SCHEME & SYLLABUS

Department of Information Science and Engineering

Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Beng...98

Head of Department
fo. Science Engineer
bal Academy of Techn...
Bangalore - 98

III -VIII Semester Scheme & Syllabus (2022-23)

Information Science & Engineering

Autonomous-2022

GLOBAL ACADEMY OF TECHNOLOGY
(Autonomous institution affiliated to VTU, Belagavi.
Accredited by NAAC with 'A' grade,
NBA Accredited CS, E&C, E&E, MECH and IS branches)
Ideal Homes Township,
Raja Rajeshwari Nagar, Bengaluru-560098.

Scheme & Syllabus of UG Autonomous Program – 2022 batch
(3rd - 8th Semester)

III-SEMESTER:

Sl. No.	Course Code	Course Title	Teaching Hours/Week			Examination			CREDITS
			L	T	P	CIE	SEE	Total	
1	22MAT31X	Discrete Mathematics – I (Branch Specific)	2	2	0	50	50	100	3
2	22ISE32	Digital Logic Design and Computer Organization (Integrated)	3	0	2	50	50	100	4
3	22ISE33	Data Structure (Integrated)	3	0	2	50	50	100	4
4	22ISE34	Operating Systems	3	0	0	50	50	100	3
5	22ISE35	ESC/ETC/**PLC** Object Oriented Programming using Java	2	0	2	50	50	100	3
6	22ISE36	Web Technology and Its Applications (Integrated)	2	0	2	50	50	100	3
		Total				**300**	**300**	**600**	**20**

IV-SEMESTER:

Sl. No.	Course Code	Course Title	Teaching Hours/Week			Examination			CREDITS
			L	T	P	CIE	SEE	Total	
1	22MAT41X	Discrete Mathematics -II (Branch Specific)	2	2	0	50	50	100	3
2	22ISE42	Design and Analysis of Algorithms (Integrated)	3	0	2	50	50	100	4
3	22ISE43	Database Management Systems(Integrated)	3	0	2	50	50	100	4
4	22ISE44	Software Engineering	3	0	0	50	50	100	3
5	22ISE45	ESC/**ETC**/PLC Data Communications	2	0	2	50	50	100	3
6	22ISE46	Mobile Application Development (Integrated)	2	0	2	50	50	100	3
		Total				**300**	**300**	**600**	**20**

Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Beng... 98

Global Academy of Technology

(An Autonomous Institution, affiliated to VTU, Belagavi, recognized by Karnataka and Approved by AICTE, New Delhi.)

B.E. in Information Science & Engineering Scheme of Teaching and Examinations 2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

V SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMS	22ISE51	Software Project Management & Economics	TD: IS PSB: IS	3	0	0		03	50	50	100	3
2	IPCC	22ISE52	Computer Networks (Integrated)	TD: IS PSB: IS	3	0	2		03	50	50	100	4
3	PCC	22ISE53	Theory of Computations	TD: IS PSB: IS	3	2	0		03	50	50	100	4
4	PCCL	22ISEL54	Data Visualization Lab	TD: IS PSB: IS	0	0	2		03	50	50	100	1
5	PEC	22ISE55X	Professional Elective - I	TD: IS PSB: IS	3	0	0		03	50	50	100	3
6	PROJ	22ISE56	Mini Project	TD: IS PSB: IS	0	0	4		03	100		100	2
7	AEC	22RMIK57	Research Methodology and IPR	HSS	2	2	0		03	50	50	100	3
8	MC	22CIVK58	Environmental Studies	TD: CV/Env/Chem PSB:CV	2	0	0		02	50	50	100	2
9	MC	22NSK59	National Service Scheme (NSS)	NSS coordinator	0	0	2			100		100	0
		22PEK59	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YOK59	Yoga	Yoga Teacher									
									Total	**550**	**350**	**900**	**22**

H.R. Rajashekhar Swamy
Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Beng...98

Professional Elective Course - I			
22ISE55A	Computer Vision	22ISE55C	Distributed Systems
22ISE55B	Unix System Programming	22ISE55D	Cloud Computing

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K :** The letter in the course code indicates common to al the stream of engineering. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course.

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Mini-project work: Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

No SEE component for Mini-Project.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

H.P. Rajasekhar Swamy
Dean Academic
Global Academy of Technology,
Raja...shwarinagar, Beng... 98

Global Academy of Technology

(An Autonomous Institution, affiliated to VTU, Belagavi, recognized by Karnataka and Approved by AICTE, New Delhi.)

B.E. in Information Science & Engineering Scheme of Teaching and Examinations 2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

VI SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22ISE61	Full Stack Development (Integrated)	TD: IS PSB: IS	3	0	2		03	50	50	100	4
2	PCC	22ISE62	Machine Learning	TD: IS PSB: IS	4	0	0		03	50	50	100	4
3	PEC	22ISE63X	Professional Elective - II	TD: IS PSB: IS	3	0	0		03	50	50	100	3
4	OEC	22ISE64X	Open Elective -I	TD: IS PSB: IS	3	0	0		03	50	50	100	3
5	PROJ	22ISEP65	Major Project Phase - I	TD: IS PSB: IS	0	0	4		04	100	--	100	2
6	PCCL	22ISEL66	Machine Learning Lab	TD: IS PSB: IS	0	0	2		03	50	50	100	1
7	AEC/ SDC	22ISE67X	Ability Enhancement Course/ SkillDevelopment Course - III	TD & PSB: Concerned Department	If the course is offered as a Theory: 1	0	0		01	50	50	100	1
					If course is offered as a practical: 0	0	2						
8	MC	22NSK68	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		22PEK68	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YOK68	Yoga	Yoga Teacher									
9	IKS	22IKS69	Indian Knowledge System		1	0	0		01	50	50	100	0
10	UHV	22UHV69	Universal Human Values		1	0	0		01	50	50	100	0
									Total	**600**	**400**	**1000**	**18**

Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Benga...-98

Professional Elective Course			
22ISE63A	Blockchain Technology	22ISE63C	Wireless Sensor Networks
22ISE63B	Ethical Hacking	22ISE63D	Computer Graphics
Open Elective Course			
22ISE64A	Introduction to Data Structures	22ISE64C	Introduction to Computer Networks
22ISE64B	Introduction to Operating Systems	22ISE64D	Introduction to JAVA
Ability Enhancement Course / Skill Enhancement Course - III			
22ISE67A	Mobile Application Development	22ISE67C	IT Law and Ethics
22ISE67B	Tosca – Automated Software Testing	22ISE67D	Devops

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K :** The letter in the course code indicates common to al the stream of engineering. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course. **PROJ**: Project Phase -I, **OEC**: Open Elective Course

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Project Phase-I : Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

Dean Academic
Global Academy of Technology,
Raja... Bangalore-98

Global Academy of Technology

(An Autonomous Institution, affiliated to VTU, Belagavi, recognized by Karnataka and Approved by AICTE, New Delhi.)

B.E. in Information Science & Engineering Scheme of Teaching and Examinations 2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

Scheme A- VII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22ISE71	Big Data Analytics (Integrated)	TD: IS PSB: IS	3	0	2		03	50	50	100	4
2	IPCC	22ISE72	Industrial Internet of Things (Integrated)	TD: IS PSB: IS	3	0	2		03	50	50	100	4
3	PCC	22ISE73	Information and Network Security	TD: IS PSB: IS	4	0	0		03	50	50	100	4
4	PEC	22ISE74X	Professional Elective-III	TD: IS PSB: IS	3	0	0		03	50	50	100	3
5	OEC	22ISE75X	Open Elective- II	TD: IS PSB: IS	3	0	0		01	50	50	100	3
6	PROJ	22ISEP76	Major Project Phase-II	TD: IS PSB: IS	0	0	12		03	100	100	200	6
									Total	**350**	**350**	**700**	**24**

Professional Elective Course			
22ISE74A	Deep Learning	22ISE74C	Information Retrieval and Natural Language Processing
22ISE74B	Quantum Computing	22ISE74D	.Net Frame Work for Applications
Open Elective Course			
22ISE75A	Introduction to DBMS	22ISE75C	Introduction Software Engineering
22ISE75B	ReactJS	22ISE75D	Web Technology

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **OEC**: Open Elective Course PR: Project Work, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work

Note: VII and VIII semesters of IV years of the program

(1) Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/ industry internships after the VI

Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Benga...-98

semester**.**

(2) Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether the VII or VIII semesters is completed during the beginning of the IV year or the later part of IV years of the program.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

PROJECT WORK (21MEP75): The objective of the Project work is

(i) To encourage independent learning and the innovative attitude of the students.

(ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.

(iii) To impart flexibility and adaptability.

(iv) To inspire team working.

(v) To expand intellectual capacity, credibility, judgment and intuition.

(vi) To adhere to punctuality, setting and meeting deadlines.

(vii) To install responsibilities to oneself and others.

(viii) To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve ingroup discussion to present and exchange ideas.

CIE procedure for Project Work:

(1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

Dean Academic
Global Academy of Technology,
Raja... ...hwarinagar, Beng... ...98

Global Academy of Technology

(An Autonomous Institution, affiliated to VTU, Belagavi, recognized by Karnataka and Approved by AICTE, New Delhi.)

B.E. in Information Science & Engineering Scheme of Teaching and Examinations 2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

Scheme A- VIIISEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PEC	22ISE81X	**Professional Elective -IV (Online Courses)**	PSB: IS	3	0	0		03	50	50	100	3
2	OEC	22ISE82X	**Open Elective - III (Online Courses)**	PSB: IS	3	0	0		03	50	50	100	3
3	INT	22ISEI83	**Internship (Industry/Research) (14 - 20 weeks)**	PSB: IS	0	0	12		03	100	100	200	10
									Total	**200**	**200**	**400**	**16**

Professional Elective Course (Online courses)

22ISE81A	Reinforcement Learning https://nptel.ac.in/courses/106106143	22ISE81C	Multi-Core Computer Architecture https://nptel.ac.in/courses/106103184
22ISE81B	Social Network Analysis https://nptel.ac.in/courses/106106239	22ISE81D	Design & Implementation of Human-Computer Interfaces https://nptel.ac.in/courses/106103237

Open Elective Courses (Online Courses)

22ISE82A	Software Testing https://nptel.ac.in/courses/106101163	22ISE82C	Responsible & Safe AI Systems https://nptel.ac.in/courses/106106472
22ISE82B	Introduction to Industry 4.0 and Industrial Internet of Things https://nptel.ac.in/courses/106105195	22ISE82D	Data Science for Engineers https://nptel.ac.in/courses/106106179

L: Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work, **INT**: Industry Internship / Research Internship / Rural Internship

Note: VII and VIII semesters of IV years of the program

Swapping Facility

- Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate **research internships/ industry internships/Rural Internship** after the VI semester**.**

Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Beng...98

- Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or VIII semester is completed during the beginning of IV year or later part of IV year of the program.

Elucidation:

At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester **Research Internship /Industrial Internship / Rural Internship** shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship.

Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation centre, Incubation centre, Start-up, centre of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internship is for 14 to 20 weeks. The internship shall be considered as a head of passing and shall be considered for the award of a degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements.

Research internship: A research internship is intended to offer the flavour of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

Rural Internship: Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

The faculty coordinator or mentor has to monitor the student's internship progress and interact with them to guide for the successful completion of the internship.The students are permitted to carry out the internship anywhere in India or abroad. University shall not bear any expenses incurred in respect of the internship.

With the consent of the internal guide and Principal of the Institution, students shall be allowed to carry out the internship at their hometown (**within or outside the state or abroad**), provided favorable facilities are available for the internship and the student remains regularly in contact with the internal guide. **University shall not bear any cost involved in carrying out the internship by students.** However, students can receive any financial assistance extended by the organization.

Professional Elective /Open Elective Course: These are ONLINE courses suggested by the respective Board of Studies. Details of these courses shall be made available for students on the VTU web portal.

H.P. Rajasekhar Iyer
Dean Academic
Global Academy of Technology,
Raja... ...hwarinagar, Beng... ...98

Global Academy of Technology

(An Autonomous Institution, affiliated to VTU, Belagavi, recognized by Karnataka and Approved by AICTE, New Delhi.)

B.E. in Information Science & Engineering Scheme of Teaching and Examinations 2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

VI SEMESTER Scheme B - for the candidates who seek a two-semester internship with project work /Start-up

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22ISE61	Full Stack Development (Integrated)	TD: IS PSB: IS	3	0	2		03	50	50	100	4
2	PCC	22ISE62	Machine Learning	TD: IS PSB: IS	4	0	0		03	50	50	100	4
3	PEC	22ISE63X	Professional Elective - II	TD: IS PSB: IS	3	0	0		03	50	50	100	3
4	OEC	22ISE64X	Open Elective -I	TD: IS PSB: IS	3	0	0		03	50	50	100	3
5	PCCL	22ISEL66	Machine Learning Lab	TD: IS PSB: IS	0	0	2		03	50	50	100	1
6	AEC/ SDC	22ISE67X	Ability Enhancement Course/ SkillDevelopment Course - III	TD & PSB: Concerned Department	If the course is offered as a Theory 1	0	0		01	50	50	100	1
					If course is offered as a practical 0	0	2						
7	MC	22NSK68	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		22PEK68	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YOK68	Yoga	Yoga Teacher									
8	IKS	22IKS69	Indian Knowledge System		1	0	0		01	50	50	100	0
9	UHV	22UHV69	Universal Human Values		1	0	0		01	50	50	100	0
									Total	**500**	**400**	**900**	**16**

Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Beng...-98

Professional Elective Course			
22ISE63A	Blockchain Technology	22ISE63C	Wireless Sensor Networks
22ISE63B	Ethical Hacking	22ISE63D	Computer Graphics
Open Elective Course			
22ISE64A	Introduction to Data Structures	22ISE64C	Introduction to Computer Networks
22ISE64B	Introduction to Operating Systems	22ISE64D	Introduction to JAVA
Ability Enhancement Course / Skill Enhancement Course - III			
22ISE67A	Mobile Application Development	22ISE67C	IT Law and Ethics
22ISE67B	Tosca – Automated Software Testing	22ISE67D	Devops

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K :** The letter in the course code indicates common to al the stream of engineering. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course. **PROJ**: Project Phase -I, **OEC**: Open Elective Course

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Project Phase-I : Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

Global Academy of Technology

(An Autonomous Institution, affiliated to VTU, Belagavi, recognized by Karnataka and Approved by AICTE, New Delhi.)

