach loop, Processing items by using If statements, Creating a random password, Creating users based on a CSV file. Accepting user input, Overview of script documentation, Troubleshooting and error handling, Functions and modules, Querying disk information from remote computers, Updating the script to use alternate credentials, Documenting a script, Creating a logging function, Adding error handling to a script, Converting a function to a module.	**8 Hours**
Unit-4:	**Administering Remote Computers :** Using basic Windows PowerShell remoting, Using advanced Windows PowerShell, remoting techniques, Enabling remoting on the local computer, Performing one-to-one remoting, Performing one-to-many remoting, Using PSSessions, Using implicit remoting, managing multiple computers.	**8 Hours**
Unit-5:	**Advanced Windows PowerShell techniques:** Using background jobs, Starting and managing jobs, Using scheduled jobs, creating a scheduled job. Creating profile scripts, Using advanced techniques, Practicing	**8 Hours**

	advanced techniques: Creating a profile script, Verifying the validity of an IP address, Reporting disk information, Configuring NTFS permissions, Creating user accounts with passwords from a CSV file, Practicing script development.	
Text Books:	1. Windows PowerShell Cookbook by leeholmes and dean Tsaltas, published by Shroff Publishers & distribution.	
Reference Books:	1. Windows Server 2016 Automation with PowerShell Cookbook 2nd Edition by Thomas Lee 2. Mastering Windows PowerShell Scripting by Brenton J.W. Blawat 3. Getting Started with PowerShell by Michael Shepard *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. http://www.docs.is.ed.ac.uk/skills/documents/3835/3835.pdf 2.http://www.informit.com/content/images/9780735663398/samplepages/9780735663398.pdf	

Course Code: **ICS709**	**Professional Elective Courses - VI** **Specialization- CTIS** **B. Tech- Semester-VII** **NoSQL Database**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of NoSQL databases.	
CO2.	Understanding about basic principles and design criteria of NoSQL databases.	
CO3.	Understanding the concepts of different types of NoSQL databases.	
CO4.	Understanding about data storage and processing techniques.	
CO5.	Applying the various queries used in NoSQL databases.	
Course Content:		
Unit-1:	**Introduction to NoSQL:** Understanding NoSQL Databases, Features of NoSQL, History of NoSQL, Classification and Comparison of NoSQL Databases, Data Types, CAP, Columnar, Key-Values, Triple and graph stores, Document, Search Engines, Available NoSQL Databases, Describing NoSQL, Applying Constituency Methods, ACID, BASE, Advantages of NoSQL over RBDMS.	**8 Hours**
Unit-2:	**Key-Value Based Databases:** Key Value Store, Features, Consistency, Transactions, Partitioning, Scaling, Replicating Data, Versioning Data, Use Cases	**8 Hours**
Unit-3:	**Document Based Databases:** Understanding Document Databases, Supporting Unstructured Documents, Document Databases Vs. Key-Value Stores, Sharding, Features, Consistency, Transactions, Availability, Scaling, Use Cases	**8 Hours**
Unit-4:	**Column-Oriented Based Databases:** Understanding Column oriented Database, Features, Consistency, Transactions, Scaling, and Use Cases	**8 Hours**
Unit-5:	**Graph Based Databases:** Understanding Graph Databases, Features, Consistency, Transactions, Availability, Scaling, Use Cases.	**8 Hours**
Text Books:	1. NoSQL for Dummies, By: Adam Fowler, Published by: John Wiley & Sons, Inc.	
Reference Books:	1. Professional NoSQL, Shashank Tiwari, 2. NoSQL Distilled, By: Pramod J. Sadalage & Martin Fowler, Pearson Education, Inc."Cassandra: The Definitive Guide", O'Reilley, 2010. 3. MongoDB: The Definitive Guide" by Kristina Chodorow *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1. http://pages.di.unipi.it/turini/Basi%20di%20Dati/Slides/11.NoSQL-slides.pdf 2. https://www.christof-strauch.de/nosqldbs.pdf	