B.E. in Information Science & Engineering Scheme of Teaching and Examinations 2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

Scheme B - VII and VIII semesters for the candidates who seek an internship with project work)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22ISE71	Big Data Analytics (Integrated)	TD: IS PSB: IS	3	0	2		03	50	50	100	4
2	IPCC	22ISE72	Industrial IOT (Integrated)	TD: IS PSB: IS	3	0	2		03	50	50	100	4
3	PCC	22ISE73	Information and Network Security	TD: IS PSB: IS	4	0	0		03	50	50	100	3
4	PEC	22ISE74X	Professional Elective-III (MOOC COURSES)	TD: IS PSB: IS	3	0	0		03	50	50	100	3
5	OEC	22ISE75X	Open Elective- II (MOOC COURSES)	TD: IS PSB: IS	3	0	0		01	50	50	100	3
6	PEC	22ISE81X	Professional Elective-IV (MOOC COURSES)	TD: IS PSB: IS	3	0	0		03	50	50	100	3
7	OEC	22ISE82X	Open Elective- III (MOOC COURSES)	TD: IS PSB: IS	3	0	0		03	50	50	100	3
8	PROJ	22ISEP84	Major Project Phase-II	TD: IS PSB: IS	0	0	12		03	100	100	200	9
9	INT	22ISEI83	Internship (Industry/Research) (14 - 20 weeks)	TD: IS PSB: IS	0	0	12		03	100	100	200	10
									Total	**550**	**550**	**1100**	42

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **OEC**: Open Elective Course PR: Project Work, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work

Note: VII and VIII semesters of IV years of the program

(1) Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/ industry internships after the VI

3rd Semester Syllabus

SEMESTER – III

Course: Discrete Mathematics and Graph Theory
(Common for CSE/ISE/AI&DS /AI&ML/AI&ML/CS(AIML))

Course Code	**22MAT31A**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:2:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of Mathematics in fields of computer science and allied branches by making them to learn:

CLO1	Counting Principles
CLO2	Mathematical Logic and Set Theory
CLO3	Relations and Functions
CLO4	Graph Theory

Content	No. of Hours/ RBT levels
Module 1 The Rules of Sum and Product, The Pigeon-hole Principle, Permutations, Combinations, The Binomial Theorem, Combinations with Repetition.	**08 Hours L2, L3**
Module 2 Sets and Subsets, Set operations and Laws of Set Theory. Counting and Venn Diagrams. Probability, Conditional probability and Bayes Theorem.	**08 Hours L2, L3**
Module 3 Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implications: Rules of Inference. Quantifiers, Definitions and the Proofs of Theorems.	**08 Hours L2, L3**
Module 4 Relations and properties of relations, Representation of relations. Equivalence Relations and Partitions. Functions, Types of Functions, Function Composition and Inverse Functions.	**08 Hours L2, L3**
Module 5 Graphs, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits. Planar Graphs, Trees and Rooted Trees.	**08 Hours L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO31.1	Use computational techniques essential for the study of mathematical logic, set operations, relations and functions.
CO31.2	Solve problems using basic graph theory

Textbooks:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2020.

Reference books:

1. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO31.1	3	2	1									3				
CO31.2	3	2	1									3				
Average	3	2	1									3				

Low-1: Medium-2: High-3

SEMESTER- III

Course: Digital Logic Design and Computer Organization (Integrated)

Course Code	22ISE32	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites: Basic Electronics

Course Learning Objectives:

CLO1	Understand the basic digital principles and working of various logic gates, and different techniques for simplification of Boolean function.
CLO2	Design combinational logic circuits and describe their applications.
CLO3	Design and Analyze working of sequential circuits and its applications
CLO4	Describe about the Input/output Organization and Machine Instructions
CLO5	Illustrate the working of various Memory System of computer

Content	No. of Hours/ RBT levels
Module 1 : Introduction **Digital Principles:** Definition of Digital Signals, Digital Waveforms, Digital Logic **Digital Logic:** The Basic Gates-: NOT, OR, AND, Universal Logic Gates: NOR, NAND, Positive and Negative Logic **Combinational Logic Circuits:** Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Simplification by Quine-McCuskey Method, HDL Implementation Models. **Text Book 1: Chapter 1,2, & 3 (Specified Topics Only)**	**08 Hours L3**
Module 2: Data-Processing Circuits **Data-Processing Circuits:** Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD-to-decimal Decoders, Encoders, Exclusive-or Gates, Parity Generators and Checkers, Magnitude Comparator, Programmable Array Logic, Programmable Logic Arrays, HDL Implementation of Data Processing Circuits **Text Book 1: Chapter 4 (Specified Topics Only)**	**08 Hours L3**
Module 3: Sequential Circuits **Flip-Flops:** Definition, Clocked RS Flip-Flops, Clocked D Flip-Flops, Edge-Triggered RS Flip-Flops, Edge-Triggered D- Flip-Flops, Edge-Triggered JK Flip-Flops JK Master-Slave. Flip-Flops, Various Representations of Flip-Flops, HDL Implementation of Flip-Flops **Registers**: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Universal Shift Register, Register Implementation in HDL **Counters**: Definitions: Counter, Asynchronous Counter, Synchronous Counter, Counter Design as A Synthesis Problem, A Digital Clock, Counter Design using HDL **Text Book 1: Chapter 8,9 & 10 (Specified Topics Only)**	**08 Hours L4**

Module 4 **Machine Instructions and Programs:** Numbers, Arithmetic Operations and Characters, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language **Input/output Organization:** Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Direct Memory Access, Buses **Text Book 2: Chapter 2 & 4 (Specified Topics Only)**	**08 Hours** **L3**
Module 5 **Memory System:** Basic Concepts, Semiconductor RAM Memories – Internal organization of memory chips, Static memories, Asynchronous and synchronous DRAM, Structure of larger memories, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations – Hit rate and miss penalty. **Text Book 2: Chapter 5 (Specified Topics Only)**	**08 Hours** **L3**

Lab. No	Experiments
1.	Introduction to Lab
2.	Design and Implementation of the following Using HDL: ➢ Basic Gates and Universal Gates
3.	Design and Implementation of the following Using HDL: ➢ Simplifying Given SOP and HDL Implementation for the simplified expression
4.	Design and Implementation of the following Using HDL: ➢ 8:1 Multiplexer ➢ Demultiplexer
5.	Design and Implementation of the following Using HDL: ➢ BCD-to-decimal Decoders ➢ Encoders
6.	Design and Implementation of the following Using HDL: ➢ Mod-n (n<8) synchronous up counter using J- K Flip-Flops.
7.	Design and Implementation of the following Using HDL: ➢ An asynchronous counter using decade counter count up from 0 to n (n<=9)
8.	Case study: Illustrate the various addressing modes of different processors with example.
9.	Case study: Study and Prepare a Report on Evolution of computer Memory Systems.
10.	Revision Lab and Report Submission for case Studies
11.	Lab Internal Assessment

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22ISE32.1	Experiment with Various logic gates and Problem Solving Techniques
22ISE32.2	Design various data processing circuits
22ISE32.3	Design, analyze and implement various sequential Circuits
22ISE32.4	Utilize the machine instructions and addressing modes, interrupts and DMA
22ISE32.5	Identify the Memory System for efficient data store

Textbooks:

1. DIGITAL PRINCIPLES A D APPLICATIONS , Seventh Edition (Indian Special Edition) by Donald P Leach, Albert Paul Malvino and Goutam Saha , Tata McGraw Hill, 2011
2. Computer Organization- Carl Hamacher, ZvonkoVranesic, SafwatZaky:, 5th Edition, Tata McGraw Hill,2018

Reference books:

1. R D Sudhakar Samuel, K.S. Nandini Prasad: Logic Design, 1st edition, Elsevier Publication, 2013.
2. M Morris Mano: Digital Logic and Computer Design, 14th Impression, Pearson, 2012. ISBN 978-81-7758-409-7.
3. Charles H. Roth: Fundamentals of Logic Design, Jr., 5th Edition, Thomson, 2004
4. Computer Organization & Architecture - William Stallings, 10th Edition, Pearson, 2016.

MOOCs

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests for the theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Average of three test will be considered. The Lab CIE is conducted for 20 marks and is added to the theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE32.1	3	3	3	2	2	-	-	-	-	-	-	2	2	-	-	-
22ISE32.2	3	3	3	2	2	-	-	-	-	-	-	2	2	-	-	-
22ISE32.3	3	3	3	2	2	-	-	-	-	-	-	2	2	-	-	-
22ISE32.4	3	3	3	2	2	-	-	-	-	-	-	2	2	-	-	-
22ISE32.5	3	3	3	2	2	-	-	-	-	-	-	2	2	-	-	-
Average	3	3	3	2	2	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Data Structure (Integrated)

Course Code	22ISE33	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Prerequisites: C Programming

Course Learning Objectives:

CLO1	Explain fundamentals of data structures and their applications essential for Programming /problem solving.
CLO2	Find suitable data structure during application development/Problem Solving.
CLO3	Illustrate linear representation of data structures: Stack, Queues, Lists.
CLO4	Explain Non-Linear representation of data structures like Trees and Graphs and its memory Representation.
CLO5	Demonstrate sorting and searching algorithms.

Content	No.of Hours /RBT levels
Module 1 **Introduction:** Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation and its Functions, Representation of Linear Arrays in Memory. **Array Operations:** Review of Arrays, Traversing, inserting, deleting, searching, and sorting, Sparse Matrices. **Strings:** Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples, Pattern matching algorithms-Brute force.	**10 Hours L2**
Module 2 **Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, Programming Examples.	**10 Hours L3**
Module 3 **Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation. **Linked list operations:** Traversing, Searching, insertion, and Deletion, Doubly Linked lists, Circular linked lists, Linked Stacks and Queues, Applications of Linked lists, Programming Examples.	**10 Hours L3**

Module 4 **Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, Postorder, Preorder, **Binary Search Trees** – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees- Evaluation of Expression, Programming Examples.	**10 Hours** **L3**
Module 5 **Advanced Trees:** AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion. **Sorting**: Insertion Sort and Radix sort. **Hashing**: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.	**10 Hours** **L3**

Program List	
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position(POS) d. Deleting an Element at a given valid Position(POS) e. Exit. Support the program with functions for each of the above operations.
2	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String(REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4	Design, Develop and Implement a menu driven Program in C for the following operations on QUEUE of Integer (Array Implementation of QUEUE with maximum size MAX) a. Enqueue an Element on to Queue b. Dequeue an Element from Queue c. Demonstrate Overflow and Underflow situations on Queue d. Display the status of Queue e. Exit Support the program with appropriate functions for each of the above operations

5	a. Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^(Power) and alphanumeric operands. b. Design, Develop and Implement a Program in C for evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %.
6	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, College, a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it. c. Perform Insertion / Deletion at End of SLL. d. Perform Insertion / Deletion at Front of SLL. e. Exit.
7	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, Phone Number. a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
8	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5,2 b. Traverse the BST in Inorder, Preorder and Post Order.
9	Design, Develop and Implement a menu driven Program in C for the following operations on a. Radix Sort b. Insertion Sort
10	Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2- digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using probing

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE33.1	Understand the basic data structures and its representation in memory
22ISE33.2	Apply appropriate algorithm for problem solving using arrays, strings, stacks, queues.
22ISE33.3	Explain the representation of linked lists, trees in memory.
22ISE33.4	Solve programs using linked lists and tree for a given specification.
22ISE33.5	Utilize the concepts of Hashing and Sorting to resolve problems

Textbooks:

1. Fundamentals of Data Structures in C, Ellis Horowitz and SartajSahni,2nd Ed, Universities Press, 2019.
2. Data Structures using C, A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Reference books:

1. Data Structures: A Pseudo-code approach with C, Gilberg & Forouzan, 2nd Ed, Cengage Learning,2014.
2. Data Structures using C, Reema Thareja, 3rd Ed, Oxford press, 2018.

MOOCs:

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests for the theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Average of three test will be considered. Two lab CIE are conducted for 20 marks each and the average is added to the theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE33.1	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE33.2	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE33.3	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE33.4	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE33.5	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
Average	**3**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – III

Course: Operating Systems

Course Code	22ISE34	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basics of Computers

Course Learning Objectives

CLO1	Introduce concepts and terminology used in OS
CLO2	Illustrate process scheduling and synchronization with semaphores
CLO3	Illustrate the concept of deadlocks and memory management
CLO4	Explain Mass storage structure and file system interface and it implementation
CLO5	Discuss Protection and its Security

Contents	No. of Hours RBT Level
Module 1 **Introduction to operating systems:** what operating systems do, Computer System organization, Computer System architecture, Operating System structure, Operating System operations, Process management, Memory management, Storage management, Security and Protection. **operating system structures:** Operating System Services, User - Operating System interface, System calls, Types of system calls, System programs, Operating system design and implementation, Operating System structure **Process Management:** Process concept, Process scheduling, Operations on processes, inter process communication	**08 Hours L2**
Module 2 **Threads:** Overview, Multicore Programming, Multithreading Models, Threading Issues **Process Synchronization**: Background, The Critical section problem, Peterson's solution, Mutex Locks, Semaphores **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms.	**08 Hours L3**
Module 3 **Deadlocks:** Introduction to Deadlocks, System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock **Memory Management:** Background, Swapping, Contiguous memory allocation, Segmentation, Paging, Structure of page table **Virtual Memory:** Background, Demand paging, Copy-on-write, Page replacement, Allocation of frames	**08 Hours L3**
Module 4 **Mass-Storage Structure:** Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management.	**08 Hours L3**

File-System Interface: File Concept, Access Methods, Directory and Disk Structure File-System Mounting, File Sharing **File-System Implementation:** File- System Structure, File System Implementation, Directory Implementation, Allocation Method, Free-Space Management	
Module 5 **Protection:** Goals of protection, Principles of protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, **Security:** The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses	**08 Hours L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE34.1	Outline the fundamentals of operating system and its services
22ISE34.2	Apply Process Management and Synchronization concepts in real-time
22ISE34.3	Handle deadlock and Select appropriate Memory Management technique for a given problem
22ISE34.4	Utilize Storage Management and file system to solve real-time problem
22ISE34.5	Explain various Security and Protection concepts of operating System

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles, 10th edition, Wiley-India, 2012.