Course Code: **ICS851**	**Specialization- CTIS** **B. Tech- Semester-VIII** **Industry Internship**	**L-0** **T-0** **P-28** **C-14**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding to take initiatives, communicate, work in a team and manage a project within a given time frame.	
CO2.	Understanding the use of interpretation and application of an appropriate international engineering standard in a specific situation.	
CO3.	Applying prior acquired knowledge in problem solving.	
CO4.	Analyzing a given engineering problem and use an appropriate problem solving methodology.	
CO5.	Analyzing sources of hazards, and identify appropriate health & safety measures.	
Course Content:		
	The students will undertake a project as part of their final semester. The students can do independent projects or can take up projects in groups of two or more depending on the complexity of the project. The maximum group size will be four and in case of team projects there should be a clear delineation of the responsibilities and work done by each project member. The topic should be informed to the mentor, and the student should appear for intermediate valuations.	
Industry Internship:	Students will go for the full semester industry internship in VIIIth semester. The industry internship should duly be approved by Training & Placement department and Principal of the school. Each student will be allotted a Faculty Guide and an Industry Guide during the internship work. Students need to maintain a Project Diary and update the project progress, work reports in the project diary. Every student must submit a detailed project report as per the provided template. In the case of team projects, a single copy of these items must be submitted but each team member will be required to submit an individual report detailing their own contribution to the project. Each student/group should be allotted a supervisor and periodic internal review shall be conducted which is evaluated by panel of examiners.	
	Project Evaluation Guidelines: The Project evaluator(s) verify and validate the information presented in the project report. The break-up of marks would be as follows: 1. Internal Evaluation 2. External Assessment	

	Internal Evaluation: Internal Evaluator of project needs to evaluate Internal Project work based on the following criteria: Project Scope , Objectives and Deliverables Research Work, Understanding of concepts Output of Results and Proper Documentation Interim Reports and Presentations– Twice during the course of the project	
	External Evaluation: The Project evaluator(s) perform the External Assessment based on the following criteria. • Understanding of the Project Concept • Delivery Skill • The Final Project Report • Originality and Novelty	
	The Final Project Report Details: • The report should have an excel sheet that documents the work of every project member	
	Marking Scheme: 1. **Internal Evaluation:** 50% of Total Marks 2. **External Evaluation:** 50% of Total Marks **For e.g.,** if the total mark for the Internship is 300, then ❖ Internal Evaluation = 150 marks The break-up of marks is shown below:- • Interim Evaluation 1: 30 marks • Interim Evaluation 2: 30 marks • Viva Voice: 30 marks • Implementation of project : 60 marks ❖ External Evaluation = 150 marks The break-up of marks is shown below:- • Project Report: 40 marks • Explanation of project working: 50 marks • Implementation / code : 60 marks	

Course Code: **ICS851**	**Specialization- CTIS** **B. Tech- Semester-VIII** **Project**	**L-0** **T-0** **P-16** **C-8**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding methodologies and professional way of documentation and communication.	
CO2.	Understanding about software development cycle with emphasis on different processes -requirements, design, and implementation phases.	
CO3.	Analyzing a software project and demonstrate the ability to communicate effectively in speech and writing.	
CO4.	Creating a new model over the selected field of research that will be useful for future activities.	
CO5.	Creating a project that help to gain confidence and technical knowledge.	
Course Content:		
	The students will undertake a project as part of their final semester. The students can do independent projects or can take up projects in groups of two or more depending on the complexity of the project. The maximum group size will be four and in case of team projects there should be a clear delineation of the responsibilities and work done by each project member. The projects must be from the following specialized domains or in a combination only: • Cloud Technology • Information Security • Cyber Forensics The projects must be approved by the mentor assigned to the student. The mentors will counsel the students for choosing the topic for the projects and together they will come up with the objectives and the process of the project. From there, the student takes over and works on the project.	
The Project:	Each student will be allotted a Faculty Guide during the project work. Students need to maintain a Project Diary and update the project progress, work reports in the project diary. Every student must submit a detailed project report as per the provided template. In the case of team projects, a single copy of these items must be submitted but each team member will be required to submit an individual report detailing their own contribution to the project. Each student/group should be allotted a supervisor and periodic internal review shall be conducted which is evaluated by panel of examiners.	
	Project Evaluation Guidelines: The Project evaluator(s) verify and validate the information presented in the project report.	