Reference Books

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems, A Concept Based Approach 3rd Edition, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems, Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems, Internals and Design Principles, 6th Edition, Pearson

MOOCs (Format is given below)

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs).
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks or ATT can be given and is evaluated for 10 marks1 .
Quizzes can be conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE34.1	3	-	-	-	-	-	-	-	-	-	-	3	-	2	-	-
22ISE34.2	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
22ISE34.3	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
22ISE34.4	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
22ISE34.5	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
Average	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Object Oriented Programming using JAVA

Course Code	22ISE35	CIE Marks	50
Hours/Week (L: T: P)	2:0:2	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Programming in C

Course Learning Objectives

CLO1	Understand the object-oriented concepts in JAVA.
CLO2	Implement the concepts of control structures
CLO3	Discuss the concepts of Inheritance, Exceptions, Packages and Interfaces
CLO4	Demonstrate the concept of Multithreading and Wrapper classes
CLO5	Interpret the need for advanced Java concepts like generics and collections in developing modular and efficient programs

Contents	No. of Hours RBT Level
Module 1 **Introduction to Java**: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements. **Text book 1: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5**	**08 Hours L3**
Module 2 **Classes, Inheritance:** Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **Inheritance:** Inheritance basics, using super, creating multilevel hierarchy, method overriding and Abstract class. **Text book 1: Ch:6 Ch: 8**	**08 Hours L3**
Module 3 **Exceptions, Packages and Interfaces:** Exception handling in Java – try, catch, throw, throws, finally. Packages, Access Protection, Importing Packages, Interfaces. **Multi-Threaded Programming:** Multi-Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Interthread Communication - producer consumer problem. **Text book 1: Ch:10 Ch:9 Ch:11**	**08 Hours L3**
Module 4 **Type Wrappers:** Character, Boolean, Numeric type wrappers. Autoboxing: Autoboxing and Methods, Autoboxing / Unboxing occur in expressions, Autoboxing/Unboxing Boolean and Character values, Autoboxing / Unboxing helps prevents errors **String Handling:** String Constructors**,** Special string operations, character extraction, Comparison, Searching and Modifying of strings, Data Conversion, Changing the case of characters, Additional String Methods, String Buffer, String Builder **Text book 1: Ch:12 Ch:17**	**08 Hours L3**

Module 5	
Generics: What are Generics, Simple Generics Example, A Generic Class with Two Parameters, General Form of Generic Class, Bounded Types, Wildcard Arguments, Generic Methods and Interfaces. **The Collections Framework:** Collections Overview, The Collection Interfaces – List, Set, The Collection Classes – ArrayList, LinkedList, HashSet **Text book 1: Ch:14 Ch:19**	**08 Hours** **L3**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE35.1	Illustrate the fundamentals of Java Programming.
22ISE35.2	Implement object-oriented concepts in Java.
22ISE35.3	Apply multithreading and interface concepts in Java application development.
22ISE35.4	Develop Java programs using wrapper classes and string handling methods.
22ISE35.5	Build applications using collection framework and generics to handle groups of objects effectively.

Text Books

1. **Java the Complete Reference**, Herbert Schildt, 11th Edition, Tata McGraw Hill, 2020.

Reference Books

1. **Starting Out with Java**: From Control Structures through Objects Tony Gaddis, Haywood Community College.—6th edition, Pearson Education.2017
2. **Big Java**: **Early Objects**, Cay S. Horstmann, 7th Edition, Wiley Publication.
3. **Advanced JAVA programming**, Uttam K Roy, Oxford University press, 2015.

MOOCs (Format is given below)

1. Programming in java:https://nptel.ac.in/courses/106/105/106105191/
2. Java Tutorial for Complete Beginners: https://www.udemy.com/course/java-tutorial/
3. Core Java Specialization:https://www.coursera.org/specializations/core-java

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE35.1	3	3	3	-	2	-	-	-	-	-	-	1	1	-	3	3
22ISE35.2	3	3	3	-	2	-	-	-	-	-	-	1	2	-	3	3
22ISE35.3	3	3	3	-	2	-	-	-	-	-	-	1	2	-	3	3
22ISE35.4	3	3	3	-	2	-	-	-	-	-	-	1	2	-	3	3
22ISE35.5	3	3	3	-	2	-	-	-	-	-	-	1	2	-	3	3
Average	3	3	3	-	2	-	-	-	-	-	-	1	1.8	-	3	3

Low-1: Medium-2: High-3

SEMESTER – III

Course: Web Technology and Its Applications (Integrated)

Course Code	22ISE36	CIE Marks	50
Hours/Week (L: T: P)	2:0:2	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Computer Networks, object-oriented programming

Course Learning Objectives

CLO1	Understand the basic tags, forms and tables using HTML and CSS
CLO2	Design Client-Side programs using JavaScript and Server-Side programs using PHP
CLO3	Interpret Object Oriented Programming capabilities of PHP
CLO4	Analyze different JavaScript frameworks

Contents	No. of Hours RBT Level
Module 1 Introduction to HTML, What is HTML and Where did it come from? HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.	**08 Hours L2**
Module 2 HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.	**08 Hours L3**
Module 3 JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions	**08 Hours L3**
Module 4 PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design	**08 Hours L3**
Module 5 Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript PseudoClasses, jQuery Foundations, AJAX, Asynchronous File Transmission, **Protection:** Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix, Implementation of access matrix, Revocation of Access Rights , Role-Based Access Control	**08 Hours L2**

Program List	
1	Develop and demonstrate a HTML document that illustrates a) Headings tags(H1,H2,H3,H4,H5,H6) b) Font Details (Font Size,Style, Type, Color) c) Unordered List(UL) d) Ordered List(OL) and Definition list (DL)
2	Develop and demonstrate a HTML document that illustrates a) Image as a background b) Hyperlink using an image c) Hyperlink to another web page
3	Write HTML code using Forms, Tables and Java Script to design a simple calculator to perform the following operations: sum, product, difference and quotient.
4	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
5	Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.
6	Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems: a. Parameter: A string b. Output: The position in the string of the left-most vowel c. Parameter: A number d. Output: The number with its digits in the reverse order
7	Write a PHP program a) to display a digital clock which displays the current time of the server. b) to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
8	Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix. c. Multiplication of two matrices. d. Addition of two matrices.
9	Write a PHP program named states.py that declares variable states with value "Global Academy of Technology". write a PHP program that does the following: a. Search for a word in variable states that ends in emy. Store this word in element 0 of a list named statesList. b. Search for a word in states that begins with G and ends in l. Perform a case insensitive comparison. [Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList. c. Search for a word in states that begins with T and ends in y. Store this word in element 2 of the list. d. Search for a word in states that ends in f. Store this word in element 3 of the list.
10	Demonstrate JQuery program using CSS.

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE36.1	Design web pages using HTML tags and CSS
22ISE36.2	Construct tables and forms using HTML and CSS
22ISE36.3	Apply Javascript and PHP concepts for client side and server-side scripting
22ISE36.4	Demonstrate the object-oriented PHP concepts
22ISE36.5	Illustrate web services, applications, and JavaScript frameworks like jQuery to focus on core features

Text Books

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1 stEdition, Pearson Education India. (ISBN:978-9332575271)

Reference Books

1. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4 thEdition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014

MOOCs (Format is given below)

1. https://nptel.ac.in/courses/106105084
2. https://www.coursera.org/learn/django-database-web-apps
3. https://www.udemy.com/topic/javascript/

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Two lab CIE is conducted for 20 marks each and average is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test-3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE36.1	2	-	-	-	2	-	-	-	-	-	-	2	-	-	-	-
22ISE36.2	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE36.3	2	2	2	-	2	-	-	-	-	-	-	2	-	-	-	-
22ISE36.4	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE36.5	2	-	-	-	2	-	-	-	-	-	-	2	2	-	-	-
Average	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

4th Semester Syllabus

SEMESTER – IV

Course: Probability and Linear Algebra
(Common for CSE/ISE/AI&DS/AIML/CS(AIML))

Course Code	22MAT41A	CIE Marks	50
Hours/Week (L: T: P)	2:2:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Course Objectives: To enable students to apply the knowledge of Mathematics in fields of computer science and allied branches by making them to learn:

CLO1	Probability and Random Variables
CLO2	System of linear equations
CLO3	Vector spaces, linear transformations
CLO4	Eigenvalues, Eigenvectors, diagonalization and Singular value decomposition

Content	No. of Hours/ RBT levels
Module 1 Random Variable, Binomial, Poisson, Exponential and Normal distributions. Joint distributions (both discrete and continuous), Expectation and Covariance. Central limit theorem and law of large numbers.	**08 Hours L2, L3**
Module 2 System of linear equations, row reduction and echelon form, vector equations, The matrix equation AX = b. Linear independence and introduction to linear transformations. Matrix of linear transformation, invertible matrix, inverse of a matrix by Gauss Jordan method.	**08 Hours L2, L3**
Module 3 Vector space, subspaces, linearly independent sets, Bases. Coordinate systems, the dimensions of a vector space, Rank, Change of basis. Eigen vectors and Eigen values, diagonalization, Eigen vectors and linear transformations.	**08 Hours L2, L3**
Module 4 Inner products; inner product spaces; orthogonal sets and projections; Gram-Schmidt process; QR-factorization.	**08 Hours L2, L3**
Module 5 Least square solutions and fittings, diagonalization of symmetric matrices, quadratic forms, constrained optimization; Singular value decomposition.	**08 Hours L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO41.1	Solve problems associated with random variables using probability distributions
CO41.2	Solve systems of linear equations.
CO41.3	Work within vector spaces.
CO41.4	Use computational techniques for the study of Eigenvalues, Eigenvectors, and diagonalization

Textbooks:

1. T Veerarajan, Probability, Statistics and Random Processes for Engineers, Tata McGraw Hill, 3rd Edition, 2008
2. David C Lay, Linear Algebra and its applications, Pearson, 4th Edition, 2012.

Reference books:

1. Richard H Williams, Probability, Statistics and Random Processes for Engineers, Cengage Learning, 1st Edition, 2003
2. Gilbert Strang, Linear Algebra and its Applications, Cengage Learning, 4th Edition, 2006
3. K. Hoffman and R. Kunze, Linear Algebra, Prentice Hall, 2nd Edition, 2004.

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO41.1	3	2	1									3				
CO41.2	3	2	1									3				
Average	3	2	1									3				

Low-1: Medium-2: High-3

SEMESTER –IV

Course: Design and Analysis of Algorithms (Integrated)

Course Code	**22ISE42**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:2**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**3**

Prerequisites: C Programming and Data Structures

Course Learning Objectives:

CLO1	Apply different techniques used in algorithm analysis for solving computational problems.
CLO2	Design appropriate algorithm to solve problems on real world applications
CLO3	Understand different algorithm's design techniques and strategies.
CLO4	Analyze the efficiency of alternative algorithmic solutions for the same problem
CLO5	Apply appropriate data structures to enhance the performance of algorithms for problem solving

Content	**No. of Hours/ RBT levels**
Module 1 **Basics of Algorithms:** Definition, Fundamentals of Algorithm and Problem Solving — Important Problem Types — Fundamentals of Algorithm Analysis and Efficiency, Time and Space Complexity. **Analysis of Algorithm:** The efficient algorithm, Average, Best and worst-case analysis, Amortized analysis, Asymptotic Notations, Mathematical analysis of Non-Recursive and recursive Algorithms with Examples	**10 Hours L3**
Module 2 **Divide and Conquer Algorithm**: Introduction, Recurrence and different methods to solve recurrence. Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication. **Exploring Graphs:** An introduction to graphs - Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search and Connected components**. Decrease and Conquer Approach:** Topological Sort.	**10Hours L3**
Module 3 Greedy Algorithm General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Elements of Greedy strategy, The Knapsack Problem, Job Scheduling Problem, Coin Change Problem, Huffman code. **Minimum Spanning** trees - Kruskal's algorithm and Prim's algorithm, **Single source shortest paths:** Dijkstra's Algorithm.	**10 Hours L3**
Module 4 **Dynamic Programming:** Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming - Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, **Transitive Closure**-Warshall's Algorithm, All Points Shortest path, Floyd's Algorithm, Optimal Binary Search Trees, Bellman-Ford Algorithm, Travelling Sales Person problem.	**10Hours L3**

Module 5	
Backtracking and Branch and Bound: Introduction, The N Queens problem, Knapsack problem, Travelling Salesman problem, Minimax principle. **Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms.	**10 Hours L3**

Program List	
1	Sort a given set of ***n*** integer elements using **Selection Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how brute force method works along with its time complexity analysis: worst case, average case and best case.
2	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
3	Implement in C, the **0/1 Knapsack** problem using (a) Greedy method. (b) Dynamic Programming method
4	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in C.
5	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal's algorithm.**
6	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**.
7	Write C programs to implement **All-Pairs Shortest Paths problem** using **Floyd's algorithm**.
8	Write C programs to Implement **Travelling Salesmen Problem** using Dynamic programming.
9	Design and implement in C to find a **subset** of a given set **S** = {SI, S2,.....,Sn} of ***n*** positive integers whose SUM is equal to a given positive integer ***d***. For example, if S ={1, 2, 5, 6, 8} and ***d***= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
10	Design and implement in C, **the Hamiltonian problem** and analyses for NP Completeness.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22ISE42.1	Demonstrate the Computational Complexity of Algorithms in terms of time and space
22ISE42.2	Devise algorithms using divide and conquer, decrease and conquer strategies for a given problem
22ISE42.3	Demonstrate Graph algorithms using greedy method, transform and conquer approach to model engineering problems
22ISE42.4	Solve the given problem using Dynamic Programming strategy
22ISE42.5	Use Back Tracking, Branch and Bound algorithm design technique for solving computationally hard problems

Textbooks:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 2rd Edition, 2019. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

MOOCs:

1. http://npteI.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Two lab CIE is conducted for 20 marks each and average is added to theory component.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE42.1	3	3	3	1	-	-	-	-	-	-	-	1	3	-	-	-
22ISE42.2	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
22ISE42.3	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
22ISE42.4	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
22ISE42.5	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
Average	3	3	3	1	-	-	-	-	-	-	-	1	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER IV

Course: Database Management Systems (Integrated)

Course Code	22ISE43	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	03

Course Learning Objectives: Basic knowledge of Computer Science and Database

CLO1	To understand the concept of DBMS and ER Modeling.
CLO2	To explain the relational algebra, queries and its features
CLO3	To understand the use of Advanced queries and Normalization of the database
CLO4	To become familiar with Transactions in database, Recovery and Security of database
CLO5	To understand the NOSQL database management system

Content	No.of Hours/ RBT levels
Module 1 **Fundamental Concepts and Architecture** Introduction to database system, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of using the DBMS Approach, Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence. **Conceptual Database Design** High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues.	**10 Hours L3**
Module 2 **Relational Database Design** Relational Model Constraints, Update Operations, dealing with Constraint Violations, Relational Algebra, Unary Relational Operations: Operations from Set Theory, Binary Relational Operations, Additional Relational Operations, Database Design Using ER-to-Relational Mapping **SQL** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL.	**10 Hours L3**

Module 3 **Advances Queries** More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. Database Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, **Normalization Theory** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Normal Forms Based on Primary Keys, Boyce-Codd Normal Form	**12 Hours L3**
Module 4 **Transaction and Concurrency** Introduction to Transaction Processing, Desirable Properties of Transactions, Characterizing Schedules Based on Serializability, Concurrency, Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering. **Recovery and Security** Recovery Concepts, NO-UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging.	**10 Hours L3**
Module 5 **NoSQL Database Management** Introduction, Need of NoSQL, CAP Theorem, different NoSQL data models: Key-value stores, Column families, Document databases, Graph databases	**08 Hours L3**

Program List	
1	Consider the following schema for a Library Database: BOOK(Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id, Author_Name) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Branch_id, No-of_Copies) BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date) LIBRARY_BRANCH(Branch_id, Branch_Name, Address) ***Write SQL queries to*** 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017. 3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library.