	The break-up of marks would be as follows: • Internal Evaluation • External Assessment • Viva Voce	
	Internal Evaluation: Internal Evaluator of project needs to evaluate Internal Project work based on the following criteria: • Project Scope , Objectives and Deliverables • Research Work, Understanding of concepts • Output of Results and Proper Documentation • Interim Reports and Presentations– Twice during the course of the project	
	External Evaluation: The Project evaluator(s) perform the External Assessment based on the following criteria. • Understanding of the Project Concept • Delivery Skill • The Final Project Report • Originality and Novelty	
	The Final Project Report Details: • The report should have an excel sheet that documents the work of every project member	
	Viva Voce • Handling questions • Clarity and Communication Skill	
	Marking Scheme: 1. **Internal Evaluation:** 35% of Total Marks 2. **External Evaluation:** 50% of Total Marks 3. **Viva Voce:** 15 % of Total Marks **For e.g.,** if the total mark for the project is 100, then ❖ Internal Evaluation = 35 marks The break-up of marks is shown below:- • Interim Evaluation 1: 10 marks	

	• Interim Evaluation 2: 10 marks • Understanding of concepts: 5 marks • Programming technique: 5 marks • Execution of code : 5 marks ❖ External Evaluation = 50 marks The break-up of marks is shown below:- • Project Report: 15 marks • Explanation of project working: 10 marks • Execution of code: 10 marks – (if done in industry, a stand-alone module can be reprogrammed and submitted. Error rectification etc. can be included by the evaluator) • Participation in coding: 15 marks ❖ Viva Voce = 15 marks The break-up of marks is shown below: - • Questions related to project: 10 marks • Questions related to technology: 5 marks. The Project evaluator(s) verifies and validates the information presented in the project report.	

Course Code: ICS801	**Professional Elective Courses – VII** **Specialization- CTIS** **B. Tech- Semester-VIII** **Cloud Web Services**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding fundamental understanding of AWS cloud technologies.	
CO2.	Understanding Windows or Linux server in the cloud with its own private address.	
CO3.	Understanding the start-up of a CRM / Word Press / etc. website hosted in cloud.	
CO4.	Creating a highly scalable MySQL or Oracle database in the cloud with multiple read-replica databases (for scalability of database).	
CO5.	Creating a load-balancer setup in the cloud.	
Course Content:		
Unit-1:	**Introduction to Cloud Computing and Amazon Web Services:** Introduction to Cloud Computing, Cloud Service Delivery Models (IAAS, PAAS, SAAS), Cloud Deployment Models (Private, Public, Hybrid and Community), Cloud Computing Security, Case Study Introduction to Amazon Web Services, Why Amazon? Use Cases, AWS Storage Options, AWS Compute Options, AWS Database Options, AWS Workflow Automation and Orchestration Options, AWS Systems Management and Monitoring Options, AWS Virtual Private Cloud Introduction, Pricing Concepts.	**8 Hours**
Unit-2:	**Unit II: Introduction to EC2:** Introduction To EC2, Instance Types And Uses, Auto scaling Instances, Amazon Machine Images (AMIS), Modifying Existing Images, Creating New Images of Running Instances, Converting An Instance Store AMI To An EBS AMI, Instances Backed By Storage Types, Elastic IPS, Elastic Load Balancing.	**8 Hours**
Unit-3:	**Web Applications and Security:** Introduction to Elastic Beanstalk, Deploying Scalable Application On AWS, Selecting And Launching An Application Environment, Provisioning Application Resources with Cloud formation, Introduction to CloudWatch, Describe Amazon Cloud Watch metrics and alarms, AWS Messaging Services(SNS,SQS,SES). Introduction to AWS Security, Describe Amazon Identity and Access Management (IAM), AWS Directory Service, AWS Key Management Service, Securing Data at Rest and In Motion.	**8 Hours**
Unit-4:	**AWS Storage:** Amazon Storage, S3 Storage Basics, Buckets and Objects, Creating A Web Server Using S3 Endpoints, Managing Voluminous Information with EBS, Glacier Storage Service , Describe Amazon Dynamo, Understand key aspects of Amazon RDS, Launch an Amazon RDS instance.	**8 Hours**
Unit-5:	**AWS Networking:** Introduction to AWS Networking , Access Control Lists (ACLs), Setting Up a Security	**8 Hours**