2	Consider the following schema for Order Database: SALESMAN(Salesman_id, Name, City, Commission) CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) ***Write SQL queries to*** 1. Count the customers with grades above Bangalore's average. 2. Find the name and numbers of all salesman who had more than one customer. 3. List all the salesman and indicate those who have and don't have customers in their cities 4. Create a view that finds the salesman who has the customer with the highest order of a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.
3	Consider the schema for Movie Database: ACTOR(Act_id, Act_Name, Act_Gender) DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(Act_id, Mov_id, Role) RATING(Mov_id, Rev_Stars) ***Write SQL queries to*** 1. List the titles of all movies directed by 'Hitchcock'. 2. Find the movie names where one or more actors acted in two or more movies. 3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation). 4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title. 5. Update rating of all movies directed by 'Steven Spielberg' to 5.
4	Consider the schema for College Database: STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID) SUBJECT(Subcode, Title, Sem, Credits) IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) ***Write SQL queries to*** 1. List all the student details studying in fourth semester 'C' section. 2. Compute the total number of male and female students in each semester and in each section. 3. Create a view of Test1 marks of student USN '1BI15CS101' in all subjects. 4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students. 5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students.
5	Consider the schema for Company Database: EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)

	DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate) DLOCATION(DNo,DLoc) PROJECT(PNo, PName, PLocation, DNo) WORKS_ON(SSN, PNo, Hours) ***Write SQL queries to*** 1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project. 2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. 3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department 4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). 5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22ISE43.1	Design entity relationship diagrams to represent simple database application scenarios.
22ISE43.2	Illustrate the design principles for database design, SQL.
21ISE43.3	Retrieve data using advanced queries, also can normalize the database using Normalization Techniques.
22ISE43.4	Demonstrate Transaction processing and can apply Concurrency control on database also can use recovery mechanisms for the desirable database problem.
22ISE43.5	Review the fundamental view on unstructured data and its management.

Textbooks:

1. Fundamentals of Database Systems**,** Ramez Elmasri and Shamkant B.Navathe, Pearson Education,7th edition, 2013

Reference books:

1. Database Management Systems, Raghu Rama Krishnan, Tata Mcgraw Hill,6th edition,2010.
2. Database System Concepts, Abraham Silberschatz, Henry F.Korth and S.Sudarshan, Tata Mc Graw Hill, 6th edition, 2011.

MOOCs

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests for the theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Two lab CIE are conducted for 20 marks each and the average is added to the theory component.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE43.1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
22ISE43.2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
22ISE43.3	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
22ISE43.4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
22ISE43.5	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Software Engineering

Course Code	22ISE44	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: General awareness of the software/project development.

Course Learning Objectives:

CLO1	Outline software engineering principles and processes involved in building software by following professional and ethical laws.
CLO2	To gain knowledge of the development of software projects by applying phases of SDLC.
CLO3	Outline the various levels of software evaluation and software evolution to meet the changes.
CLO4	Identify software quality parameters, schedule of project activities.
CLO5	Recognize the need for agile practices in software development.

Content	No.of Hours/ RBT levels
Module 1 **Introduction**: Software Crisis, Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Case Studies. **Software Processes**: Models: Waterfall Model, Incremental Model and Spiral Model. Process activities. **Requirements Engineering:** Requirements Engineering Processes, Requirements Elicitation and Analysis, Functional and non-functional requirements, The software Requirements Document, Requirements Specification, Requirements validation and management.	**08 Hours L2**
Module 2 **System Models:** Context models, Interaction models, Structural models, Behavioural models. **Design and Implementation**: Introduction to RUP, Design Principles, Object-oriented design using the UML, Implementation issues.	**08 Hours L2**

Module 3 **Software Testing**: Development testing, Test-driven development, Release testing, User testing. **Software Evolution:** Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management	**08 Hours L2**
Module 4 **Project Planning**: Software pricing, Plan-driven development, Project scheduling Estimation techniques (Introduction to COCOMO model) **Quality management**: Software quality, Reviews and inspections, Software standards	**08 Hours L2**
Module 5 **Agile Software Development**: Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "The SCRUM Primer, Ver2.0") and Extreme Programming, Plan-driven and agile development , Agile project management, Scaling agile methods	**08 Hours L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE44.1	Understand the principles of software engineering process and its phases.
22ISE44.2	Outline the nature of software systems based on process and system models.
22ISE44.3	Explain the software testing and evolution processes.
22ISE44.4	Demonstrate project planning process and quality management.
22ISE44.5	Discuss software practices in agile methodology.

Textbooks:

1. **Software Engineering**, Ian Sommerville, 9th Edition, Pearson Education, 2017. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)

2. The SCRUM Primer, Ver 2.0, http://www.goodagile.com/scrumprimer/scrumprimer20.pdf

Reference books:

1. Software Engineering-A Practitioners Approach, Roger S. Pressman, 7th Edition, Tata McGraw Hill.
2. An Integrated Approach to Software Engineering, Pankaj Jalote:, Wiley India

Scheme of Examination:
Semester End Examination (SEE):SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:
seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE44.1	3	3	3	-	-	2	2	3	1	1	-	2	3	2	-	-
22ISE44.2	3	3	3	-	1	2	2	3	1	1	-	2	3	2	-	-
22ISE44.3	3	3	2	-	1	2	2	2	1	1	-	2	3	2	-	-
22ISE44.4	3	3	2	-	-	1	1	1	1	1	2	2	3	2	-	-
22ISE44.5	3	3	3	-	2	1	1	1	1	1	1	2	3	2	-	-
Average	3	3	2.6	-	1.3	1.6	1.6	2	1	1	1.5	2	3	2	-	-

Low-1: Medium-2: High-3

SEMESTER –IV

Course: Data Communications

Course Code	22ISE45	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Course Learning Objectives:

CLO1	Understand the basic concepts of data communication, layered model, protocols and interworking between computer networks
CLO2	Discuss the fundamentals of analog and digital signal and performance parameters.
CLO3	Discuss Digital and Analog conversion and various Error Detection and Correction techniques in data link layer.
CLO4	Demonstrate Link Layer services and Medium Access Control protocols for reliable and noisy channels.
CLO5	Comprehend the working of wireless and wired LANs.

Content	No.of Hours/ RBT levels
Module 1 **Introduction-** Data communications: Components, Data Representation, Data Flow; Networks: Network Criteria, Physical Structures; Network types: Local Area Network, Wide Area Network, Switching, The Internet, Accessing the Internet; Internet history: Early History, Birth of the Internet, Internet Today; standards and administration: Internet Standards, Internet Administration; **Network Models-** Protocol layering: Scenarios, Principles of Protocol Layering, Logical Connections; TCP/IP Protocol suite: Layered Architecture, Layers in the TCP/IP Protocol Suite, Description of Each Layer; The OSI model: OSI versus TCP/IP, Lack of OSI Model's Success;	**08 Hours** **L2**
Module 2 **Introduction to physical layer-** Data and signals: Analog and Digital Data, Analog and Digital Signals , Periodic and Nonperiodic; Digital signals: Bit Rate, Bit Length; Transmission Impairment: Attenuation , Distortion, Noise ; Data rate limits : Nyquist Bit Rate, Shannon Capacity; Performance: Bandwidth, Throughput , Latency (Delay) , Bandwidth-Delay Product, Jitter;	**08 Hours** **L3**
Module 3 **Digital Transmission-** Digital-to-Digital conversion: Line coding, Line coding schemes; Analog-to-Digital conversion: PCM. **Analog Transmission-**Digital to Analog conversion: Amplitude shift keying, Frequency shift keying, Phase shift keying, quadrature amplitude modulation; **Error detection & correction-** Introduction: Types of Errors, Redundancy, Detection versus Correction, Coding; Block coding: Error Detection; Cyclic codes: CRC, Polynomials; Checksum: Concept, Other Approaches to the Checksum;	**08 Hours** **L3**

Module 4 **Data link control**-DLC services: Framing, Flow and Error Control, Connectionless and Connection-Oriented; DLL protocols: Simple Protocol, Stop-and-Wait Protocol, Piggybacking; Point-to-Point Protocol: Framing, transition phases; **Media Access Control (MAC)**-Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA:Controlled Access: Reservation, Polling, Token Passing; Channelization: FDMA,TDMA, CDMA;	**08 Hours** **L2**
Module 5 **Wired LANs-**Ethernet protocol: IEEE Project 802, Ethernet Evolution; Standard Ethernet: Characteristics, Addressing; **Wireless LANs-** IEEE 802.11 PROJECT: Architecture, MAC sub layer, addressing mechanism; Bluetooth: Architecture, Bluetooth Layers; **Other Wireless Networks-** Cellular Telephony: Operation, First Generation (1G), Second Generation (2G) , Third Generation (3G), Fourth Generation (4G):	**08 Hours** **L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE45.1	Explain the fundamentals of data communication
22ISE45.2	Differentiate between analog and digital signals and understand the performance parameter.
22ISE45.3	Apply analog and digital conversion techniques for data transmission in data link layer..
22ISE45.4	Describe the fundamentals of Data Link Control and Medium Access Control layers.
22ISE45.5	Outline the basics of Wired and Wireless LANs.

Textbooks:

1. Data Communications and Networking, Behrouz A. Forouzan, , Fifth Edition, Tata McGraw-Hill, 2017.

Reference books:

1. Communication Networks –Fundamental Concepts and Key architectures, Alberto Leon Garcia and Indra Widjaja, , Second Edition, Tata McGraw-Hill, 2004.
2.Data Communications and Networking, Wayne Tomasi, Introduction to, Pearson Education, 2005

MOOCs:

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical evaluation pattern for regular courses is shown in Table 1:

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE45.1	3	-	-	-	-	1	-	1	-	-	-	1	-	3	-	-
22ISE45.2	3	3	3	3	-	1	-	1	-	-	-	1	1	3	-	-
22ISE45.3	3	3	3	3	-	1	-	1	-	-	-	1	1		-	3
22ISE45.4	3	3	3	3	-	1	-	1	-	-	-	1	-	3	-	-
22ISE45.5	3	-	-	-	-	1	-	1	-	-	-	1	-	3	-	1
Average	**3**	**3**	**3**	**3**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**3**	**-**	**2**

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Mobile Applications Development (Integrated)

Course Code	22ISE46	CIE Marks	50
Hours/Week (L: T:P)	2:0:2	SEE Marks	50
No. of Credits	3	Examination Hours	03

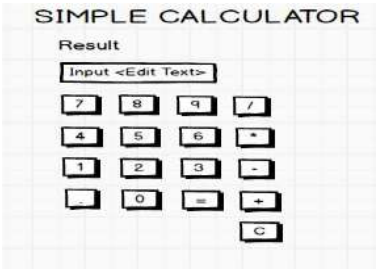
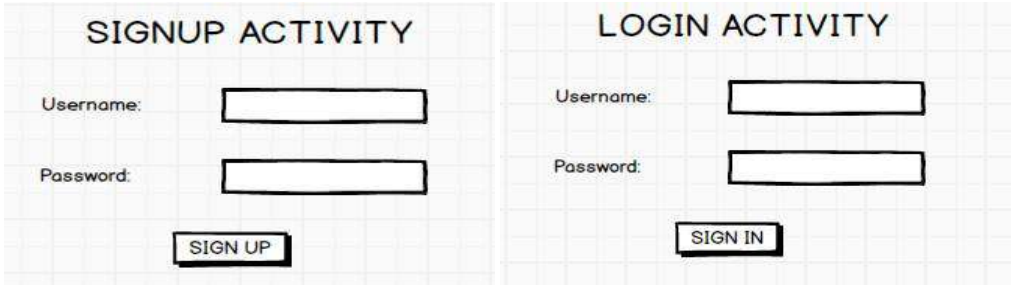
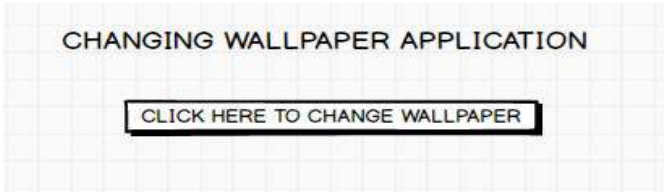
Prerequisites: Java Programming

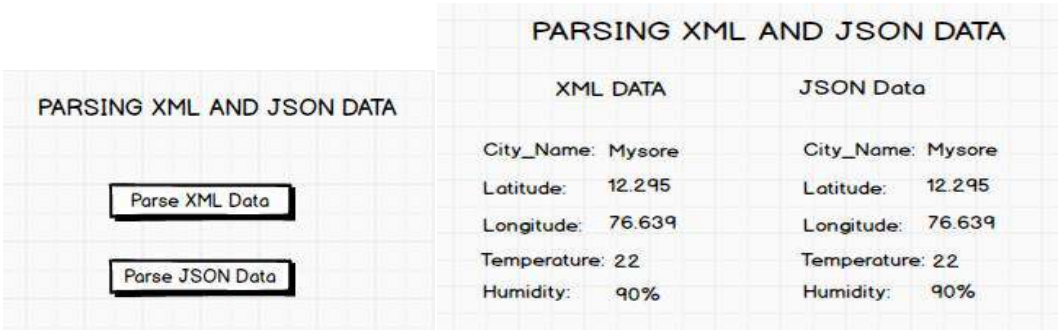
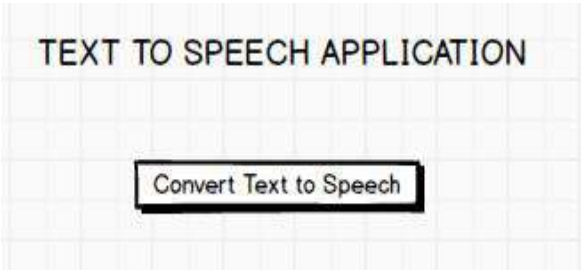
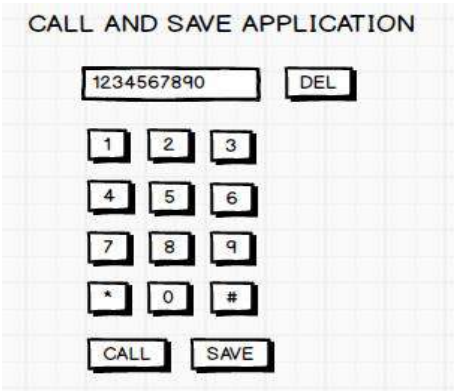
Course Learning Objectives:

CLO1	Learn to setup Android application development environment.
CLO2	Understand and illustrate user interfaces for interacting with apps.
CLO3	Implement views with pictures and menus for enhanced UI development.
CLO4	Identify options to save persistent application data.
CLO5	Publish robust android applications to cater to queries.

Content	No. of Hours/ RBT levels
Module1 Getting Started with Android Programming, Using Android Studio for Android Development, Activities, Fragments and Intents	**08 Hours L3**
Module2 Android User Interface, User Interface design with Views, User Interface Design with Layouts, Utilizing the Action Bar	**08 Hours L3**
Module3 Displaying pictures and menus with views, Using menus with views	**08 Hours L3**
Module4 Data Persistence: Saving and loading user preferences, Modifying and retrieving preference values, Persisting data to files	**08 Hours L3**
Module5 Creating and using data bases, content providers, predefined query string constants	**08 Hours L3**

Programs List	
1.	Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number. 

2	Develop an Android application using controls like Button, Text View, Edit Text for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division. 
3	Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules: • Password should contain uppercase and lowercase letters. • Password should contain letters and numbers. • Password should contain special characters. • Minimum length of the password (the default value is 8). On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched, then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed". The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button. Use Bundle to transfer information from one activity to another. 
4	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds. 
5	Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a Text View control. 

6	Create two files of XML and JSON type with values for City Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side. 
7	Develop a simple application with one Edit Text so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice. 
8	Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts. 

Course out comes:

Upon the completion of this course, student will be able to:

22ISE46.1	Develop Android application by setting up Android development environment
22ISE46.2	Implement adaptive, responsive user interfaces that work across a wide range of devices.
22ISE46.3	Demonstrate enriched user interface design for Android applications
22ISE46.4	Integrate different data storage and retrieval preferences.
22ISE46.5	Apply query strings for robust applications.

Textbooks:

1. JFD iMarzio,"Beginning Android Programming withAndroidStudio",4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13:978-812656558
2. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developerfundamentals- course-concepts/details

Reference books:

1. Erik Hellman, "Android Programming – PushingtheLimits",1stEdition,WileyIndiaPvtLtd,2014.
2. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, 'Reilly SPD Publishers, 2015.
3. Anubhav Pradhan, Anil V Deshpande, "Composing Mobile Apps" using Android, Wiley2014, ISBN:978-81- 265-4660-2
4. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developer fundamentals course-concepts/details (Download pdf file from the above link)

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40marks each. Marks scored in each test is reduced to 30 One lab CIE is conducted for 20 marks each and average is added to theory component.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ miniprojects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a- thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table2.

Table2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIETest-1	**30**	**50**
	CIETest-2	**30**	
	CIETest-3	**30**	
	Lab	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE46.1	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE46.2	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE46.3	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE46.4	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE46.5	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
Average	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2

Low-1: Medium-2: High-3

5th Semester Syllabus

SEMESTER – V

Course: Software Project Management and Economics

Course Code	22ISE51	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	3

Prerequisites: Basics of Software Engineering

Course Learning Objectives

CLO1	Gain an overview on project management framework, knowledge areas, financial management
CLO2	Examine the knowledge areas of software project management for various stakeholders' requirements.
CLO3	Prepare a cost estimate and budget for software projects along with various risk assessment.
CLO4	Envisage HR principles, quality management for model of entrepreneurship management in varied environments, and managing startups

Contents	No. of Hours RBT Level
Module 1 **INTRODUCTION:** Purpose of the PMBOK, what is a Project? The Relationships Among Portfolios, Programs, and Projects, what is Project, Management, Relationships Among Portfolio Management, Program Management, Project, Management, and Organizational Project, Management, Program Management, Portfolio Management, Projects and Strategic Planning, Project Management Office. **ORGANIZATIONAL INFLUENCES AND PROJECT LIFE CYCLE:** Organizational Influences on Project Management, Organizational Cultures and Styles, Organizational Communications., Organizational Structures, Organizational Process Assets, Enterprise Environmental Factors, Project Stakeholders and Governance, Project Stakeholders, Project Governance, Project Success, Project Team, Composition of Project Teams, Project Life Cycle, Characteristics of the Project Life Cycle, Project Phases	**08 Hours L2**
Module 2 **PROJECT MANAGEMENT PROCESSES** Common Project Management Process Interactions, Project Management Process Groups, Initiating Process Group, Planning Process Group., Executing Process Group, Monitoring and Controlling Process Group, Closing Process Group, Project Information, Role of the Knowledge Areas **PROJECT INTEGRATION MANAGEMENT-**Develop Project Charter, Develop Project Charter: Inputs, Develop Project Charter: Tools and Techniques, Develop Project Charter: Outputs, Develop Project Management Plan, Develop Project Management Plan: Inputs, Develop Project Management Plan: Tools and Techniques, Develop Project Management Plan: Outputs	**08 Hours L3**
Module 3 **DIRECT AND MANAGE PROJECT WORK-**Direct and Manage Project Work: Inputs, Direct and Manage Project Work: Tools and Techniques, Direct and Manage Project Work: Outputs, Monitor and Control Project Work, Monitor and Control Project Work: Inputs, Monitor and Control Project Work: Tools and Techniques., Monitor and Control Project Work: Outputs, Perform Integrated Change Control, Perform Integrated Change Control: Inputs, Perform Integrated Change Control: Tools and Techniques, Perform Integrated Change Control: Outputs	**08 Hours L3**

PROJECT TIME MANAGEMENT- Plan Schedule Management, Plan Schedule Management: Inputs, Plan Schedule Management: Tools and Techniques, Plan Schedule Management: Outputs, Define Activities, Define Activities: Inputs, Define Activities: Tools and Techniques, Define Activities: Outputs, Sequence Activities, Sequence Activities: Inputs, Sequence Activities: Tools and Techniques, Sequence Activities: Outputs, Estimate Activity Resources, Estimate Activity Resources: Inputs, Estimate Activity Resources: Tools and Techniques, Estimate Activity Resources: Outputs	
Module 4 **PROJECT HUMAN RESOURCE MANAGEMENT-** Plan Human Resource Management, Plan Human Resource Management: Inputs, Plan Human Resource Management: Tools and Techniques, Plan Human Resource Management: Outputs, Acquire Project Team, Acquire Project Team: Inputs, Acquire Project Team: Tools and Techniques, Acquire Project Team: Outputs, Develop Project Team, Develop Project Team: Inputs, Develop Project Team: Tools and Techniques, Develop Project Team: Outputs Manage Project Team-Manage Project Team: Inputs, Manage Project Team: Tools and Techniques, Manage Project Team: Outputs **PROJECT RISK MANAGEMENT-** Plan Risk Management, Plan Risk Management: Inputs, Plan Risk Management: Tools and Techniques, Plan Risk Management: Outputs, Identify Risks, Identify Risks: Inputs, Identify Risks: Tools and Techniques, Identify Risks: Outputs, Perform Qualitative Risk Analysis, Perform Qualitative Risk Analysis: Inputs, Perform Qualitative Risk Analysis: Tools and Techniques, Perform Qualitative Risk Analysis: Outputs, **Plan Risk Responses-** Plan Risk Responses: Inputs, Plan Risk, Responses: Tools and Techniques, Plan Risk Responses: Outputs, Control Risks, Control Risks: Inputs, Control Risks: Tools and Techniques, Control Risks: Outputs	**08 Hours** **L3**
Module 5 **PROJECT COST MANAGEMENT-** Plan Cost Management, Plan Cost Management: Inputs, Plan Cost Management: Tools and Techniques, Plan Cost Management: Outputs, Estimate Costs, Estimate Costs: Inputs, Estimate Costs: Tools and Techniques, Estimate Costs: Outputs, Determine Budget, Determine Budget: Inputs, Determine Budget: Tools and Techniques, Determine Budget: Outputs, Control Costs, Control Costs: Inputs, Control Costs: Tools and Techniques, Control Costs: Outputs **PROJECT QUALITY MANAGEMENT-** Plan Quality Management, Plan Quality Management: Inputs, Plan Quality Management: Tools and Techniques, Plan Quality Management: Outputs, Perform Quality Assurance, Perform Quality Assurance: Inputs, Perform Quality Assurance: Tools and Techniques., Perform Quality Assurance: Outputs, Control Quality, Control Quality: Inputs, Control Quality: Tools and Techniques, Control Quality: Output	**08 Hours** **L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE51.1	Gain an overview on project management framework, knowledge areas, financial management
22ISE51.2	Examine the knowledge areas of software project management, monitor, and integrate change control.
22ISE51.3	Describe the need of direct and manage project work and time management of project work.
22ISE51.4	Envisage HR principles, model of entrepreneurship and risk management.
22ISE51.5	Prepare a cost estimate and budget for software projects along with quality assessment.

Text Books:

1. AGuide to the Project Management Body of Knowledge (PMBOK Guide)-5thedition

Reference Book:

1. Project Management by Vasant Desai, Himalaya Publishing House

E-Books / Web References:
http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50.
There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**
Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Marks scored in each test is reduced to 20 and added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and three tests.
Quizzes can to be conducted and each quiz can be evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE51.1	2	2	2	-	-	-	-	-	-	-	2	-	1	-	-	-
22ISE51.2	2	2	2	-	1	-	-	3	2	-	2	-	1	-	-	-
22ISE51.3	2	2	2	-	1	-	-	-	-	-	2	-	1	-	-	-
22ISE51.4	2	2	-	-	1	-	-	3	2	-	2	2	-	-	-	-
22ISE51.5	2	2	-	-	-	-	-	3	-	-	2	2	-	-	-	-
Average	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**3**	**2**	**-**	**2**	**2**	**1**	**-**	**-**	**-**

Low-1: Medium-2: High-3

Semester-V

Course Name: Computer Networks (Integrated)

Course Code	22ISE52	CIE Marks	50
Hours/Week(L:T:P)	3:0:2	SEE Marks	50
No.of Credits	4	Examination Hours	03

Prerequisites: Data Communications

Course Learning Objectives:

CLO1	Explain routers, IP and Routing Algorithms in network layer
CLO2	Discuss transport layer services and understand UDP and TCP protocols
CLO3	Demonstration of application layer services and its protocols
CLO4	Disseminate the Wireless and Mobile Networks covering 3G, 4G, LTE and GSM
CLO5	Illustrate concepts of Security in Computer Networks with different network layer securities.

Contents	No. of Hours /RBT Level
Module1 **The Network layer**: **Introduction:** Forwarding and routing, Network service models, **What's Inside a Router?:** Input Processing, Switching, Output Processing, **The Internet Protocol:** datagram format, IPv4 addressing, ICMP, IPv6, **Routing Algorithms:** The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, **Routing in the Internet**: Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP.	**08 Hours L1,L2,L3**
Module2 **Transport Layer: Introduction and Transport-Layer Services**: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, **Connectionless Transport**: UDP Segment Structure, UDP Checksum, **Principles of Reliable Data Transfer:** Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, **Connection-Oriented Transport TCP:** The TCP Connection, TCP Segment Structure, Reliable Data Transfer, Flow Control, TCP Connection Management, **Principles of Congestion Control:** The Causes and the Costs of Congestion, Approaches to Congestion Control.	**08 Hours L1,L2,L3**
Module3 **Application Layer: Principles of Network Applications:** Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. **The Web and HTTP:** Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, **File Transfer FTP**: Commands & Replies, **Electronic Mail in the Internet:** SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, **DNS;** The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages.	**08 Hours L1,L2,L3**

Module4 **Wireless and Mobile Networks**: **Introduction:** Wireless links and Network characteristics, **Cellular Internet Access:** An Overview of Cellular Network Architecture, **3G Cellular Data Networks:** Extending the Internet to Cellular subscribers, On to 4G: LTE, **Mobility management:** Principles, Addressing, Routing to a mobile node, Mobile IP, **Managing mobility in cellular Networks**: Routing calls to a Mobile user, Handoffs in GSM, **Wireless and Mobility**: Impact on Higher-layer protocols.	**08 HoursL1,L2,L3**
Module5 **Security in Computer Networks:** What is Network Security? **Principles of Cryptography:** Symmetric key Cryptography, Public key Encryption, **Message Integrity and Digital Signature:** Cryptographic Hash Function, Message Authentication Code, Digital Signature, **Securing E-Mail**: Secure E-mail, PGP, **Network Layer Security:** IPsec and Virtual Private Networks (VPNs), The AH and ESP protocols, Security Associations, The IPsec Datagram. IKE: Key Management in IPsec.	**08 HoursL1,L2,L3**

COURSEOUTCOMES(COs)
Upon completion of this course, student will be able to:

22ISE52.1	Describe the Internet Protocol and network layer routing algorithms
22ISE52.2	Explain transport layer UDP and TCP protocols services
22ISE52.3	Understand principles of application layer protocols
22ISE52.4	Discuss the wireless and mobile network covering IEEE 802.11standard
22ISE52.5	Understand different network security algorithms.