	Group, Setting Up VPC And Internet Gateway, Setting Up A VPN, Setting Up A Customer Gateway For VPN, Setting Up Dedicated Hardware For VPC, Scenario 1:VPC With A Public Subnet Only (Standalone Web), Scenario 2: VPC with Public And Private Subnets (3 Tier App), Scenario 3:VPC With Public And Private Subnets And Hardware VPN Access (Web On The Cloud, Database and App On Prem) Scenario 4: VPC With A Private Subnet Only And Hardware VPN Access. (Extension Of Your Corporate Network), Route53 for DNS System, Cloud front, Case Study.	
Text Books:	1. Joe Baron, HishamBaz , Tim Bixler , Biff Gaut , Kevin E. Kelly , Sean Senior , John Stamper , "AWS Certified Solutions Architect Official Study Guide: Associate Exam, John Wiley and Sons Publications, 2017.	
Reference Books:	1. YohanWadia , "AWS Certified Solutions Architect Official Study Guide: Associate Exam, John Packt Publishing, 2016. 2. Bernald Golden, "Amazon Web Services for Dummies", John Wiley & Sons, 2013. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1.https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.448.2253&rep=rep1&type=pdf 2. https://www.omg.org/cloud/deliverables/CSCC-Cloud-Customer-Architecture-for-Web-Application-Hosting.pdf	

Course Code: **ICS802**	**Professional Elective Courses – VII** **Specialization- CTIS** **B. Tech- Semester-VIII** **Infrastructure Solutions on Cloud**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding basics of Azure, Azure Services and Azure Portals.	
CO2.	Understanding basics of Storage, Types and Azure Storage Offerings.	
CO3.	Understanding basics of Virtual Networks, Address Spaces, Subnets and DNS Servers.	
CO4.	Understanding the Active Directory (AD), Identity and Authentication in Public Cloud.	
CO5.	Creating a SQL Server and Creating a SQL DB.	
Course Content:		
Unit-1:	**Getting Started with Azure:** Overview of Cloud Computing – Various Cloud Offerings – Azure Basics – Azure Services – Azure Portals – Preview Portal, Management Portal, Subscription Management – Billing – Pricing Calculator - Azure Virtual Machines : Virtual Machine(VM) Basics – Status, IP Address, Creating and Configuring Virtual Machines – Configuring VM disks – Virtual Machine Management.	**8 Hours**
Unit-2:	**Azure Storage:** Storage Basics – Storage Types – Azure Storage Offerings – Understanding Azure Regions – Using Storage Accounts – Enabling Larger and Faster Storage – Resizing Azure Disks – Using Premium Storage – Monitoring Azure Storage Accounts – Best Practices for Azure Storage – Azure VM Storage Types – Azure Files – Managing Azure Storage.	**8 Hours**
Unit-3:	**Azure Networking:** Basics of Virtual Networks –Address Spaces, Subnets, DNS Servers – Creating and Using Virtual Networks – Network Security Groups – Virtual Appliances – Load Balancer basics – Configuring Load Balancers – Creating and Using Load balancers – Azure VPN.	**8 Hours**
Unit-4:	**Azure Active Directory:** Introduction to Active Directory(AD), Identity and Authentication in Public Cloud – Introduction to Azure AD – Extending Active Directory into Azure – Azure AD and applications – Reporting and Monitoring Azure AD.	**8 Hours**
Unit-5:	**Azure Databases:** SQL Azure: Creating a SQL Server - Creating a SQL DB - Creating Tables - Adding Data to the Table - View Connection Strings - Security Configurations - Migrating on premise DB to SQL Azure. Azure Websites: Creating a Website, Setting deployment credentials -Choosing a	**8 Hours**

	platform -Setting up Default page for website - Scaling - Auto Scaling by Time - Auto Scaling by Metric - Difference between Free, Shared, Basic and Standard websites - Creating a website using Visual studio	
Text Books:	1. Michael Collier, Robin Shahan, "Fundamentals of Azure – Microsoft Azure Essentials", Microsoft Press, 2015.	
Reference Books:	1. Michael W, "Implementing Microsoft Azure Infrastructure Solutions", Phi Learning Pvt Ltd, 2009. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1.https://cloud.report/Resources/Whitepapers/66010887-aca9-49b8-8a55-4a8390b94433_10.1.1.1020.1178.pdf 2. https://www.intel.in/content/dam/www/public/us/en/documents/guides/cloud-computing-virtualization-building-private-iaas-guide.pdf	