Text Books:

1. **James F KuroseandKeithWRoss,** Computer Networking, A Top Down Approach, Sixth edition, Pearson,2017.

Reference books:

1.BehrouzAForouzan, Data and Communications and Networking, Fifth Edition, McGrawHill, Indian Edition
2.LarryLPetersonandBrusce S Davie, Computer Networks, fifth edition, ELSEVIER
3.AndrewSTanenbaum, Computer Networks, fifth edition, Pearson
4.MayankDave, Computer Networks, Second edition, Cengage Learning

E-Books/Web References:

1. https://eclass.teicrete.gr/modules/document/file.php/TP326/%CE%98%CE%B5%CF%89%CF%81%CE%AF%CE%B1%20(Lectures)/Computer_Networking_A_Top-Down_Approach.pdf
2. http://eti2506.elimu.net/Introduction/Books/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests for the theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Average of three test will be considered. The Lab CIE is conducted for 20 marks and is added to the theory component.

Typical Evaluation pattern for regular courses is shown inTable2.

Table2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIETest-1	**30**	**50**
	CIETest-2	**30**	
	CIETest-3	**30**	
	Laboratory Test	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE52.1	3	1	-	-	2	-	-	-	-	-	-	1	2	1	-	-
22ISE52.2	2	1	-	-	2	-	-	-	-	-	-	1	2	2	-	-
22ISE52.3	2	1	1	-	2	-	-	-	-	-	-	1	2	1	-	-
22ISE52.4	2	1	1	-	-	-	-	-	-	-	-	2	2	2	-	-
22ISE52.5	2	1	1	-	-	-	-	-	-	-	-	2	2	1	-	-
Average	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**-**	**-**

High-3: Medium-2: Low-1

Sl.No.	Program List (Using C/C++/JAVA programs)	No. of Hours/ RBT levels
1	Write a program to implement HLDC frame to perform the following: a) Bit stuffing and b) Character Stuffing	**L3**
2	Write a program for Distance Vector Algorithm to find suitable path for transmission.	**L3**
3	Write a program to implement Dijkstras's algorithm to compute the shortest Routing Path.	**L3**
4	Write a program to implement congestion control using leaky bucket algorithm.	**L3**
5	Write a program to implement Stop and Wait Protocol and Sliding Window Protocol Stop and wait.	**L3**
6	Write a Java program for error detecting code using CRC-CCITT (16-bits).	**L3**
7	Writeajavaprogramtofindtheshortestpathbetweenverticesusingbellman-fordalgorithm.	**L3**
8	Write a java program for congestion control using leaky bucket algorithm	**L3**
9	Write a java program to implement RSA algorithm, to encrypt the data while sending it and decrypt while receiving	**L3**
10	Write a java program to implement TCP/IP sockets, write a client – server program to make the clients end the filename and to make the server send Back the contents of the requested file if present	**L3**

SEMESTER –V

Course: Theory Of Computation

Course Code	22ISE53	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	04	Examination Hours	03

Prerequisites: Basic Electronics

Course Learning Objectives

CLO1	Introduce core concepts in Automata and Theory of Computation.
CLO2	Identify different Formal Language Classes and their Relationships.
CLO3	Learn concepts of Grammars and Recognizers for different formal languages.
CLO4	Prove or disprove theorems in automata theory using their properties.
CLO5	Determine the decidability and intractability of Computational problems.

Contents	No. of Hours RBT Level
Module 1 Introduction to Finite Automata, Structural Representations, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, An Application: Text Search, Finite Automata with Epsilon-Transitions. **TEXT BOOK: Sections 1.1, 1.5, 2.2,2.3,2.4,2.5**	**10 Hours L3**
Module 2: Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular. Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications of Regular Expressions **TEXT BOOK: Sections 3.1, 3.2 (Except 3.2.1), 3.3, 4.1, 4.2, 4.4**	**10 Hours L3**
Module 3: Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Ambiguity in Grammars and Languages, Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. **TEXT BOOK: Sections 5.1, 5.2, 5.4, 6.1,6.2,6.3.1,6.4**	**10 Hours L3**
Module 4 Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages. **TEXT BOOK: Sections 7.1, 7.2, 7.3**	**10 Hours L3**
Module 5 Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Undecidability: A Language That Is Not Recursively Enumerable. **TEXT BOOK: Sections 8.1,8.2, 8.3,8.4, 9.1, 9.2**	**10 Hours L3**

COURSE OUTCOMES

Upon completion of this course, students will be able to

22ISE53.1	Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.
22ISE53.2	Prove the properties of regular languages using regular expressions.
22ISE53.3	Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.
22ISE53.4	Design Turing machines to solve the computational problems
22ISE53.5	Explain the concepts of decidability and undecidability.

Text Books

1. John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman," Introduction to Automata Theory, Languages and Computation", Second Edition, Pearson.

Reference Books

1. Elain Rich, "Automata, Computability and complexity", 1st Edition, Pearson Education,2018.
2. K.L.P Mishra, N Chandrashekaran , 3rd Edition , 'Theory of Computer Science",PHI,2012.
3. Peter Linz, "An introduction to Formal Languages and Automata ", 3rd Edition, Narosa Publishers,1998.
4. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013.
5. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013.

MOOCs

- https://archive.nptel.ac.in/courses/106/105/106105196/
- https://archive.nptel.ac.in/courses/106/106/106106049/
- https://nptelvideos.com/course.php?id=717

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE53.1	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
22ISE53.2	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
22ISE53.3	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
22ISE53.4	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
22ISE53.5	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
Average	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-

Low-1: Medium-2: High-3

SEMESTER V

SUBJECT: Data Visualization Lab

Semester:	**5**	**CIE Marks:**	**50**
Course Code:	**22ISEL54**	**SEE Marks:**	**50**
Hours/Week (L: T: P):	**0:0:2**	**Duration of SEE (Hours):**	**3**
Type of Course	**PCCL**	**Credits**	**1**

Course Objectives:

CLO1	Understand the Importance of data Visualization for business intelligence and decision making.
CLO2	Learn different approaches to understand the importance of visual perception.
CLO3	Learn different data visualization techniques and tools.
CLO4	Gain knowledge of effective data visuals to solve workplace problems.

SlNo.	Experiment Name
1	Getting Started - Tableau Workspace, Tableau terminologies, basic functionalities.
2	Connecting to Data Source – Connecting to Database, Different types of Tableau Joins.
3	Creating a View - formatting charts, adding filters, creating calculated fields and defining parameters
4	Dashboard Design and Storytelling – Components of Dashboard, Understanding how to placeworksheets in Containers, Action filters and its types.
5	Introducing Power BI –Components and the flow of work. Power BI Desktop Interface-The Report hasfive main areas.
6	Querying Data from CSV - Query Editor, Connecting the data from the Excel Source, Clean, Transform thedata.
7	Creating Reports & Visualizations - Different types of charts, Formatting charts with Title, Colors.
8	Dashboards - Filters in Power BI, Formatting dashboards.
9	Analysis of revenue in sales dataset: i) Create a choropleth map (fill the map) to spot the special trends to show the state which has the highestrevenue. ii) Create a line chart to show the revenue based on the month of the year. iii) Create a bin of size 10 for the age measure to create a new dimension to show the revenue. iv) Create a donut chart view to show the percentage of revenue per region by creating zero access in thecalculated field. v) Create a butterfly chart by reversing the bar chart to compare female & male revenue based on productcategory. vi) Create a calculated field to show the average revenue per state & display profitable & non-profitablestate. vii) Build a dashboard.
10	Analysis of GDP dataset: i) Visualize the countries data given in the dataset with respect to latitude and longitude along withcountry name using symbol maps. ii) Create a bar graph to compare GDP of Belgium between 2006 – 2026. iii) Using pie chart, visualize the GDP of India, Nepal, Romania, South Asia, Singapore by the year 2010. iv) Visualize the countries Bhutan & Costa Rica competing in terms of GDP v) Create a scatter plot or circle views of GDP of Mexico, Algeria, Fiji, Estonia from 2004 to 2006. vi) Build an interactive dashboard.

11	Analysis of HR Dataset: i)Create KPI to show employee count, attrition count, attrition rate, attrition count, active employees, andaverage age. ii) Create a Lollipop Chart to show the attrition rate based on gender category. iii) Create a pie chart to show the attrition percentage based on Department Category- Drag departmentinto colours and change automatic to pie. Entire view, Drag attrition count to angle. Label attrition count,change to percent, add total also, edit label. iv) Create a bar chart to display the number of employees by Age group, v) Create a highlight table to show the Job Satisfaction Rating for each job role based on employee count. vi) Create a horizontal bar chart to show the attrition count for each Education field Education field wiseattrition – drag education field to rows, sum attrition count to col, vii) Create multiple donut chart to show the Attrition Rate by Gender for different Age group.
12	Analysis of Amazon Prime Dataset: i) Create a Donut chart to show the percentage of movie and tv shows ii) Create a area chart to shows by release year and type iii) Create a horizontal bar chart to show Top 10 genre iv) Create a map to display total shows by country v) Create a text sheet to show the description of any movie/movies. vi) Build an interactive Dashboard

COURSE OUTCOMES (CO):

Upon completion of this course, student will be able to:

22ISEL54.1	Design the experiment to create basic charts and graphs using Tableau and Power BI.
22ISEL54.2	Develop the solution for the given realworld problem.
22ISEL54.3	Analyze the results and produce substantial written documentation.

Text Books:

1. **Microsoft Power BI Dashboards Step by Step** by Errin O'Connor, 2019 by Pearson Education, Inc.
2. **Information Dashboard Design: Displaying Data for At-a-glance Monitoring**" by StephenFew
3. https://help.tableau.com/current/guides/get-started-tutorial/en-us/get-started-tutorial-home.htm
4. https://www.tutorialspoint.com/tableau/index.htm
5. https://www.simplilearn.com/tutorials/power-bi-tutorial/power-bi-vs-tableau

MOOCs

1. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384107725894451295 2_shared/overview2.
2. https://www.tableau.com/learn/certification
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013842054614155264 1070_shared/overview

Assessment Details (both CIE and SEE) :

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks.**

The split-up of CIE marks for record/ journal and test are in the ratio **60:40.**

● Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubricsfor the evaluation of the journal/write-up for hardware/software experiments are designed by the facultywho is handling the laboratory session and are made known to students at the beginning of the practicalsession.

● Record should contain all the specified experiments in the syllabus and each experiment write-up will beevaluated for 10 marks.

● Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).

● Weightage to be given for neatness and submission of record/write-up on time.

● Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.

● In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry aweightage of 60% and the rest 40% for viva-voce.

● The suitable rubrics can be designed to evaluate each student's performance and learning ability.

● The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marksscored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

● SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by theHead of the Institute.

● The examination schedule and names of examiners are informed to the university before the conduction ofthe examination. These practical examinations are to be conducted between the schedule mentioned in theacademic calendar of the University.

● All laboratory experiments are to be included for practical examination.

● (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners.

● Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.

● Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

● General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marksshall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

CO-PO & PSO Mapping																
CO/PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISEL54.1	3	3	3	3	3	-	-	-	2	-	-	2	-	-	-	-
22ISEL54.2	3	3	3	3	3	-	-	-	2	-	-	2	-	-	-	-
22ISEL54.3	3	3	3	3	3	-	-	-	2	-	-	2	-	-	-	-
Average	3	3	3	3	3	-	-	-	2	-	-	2	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – V

Course: Computer Vision

Course Code	22ISE55A	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Operating Systems

Course Learning Objectives

CLO1	study the basic concepts of computer vision which helps to understand AI applications.
CLO2	Explain image geometry, photometric image formation and linear filters.
CLO3	Illustrate Hough Transform and its applications to detect lines, circles, ellipses
CLO4	Contrast three-dimensional image analysis techniques, motion analysis and applications of computer vision algorithms

Contents	No. of Hours RBT Level
Module 1 Radiometry - Measuring Light: Light in Space, Light Surfaces, Important Special Cases. Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading. Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from finite dimensional linear models.	**08 Hours L3**
Module 2 Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates. Edge Detection: Noise, Estimating Derivatives, Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models.	**08 Hours L3**
Module 3 The Geometry of Multiple Views: Two Views. Stereopsis: Reconstruction, Human StereopsisBinocular Fusion, Using More Cameras, Using more cameras. Segmentation by Clustering: Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image segmentation by Clustering Pixels.	**08 Hours L3**
Module 4 Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice. Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models and Kalman Filtering.	**08 Hours L3**
Module 5 Geometric Image features: Elements of differential geometry. Geometric Camera Models: Elements of Analytical Euclidean Geometry, Geometric Camera Parameters, Calibration Methods: A Linear Approach to Camera Calibration technique- Linear Least-Square methods, Taking Radial Distortion into Account, Analytical Photogrammetry technique-Nonlinear least squares methods.	**08 Hours L3**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE55A.1	Explain the fundamental concepts of computer vision which helps to understand AI applications
22ISE55A.2	Apply Linear Filters, Fourier transforms and segmentation in computer vision
22ISE55A.3	Analyze Hough transformations, segmentation methods, Shot Boundary Detection and Background Subtraction in computer vision.
22ISE55A.4	Develop computer vision applications using appropriate tools for a given scenario.

Text Books

1. Unix System Programming Using C++ - Terrence Chan, PHI, 1999.
2. Advanced Programming in the UNIX Environment - W.Richard Stevens, Stephen A. Rago, 3nd Edition, Pearson Education / PHI, 2005.

Reference Books

1. Advanced Unix Programming- Marc J. Rochkind, 2nd Edition, Pearson Education, 2005
2. The Design of the UNIX Operating System - Maurice.J.Bach, Pearson Education / PHI, 1987
3. Unix Internals - Uresh Vahalia, Pearson Education, 2001

MOOCs

1.https://www.vturesource.com/vtu-question-papers/CS/2010/10CS62/Unix-System-Programming

2.https://www.guru99.com/must-know-linux-commands.html

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE55A.1	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-	-
22ISE55A.2	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-	-
22ISE55A.3	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-	-
22ISE55A.4	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-	-
Average	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – V

Course: UNIX SYSTEM PROGRAMMING

Course Code	22ISE55B	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Operating Systems

Course Learning Objectives

CLO1	Explain the fundamental design of the Unix operating system
CLO2	Familiarize with the systems calls provided in the Unix environment
CLO3	Design and build an application/service over the Unix operating system

Contents	No. of Hours RBT Level
Module 1 **Introduction** **UNIX and ANSI Standards:** The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. **UNIX and POSIX APIs**: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics	**08 Hours** **L3**
Module 2 **UNIX Files**: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. **UNIX File APIs**: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs	**08 Hours** **L3**
Module 3 **UNIX Processes and Process Control**: **Process Environment:** Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. **Process Control**: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times. **Process Relationships:** Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.	**08 Hours** **L3**
Module 4 **Signals and Daemon Processes**: **Signals:** The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers class. **Daemon Processes**: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.	**08 Hours** **L3**
Module 5 **Interprocess Communication**: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphore, Shared Memory, Client-Server Properties, Advanced IPC: STREAM-BASED Pipes, Passing File Descriptors, An Open Server-Version 1, An Open Server-Version 2.	**08 Hours** **L3**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE55B.1	Use runtime & compile time limits in UNIX platform, Understand API characteristics using POSIX standard
22ISE55B.2	Understand file structure in UNIX operating system, Apply file manipulation system calls for different types of files
22ISE55B.3	Analyze process control primitives for different applications in multiuser environment, Identify relationship between group of processes for job control
22ISE55B.4	Apply interrupt methods for handling asynchronous events, Understand daemon characteristics for coding rules
22ISE55B.5	Distinguish message queues semaphores & shared memory across machine boundaries, Discover communication between client server using pipes & sockets

Text Books

1. Unix System Programming Using C++ - Terrence Chan, PHI, 1999.
2. Advanced Programming in the UNIX Environment - W.Richard Stevens, Stephen A. Rago, 3nd Edition, Pearson Education / PHI, 2005.

Reference Books

1. Advanced Unix Programming- Marc J. Rochkind, 2nd Edition, Pearson Education, 2005
2. The Design of the UNIX Operating System - Maurice.J.Bach, Pearson Education / PHI, 1987
3. Unix Internals - Uresh Vahalia, Pearson Education, 2001

MOOCs

1.https://www.vturesource.com/vtu-question-papers/CS/2010/10CS62/Unix-System-Programming
2.https://www.guru99.com/must-know-linux-commands.html

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE55B.1	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-	-
22ISE55B.2	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-	-
22ISE55B.3	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-	-
22ISE55B.4	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-	-
22ISE55B.5	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-	-
Average	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – V

Course: Distributed Systems

Course Code	22ISE55C	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Operating system, Data Communication

Course Learning Objectives

CLO1	Discuss the characteristics and system models of distributed system.
CLO2	Illustrate the mechanism of IPC between distributed objects.
CLO3	Describe the distributed file service architecture and the important characteristics of SUN NFS.
CLO4	Discuss the time, global states and coordination.
CLO5	Discuss Concurrency control in distributed transactions.

Contents	No. of Hours RBT Level
Module 1 **Characterization of Distributed Systems:** Introduction, Examples of Distributed Systems, Resource sharing and the Web, Challenges. **System Models:** Introduction, Architectural Models, Fundamental Models.	**08 Hours L2**
Module 2 **Inter Process Communication:** Introduction, The API for Internet Protocols, External Data Representation and Marshalling, Client – Server Communication, Group Communication. **Distributed Objects and Remote Invocation:** Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Study: Java RMI.	**08 Hours L2**
Module 3 **Operating System Support:** Introduction, The Operating System layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture. **Distributed File Systems:** Introduction, File Service architecture, Case Study: Sun Network File System.	**08 Hours L2**
Module 4 **Time and Global States:** Introduction, Clocks, events and process status, Synchronizing physical clocks, Logical time and logical clocks, Global states. **Coordination and Agreement:** Introduction, Distributed mutual exclusion, Elections.	**08 Hours L2**
Module 5 **Distributed Transactions:** Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, distributed deadlocks, Transaction Recovery	**08 Hours L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE55C.1	Understand the Characterization of Distributed Systems and Distributed Objects and RMI
22ISE55C.2	Demonstrate the Inter Process Communication and Client – Server Communication.
22ISE55C3	Understand the OS Layer and distributed file system.
22ISE55C.4	Understand the Time, global states and coordination
22ISE55C.5	Demonstrate Concurrency control in distributed transactions.

Textbooks:

1. George Coulouris, Jean Dollimore and Tim Kindberg: Distributed Systems – Concepts and Design, 4th Edition, Pearson Publications, 2009

Reference Books:

1. Andrew S Tanenbaum: Distributed Operating Systems, 3rd edition, Pearson publication, 2007
2. Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles, Algorithms and Systems, Cambridge University Press, 2008
3. Sunita Mahajan, Seema Shan, "Distributed Computing", Oxford University Press,2015

MOOCs

1.https://onlinecourses.nptel.ac.in/noc21_cs87/preview
2.https://online.vtu.ac.in/course-details/distributed-systems-480668
3.https://www.classcentral.com/course/swayam-distributed-systems-43583
4.https://youtu.be/WW7KkUvshhc?si=AnRIzv5ZMH0Js_d9

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE55C.1	3	3	3	-	-	-	-	-	-	-	-	2	2	2	2	2
22ISE55C.2	3	3	3	-	-	-	-	-	-	-	-	2	2	2	2	2
22ISE55C.3	3	3	3	-	-	-	-	-	-	-	-	2	2	2	2	2
22ISE55C.4	3	3	3	-	-	-	-	-	-	-	-	2	2	2	2	2
22ISE55C.5	3	3	3	-	-	-	-	-	-	-	-	2	2	2	2	2
Average	3	3	3	-	-	-	-	-	-	-	-	2	2	2	2	2

Low-1: Medium-2: High-3

SEMESTER – V

Course: Cloud Computing

Course Code	22ISE55D	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisite:Basics of Operating Systems, Databases

Course Learning Objectives

CLO1	Understand the core concepts of the cloud computing paradigm and reference models
CLO2	Discuss system virtualization and outline its role in enabling the cloud computing system model
CLO3	Learn the key and enabling technologies that help in the development of cloud.
CLO4	Be able to install and use current cloud technologies

Contents	No. of Hours RBT Level
Module 1 **Introduction:** Defining Cloud Computing, Cloud Types, Examining the Characteristics of Cloud Computing Historical Developments, Virtualization, Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: VMware: Full Virtualization.	**08 Hours L2**
Module 2 **Cloud Computing Architecture:** Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects, Aneka application framework overview	**08 Hours L3**
Module 3 **Cloud Computing and Big Data:** Introduction to Bigdata, Characteristics, Cloud computing role for Bigdata, Data Intensive Computing, Map-Reduce Programming, Characterizing Data-Intensive Computations, Challenges Ahead, Technologies for Data-Intensive Computing, Storage Systems, Introducing the MapReduce Programming Model.	**08 Hours L3**
Module 4 **Cloud Computing Software Security Fundamentals:** Cloud Information Security Objectives, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Approaches to Cloud Software Requirements Engineering, Cloud Security Policy Implementation, Secure Cloud Software Testing, Cloud Computing Security Challenges, Virtualization Security Management, VM Security Recommendations, VM-Specific Security Techniques.	**08 Hours L3**
Module 5 **Case Study on Open Source & Commercial Clouds:** Amazon AWS, Google Cloud, Microsoft Azure Using Amazon Web Services, Amazon Web Service Components and Services, working with the Elastic Compute Cloud (EC2), Working with Amazon Storage Systems, Understanding Amazon Database Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance, CRM and ERP.	**08 Hours L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE55D.1	Explain the concepts and terminologies of cloud computing
22ISE55D.2	Identify the architecture and infrastructure of cloud computing depending on application
22ISE55D.3	Outline data intensive computing and its technologies.
22ISE55D.4	Classify the core issues of cloud computing such as security, privacy, and interoperability
22ISE55D.5	Describe the use of AWS, Azure and Google cloud platform to develop applications

Text Books

1. Cloud Computing Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley Publishers,2011
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

Reference Books

1. Thomas Erl, Cloud Computing: Concepts, Technology & Architecture, Pearson.
2. John Rhoton, Cloud Computing Explained: Handbook for Enterprise Implementation.
3. Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edison, Wiley India
4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
5. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education

MOOCs

1. https://onlinecourses.nptel.ac.in/noc21_cs14
2. https://www.udemy.com/topic/cloud-computing/
3. https://ramslaw.files.wordpress.com/2016/07/0124114547cloud.pdf
4. http://www.asecib.ase.ro/cc/carti/Cloud%20Computing%20Security%20[2010].pdf

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE55D.1	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
22ISE55D.2	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
22ISE55D.3	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
22ISE55D.4	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
22ISE55D.5	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
Average	**3**	**2**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER –V
Course: Mini Project

Course Code	22ISE56	CIE Marks	100
Hours/Week (L: T: P)	0:0:4	SEE Marks	-
No. of Credits	02	Examination Hours	03

Course Learning Objectives

CLO1	Gains profound insights on the subject matter with practical knowledge..
CLO2	Project creation helps evolve your creative thinking, analytical skills, and reasoning ability
CLO3	Allows you to explore the breadth of research that is being performed.

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 2 students.

CIE procedure for Mini-Project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head ofthe concerned Department and two senior faculty members of the Department, one of whomshall be the Guide. The CIE marks awarded for the Mini-project work, shall be based on theevaluation of project report, project presentation skill and question and answer session in theratio 50:25:25. The marks awarded for the project report shall be the same for all the batch

mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all the guides of the college. The CIE marks awarded for the Mini Project, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO 1	Develop skills in qualitative and quantitative data analysis and presentation.
CO 2	Develop advanced critical thinking skills.
CO 3	Understand to write the report writing

CIE Evaluation		
Components	**Explanation**	
Review 1	Presentation Skills: 25 + Q & A: 25 = 50	50
Review 2	Presentation Skills: 25 + Q & A: 25 = 50	50
Average of Review 1 and Review 2		**50**
Mini Project Report		**50**
TOTAL MARKS		**100**

SEMESTER – V

Course: Research Methodology and IPR

Course Code	22RMIK57	CIE Marks	50
Hours/Week (L: T: P)	2:2:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Course Objectives:

CLO1	To make the student understand the foundations of Research and problem solution
CLO2	Knowledge in Research design, Qualitative and Quantitative Research
CLO3	Knowledge to formulate and derive static and dynamic aero elastic equations of motion.
CLO4	To understand the different types of IPR

Content	
Module 1 **RESEARCH METHODOLOGY:** Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. **DEFINING THE RESEARCH PROBLEM:** Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration	**(08 hours)** L2
Module 2 (08 hours) **REVIEWING THE LITERATURE:** Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed. **RESEARCH DESIGN**: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs	**(08 hours)** L2
Module 3 (08 hours) **DESIGN OF SAMPLE SURVEYS:** Design of Sampling: Introduction, Sample Design, Sampling and Non-Sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. **MEASUREMENT AND SCALING:** Qualitative and Quantitative Data, **DATA COLLECTION:** Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.	**(08 hours)** L2
Module 4 (08 hours) **TESTING OF HYPOTHESES:** Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests ofHypothesis.	**(08 hours)** L2

INTERPRETATION AND REPORT WRITING: Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports	
Module 5 (08 hours) **INTELLECTUAL PROPERTY**: Principles of IPR, Kinds of IPR, Patent- Concepts, Novelty, Utility Inventiveness/Non-obviousness, Procedure for granting and obtaining patents; Copyright- conditions for grant of copyright, Copyright in Literary, Dramatic and Musical ,Works, Sound Recording, Cinematograph Films, Copyright in Computer Programme, Author Special Rights, Right of Broadcasting and performers, Trademark Law and Practices - Procedure of registration of trademark; Emerging Issues and Challenges; Few Future Aspects of Intellectual Property Rights;	**(08 hours)** L2

Textbook:

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9thedition
2. Business Research Methods – Alan Bryman& Emma Bell, Oxford UniversityPress.
3. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International.418p.
4. Lionel Bently., Brad Sherman-Intellectual Property Law, 3rd Edition

Reference Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, EssEss Publications. 2 volumes.
3. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
4. Wadehra, B.L. 2000. Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing.

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO 1	Understand the research problem by literature review to solve problems
CO 2	Develop skills in qualitative and quantitative data analysis and presentation.
CO 3	Develop advanced critical thinking skills.
CO 4	Understand to write the report writing and awareness about IPR

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full questionfrom each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO	PO6	PO8	PO12
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4	3	3	3
Average	3	3	3

Low-1: Medium-2: High-3

SEMESTER – V

Course: Environmental Studies

Course Code	**22CIVK58**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:0:0**	**SEE Marks**	**50**
No. of Credits	**2**	**Examination Hours**	**3**

Prerequisites:

Course Objectives: Students will be taught:

CLO1	To understand ecosystem functions and 17 SDG's for sustainable development
CLO2	To understand advanced energy systems and natural resource management.
CLO3	To understand global environmental issues, related policies and solutions.
CLO4	To understand key environmental legislation related to water, air, waste and environmental protection.
CLO5	To understand e-waste management.