Course Code: ICS803	**Professional Elective Courses – VII** **Specialization- CTIS** **B. Tech- Semester-VIII** **Cloud Architectural Patterns**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the need for Cloud architectural patterns.	
CO2.	Understanding the AutoScaling and MapReduce Architectural Patterns.	
CO3.	Understanding about Node Failure and Collocate Pattern.	
CO4.	Analyzing the Auto scaling and Map reduce architecture.	
CO5.	Creating the Database Sharding Pattern and Busy Signal Pattern.	
Course Content:		
Unit-1:	**Introduction:** Introduction to Cloud Architectural Patterns, Scalability Primer – Scalability Defined, Resource Contention, Business Concern, and Cloud-Native Application. Horizontally Scaling Compute Pattern - Cloud Significance, Impact, and Cloud Scaling is Reversible, Managing Session State, Managing Many Nodes, and Example, Building PoP on Windows Azure. Queue-Centric Workflow Pattern - Context, Cloud Significance, Impact, Mechanics, and Example: Building PoP on Windows Azure.	**8 Hours**
Unit-2:	**Auto Scaling and Map Reduce Architectural Patterns:** Auto-Scaling Pattern - Context, Cloud Significance, Impact, and Mechanics, Automation Based on Rules and Signals, Example: Building PoP on Windows Azure. Eventual Consistency Primer - CAP Theorem and Eventual Consistency, Eventual Consistency Examples, Relational ACID and NoSQL BASE, Impact of Eventual Consistency on Application Logic. MapReduce Pattern - Context, Cloud Significance, Impact, Mechanics, and MapReduce Use Cases, Beyond Custom Map, and Reduce Functions, Example: Building PoP on Windows Azure.	**8 Hours**
Unit-3:	**Database Sharding and Busy Signal Pattern:** Database Sharding Pattern- Context, Cloud Significance. Impact, Mechanics, Shard Identification and Distribution, Cloud Database Instances, Example: Building PoP on Windows Azure. Multitenancy and Commodity Hardware Primer - Multitenancy, Security, Performance Management, Impact of Multitenancy on Application Logic, Commodity Hardware, Impact of Commodity Hardware on Application Logic. Busy Signal Pattern - Context, Cloud Significance. Impact, Mechanics, Transient Failures Result in Busy Signals, Recognizing and Responding to Busy Signals, User	**8 Hours**

	Experience Impact, Testing, Example: Building PoP on Windows Azure.	
Unit-4:	**Node Failure and Collocate Pattern:** Node Failure Pattern - Context, Cloud Significance. Impact, Mechanics, Failure Scenarios, Handling Node Shutdown, Recovering from Node Failure, Shielding interactive users from failures, Resuming work-in-progress on backend systems, Example: Building PoP on Windows Azure. Network Latency Primer - Network Latency Challenges, Reducing Perceived Network Latency, Reducing Network Latency. Collocate Pattern - Context, Cloud Significance. Impact, Mechanics, Automation Helps, Cost Considerations, Non-Technical Considerations, Example, Building PoP on Windows Azure.	**8 Hours**
Unit-5:	**Valet key Pattern:** Valet Key Pattern - Context, Cloud Significance, Impact, Mechanics, Public Access, Granting Temporary Access, Security Considerations, Example: Building PoP on Windows CDN Pattern - Context, Cloud Significance, Impact, Mechanics, Caches Can Be Inconsistent, Example: Building PoP on Windows Azure. Multisite Deployment Pattern- Context, Cloud Significance, Impact, Mechanics, Non-Technical Considerations in Data Center Selection, Cost Implications, Failover across Data Centres, Example: Building PoP on Windows Azure.	**8 Hours**
Text Books:	1. Bill Wilder, "Cloud Architecture Patterns: Using Microsoft Azure", O'Reilly Media, Inc. 1st Edition, September 2012.	
Reference Books:	1. Cloud Native Development Patterns and Best Practices by John Gilbert 2. Cloud Computing Patterns: Fundamentals to Design, Build, and Manage Cloud Applications by Christoph Fehling, Frank Leymann, Ralph Retter *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material	1.https://resources.sei.cmu.edu/asset_files/Presentation/2013_017_001_48527.pdf 2.http://dl.booktolearn.com/ebooks2/computer/networking/9781449319779_cloud_architecture_patterns_5758.pdf 3. https://elib.uni-stuttgart.de/bitstream/11682/3613/1/dissertation_fehling.pdf	

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