Content	**No. of Hours/ RBT levels**
Module 1 – Ecosystem and Sustainability Ecosystem: Structure of Ecosystem, Types: Forest, Desert, Wetlands, Riverine, Oceanic ecosystems. Sustainability: 17SDG targets and possible actions. Self-Study **Component (SSC): Components of the environment.**	**6 Hours L2**
Module 2 - Natural Resource Management Natural Resources: Water resources – Availability & Quality aspects, Energy: Different types of energy, Conventional sources & non-conventional sources of Energy, Solar energy, OTEC Wind Energy, Hydrogen as an alternative energy Self-Study Component (SSC): Alternative Energy sources Disaster Management, Sustainable Mining - case studies and Carbon Trading **Self-Study Component (SSC): Alternative Energy sources.**	**6 Hours L2**
Module 3 – Environmental Pollution & Waste Management Environmental Pollution: Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Water Pollution, Water borne diseases & water induced diseases, Noise pollution, Soil Pollution, Air pollution (Sources, Impacts, Preventive measures and Public Health Aspects. Waste Management: Bio-medical Wastes; Solid waste; Hazardous wastes; Industrial and Municipal Sludge Solid Waste Management , types and sources,	**6 Hours L2**

functional elements of SWM, Biomedical Waste Management - Sources, Characteristics **Self-Study Component (SSC): Case studies of air pollution episodes.**	
Module 4 - Global Environmental Issues and Environmental Legislation Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology **Environmental Legislation** Environmental Legislation: Water Act 1974, Air Act 1981, Environmental Protection Act 1984, Solid Waste Management Rules-2016, E- Waste management Rule - 2022, Biomedical Waste management- 2016 **Self-Study Component (SSC): Case studies on waste management options**	**6 Hours L2**
Module 5 - E - Waste Management E - Waste Management**:** Introduction of E- waste; composition and generation. Global context in e- waste; E-waste pollutants, E waste hazardous properties, Effects of pollutant (E- waste) on human health and surrounding environment, domestic e-waste disposal, Basic principles of E waste management, Component of E waste management. E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2022 - Salient Features and its implications. **Self-Study Component (SSC): E-Waste (Management) Amendment Rules, 2023, 2024**	**6 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22CIVK58.1	**Analyze** ecosystem dynamics to formulate strategies for addressing sustainability challenges and implementing the SDGs.
22CIVK58.2	**Evaluate** energy technologies to design effective resource management strategies.
22CIVK58.3	**Evaluate** the impacts of pollution to develop effective waste management strategies.
22CIVK58.4	**Evaluate** global environmental issues to design solutions for sustainable management.
22CIVK58.5	**Interpret** environmental laws and regulations for sustainable management practices.
22CIVK58.6	**Understand** e-waste management in a global scenario.

Suggested Learning Resources:

Textbooks

1. S M Prakash , "Environmental Studies" 3rd Edition, Elite Publishing House, Mangalore, 2018.
2. Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009.

Reference Books:

1. EarchBarucha, "Environmental Studies for UG students", 2004.
2. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited.
3. R. Rajagopalan, "Environmental Studies- From Crisis to Cure", 2nd Edition, Oxford university press, New Delhi, 2013.
4. Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi.
5. Raman Sivakumar, "Principles of Environmental Science and Engineering", 2nd edition, Cengage learning Singapur, 2005.
6. G. Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006
7. Dr. Pratiba Singh, Dr.Anoop Singh and Dr. PiyushMalaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

Web Reference:

- https://www.hzu.edu.in/bed/E%20V%20S.pdf
- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://onlinecourses.swayam2.ac.in/cec19_bt03/preview
- https://sdgs.un.org/goals
- https://kspcb.karnataka.gov.in/waste-management/biomedical-waste E Waste (Management) Rules, 2022.
- https://kspcb.karnataka.gov.in/sites/default/files/inlinefiles/E%20Waste%20%28Management%29%20Rules%2C%202022.pdf

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least

one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average of three test marks will be added to test component. CIE is executed by way of two quizzes/Alternate Assessment Tools(AAT's), some possible AAT's: Seminar/ assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	40	**50**
	CIE Test-2	40	
	CIE Test-3	40	
	Average of CIE	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	**Semester End Examination**	**100**	**50**
Grand Total			**100**

Understand e-waste management in a global scenario.

CO/PO Mapping															
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
22CIVK58.1	2					1	1	1				2			3
22CIVK58.2	2	2	2			1	3	1				1			3
22CIVK58.3		2	2	2		1	3	1							2
22CIVK58.4		2	2	2		1	3	1				1			2
22CIVK58.5	1	2	2	2		1	2	1						1	2
22CIVK58.6	2	2	1			2	2	1				1			2
Average	1.75	2	1.8	2		1.16	2.3	1				1.25		1	2.33

6th Semester Syllabus

SEMESTER VI

Course: Full Stack Development(Integrated)

Course Code	22ISE61	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	04	Examination Hours	03

Course Learning Objectives: Knowledge of Database, Web Programming and Java Programming

CLO1	Explain the use of learning full stack web development.
CLO2	Make use of rapid application development in the design of responsive web pages.
CLO3	Illustrate Models, Views and Templates with their connectivity in Django for full stack web development
CLO4	Demonstrate the use of state management and admin interfaces automation in Django.
CLO5	Design and implement Django apps containing dynamic pages with SQL database

Content	No. of Hours/ RBT levels
Module-1: MVC based Web Designing Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS. **Textbook 1: Chapter 1 and Chapter 3**	**08 hours L3**
Module-2: Django Templates and Models Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern. Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution **Textbook 1: Chapter 4 and Chapter 5**	**08 hours L3**
Module-3: Django Admin Interfaces and Model Forms Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces. Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URL Conf Ticks, Including Other URLConfs. **Textbook 1: Chapters 6, 7 and 8**	**08 hours L3**
Module-4: Generic Views and Django State Persistence Using Generic Views, Generic Views of Objects, Extending Generic Views of objects, Extending Generic Views. MIME Types, Generating Non-HTML contents like CSV and PDF, Syndication Feed Framework, Sitemap framework, Cookies, Sessions, Users and Authentication. **Textbook 1: Chapters 9, 11 and 12**	**08 hours L3**

Module-5: jQuery and AJAX Integration in Django Ajax Solution, Java Script, XHTMLHttpRequest and Response, HTML, CSS, JSON, iFrames, Settings of Java Script in Django, jQuery and Basic AJAX, jQuery AJAX Facilities, Using jQuery UI Autocomplete in Django **Textbook 2: Chapters 1, 2 and 7**	**08 Hours** **L3**

Program List	
1.	Develop a Django app that displays current date and time in server.
2.	Develop a Django app that displays date and time four hours ahead and four hours before as an offset of current date and time in server.
3.	Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website.
4.	Develop a Django app that performs student registration to a course. It should also display list of students registered for any selected course. Create students and course as models with enrolment as ManyToMany field.
5.	For student and course models created in Lab experiment 4, register admin interfaces, perform migrations and illustrate data entry through admin forms.
6.	Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project.
7.	For students enrolment developed in experiment 4, create a generic class view which displays list of students and detail view that displays student details for any selected student in the list.
8.	Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.
9.	Develop a registration page for student enrolment as done in Module 2 but without page refresh using AJAX.
10.	Develop a search application in Django using AJAX that displays courses enrolled by a student being searched.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22ISE61.1	Understand the working of MVT based full stack web development with Django.
22ISE61.2	Designing of Models and Forms for rapid development of web pages
22ISE61.3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.
22ISE61.4	Apply the Django framework libraries to render nonHTML contents like CSV and PDF
22ISE61.5	Perform jQuery-based AJAX integration to Django Apps to build responsive full stack web applications

Textbooks:

1. Adrian Holovaty, Jacob Kaplan Moss, The Definitive Guide to Django: Web Development Done Right, Second Edition, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers, 2009.
2. Jonathan Hayward, Django Java Script Integration: AJAX and jQuery, First Edition, Pack Publishing, 2011

Reference books:

1. Aidas Bendroraitis, Jake Kronika, Django 3 Web Development Cookbook, Fourth Edition, Packt Publishing, 2020
2. William Vincent, Django for Beginners: Build websites with Python and Django, First Edition, Amazon Digital Services, 2018

3. Antonio Mele, Django3 by Example, 3rd Edition, Pack Publishers, 2020
4. Arun Ravindran, Django Design Patterns and Best Practices, 2nd Edition, Pack Publishers, 2020. 5. Julia Elman, Mark Lavin, Light weight Django, David A. Bell, 1st Edition, Oreily Publications, 2014

MOOCs

1. MVT architecture with Django: https://freevideolectures.com/course/3700/django-tutorials
2. Using Python in Django: https://www.youtube.com/watch?v=2BqoLiMT3Ao
3. Model Forms with Django: https://www.youtube.com/watch?v=gMM1rtTwKxE
4. Real time Interactions in Django: https://www.youtube.com/watch?v=3gHmfoeZ45k
5. AJAX with Django for beginners: https://www.youtube.com/watch?v=3VaKNyjlxAU

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests for the theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Average of three test will be considered. The Lab CIE is conducted for 20 marks and is added to the theory component.

TypicalEvaluationpatternfor regularcourses isshowninTable2.

	Component	Marks	TotalMarks
CIE	CIETest-1	**30**	**50**
	CIETest-2	**30**	
	CIETest-3	**30**	
	Laboratory Test	**20**	
SEE	SemesterEndExamination	**100**	**50**
GrandTotal			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE61.1	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE61.2	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE61.3	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE61.4	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE61.5	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
Average	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Machine Learning

Course Code	22ISE62	CIE Marks	50
Hours/Week (L: T: P)	4:0:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Course Learning Objectives:

CLO1	Define machine learning, its applications and problems relevant to problem solved.
CLO2	Familiarize the concepts machine learning and problems relevant to machine learning.
CLO3	Understand supervised, unsupervised & Reinforcement learning algorithms
CLO4	Familiarize neural networks, Bayesian classifier and k nearest neighbour for solving problems in machine learning.
CLO5	Describe and solve ANN, unsupervised and instance base learning algorithms

Content	No.of Hours/ RBT levels
Module 1 **Introduction**: A Brief Introduction To Machine Learning, Examples of Machine learning Applications. **Exploratory Data Analysis:** Estimates of Location, Estimates of Variability, Exploring the Data Distribution, Exploring Binary and Categorical Data. **Concept Learning:** Concept learning task, Concept learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm.	**10 Hours L3**
Module 2 **Decision Tree Learning:** Introduction, Decision tree representation, Appropriate problems, ID3 algorithm, Ensembles of Decision Trees. **Regression:** Linear Regression, Multi Linear Regression, Locally weighted regression	**10 Hours L3**
Module 3 **Bayesian Learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, Gibbs algorithm, Naive Bayes classifier, EM Algorithm.	**10 Hours L3**
Module 4 **Unsupervised Learning:** k-Means Clustering, Agglomerative Clustering **Support Vector Machine**: Introduction to Support Vector Machine, characteristics of SVM. **Instance-Base Learning:** Introduction, k-Nearest Neighbour Learning Kernelized Support Vector Machines, Dimensionality Reduction, Feature Extraction	**10 Hours L3**
Module 5 **Artificial Neural Network:** Introduction, NN representation, Appropriate problems, Perceptron, Backpropagation algorithm. **Reinforcement Learning:** Introduction, The learning task, Q-Learning.	**10 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE62.1	**Apply machine learning models techniques to classify and prediction of the data**
22ISE62.2	**Solve machine learning problems using Concept learning and Decision Tree Learning Algorithm**
22ISE62.3	**Apply Bayesian Techniques and derive effective learning rules techniques**
22ISE62.4	**Apply Regression, SVM and unsupervised learning models to solve appropriate problems**
22ISE62.5	**Apply Artificial Neural Networks algorithms for classification problems and Reinforcement Learning Algorithms.**

Text Books:

1. Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python, Peter Bruce, Andrew Bruce, Peter Gedeck,2nd edition, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
2. Probability and Statistics: The Science of Uncertainty, Second Edition, Michael J. Evans and Jeffrey S., Rosenthal University of Toronto.
3. Tom M. Mitchell, Machine Learning, McGraw Hill Education, India Edition 2013.
4. Introduction to Machine Learning with Python, Andreas C. Muller and Sarah Guido, O'Reilly Media

Reference Books:

1. Ethem Alpaydın, Introduction to machine learning, MIT press, Third edition.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer series in statistics, 2nd edition.
3. Dipanjan Sarkar, Raghav Bali, Tushar Sharma, "Practical Machine Learning with Python-A Problem Solver's Guide to Building Real-World Intelligent Systems",APress,2018.
4. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python", 1st edition, Oreilly Publications, 2016
5. Kevin P. Murphy, Francis Bach, "Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning) 1st Edition, Massachusets Institute of Technology, 2012
6. Anil Maheswari, Data Analytics, McGraw Hill, India, 2017

MOOCs

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE): SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE): Three Tests for the theory component are to be conducted for 40 marks each. Average of three test will be considered. Assignment is conducted for 10 marks each and the average is added to the theory component.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Assignment	**10**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE62.1	3	3	2	-	-	-	-	-	-	-	-	2	2	2	-	-
22ISE62.2	3	3	2	-	-	-	-	-	-	-	-	2	2	1	-	-
22ISE62.3	3	3	2	-	-	-	-	-	-	-	-	2	1	2	-	-
22ISE62.4	3	3	2	-	-	-	-	-	-	-	-	2	2	2	-	-
22ISE62.5	3	3	2	-	-	-	-	-	-	-	-	2	1	2	-	-
Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Blockchain Technology

Course Code	22ISE63A	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basics of networking and Cryptography

Course Learning Objectives:

CLO1	Understand the basic terminologies of cryptography.
CLO2	Understand how blockchain systems (mainly Bitcoin and Ethereum) work.
CLO3	Explain smart contracts and distributed applications.
CLO4	Understand various applications of Blockchain.

Content	No. of Hours/ RBT levels
Module 1 Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.	**08 Hours L2**
Module 2 Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys.	**08Hours L2**
Module 3 Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash.	**08 Hours L2**
Module 4 Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101:Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.	**08 Hours L3**
Module 5 Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media.	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22ISE63A.1	Summarize the terminologies and types of block chain.
22ISE63A 2	Understand the basics of distributed system and cryptographic terminologies.
22ISE63A.3	Outline distributed consensus in Bitcoin and its alternative options.
22ISE63A.4	Develop Smart contracts which can be applied for various use cases.
22ISE63A.5	Illustrate various applications of Blockchain.

Textbooks:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017

Reference books:

1. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016 Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
2. DR. Gavin Wood, ``ETHEREUM: A Secure Decentralized Transaction Ledger,''Yellow paper.2014.

E-Books / Web References :

1. Blockchain for dummies-IBM limited edition http://gunkelweb.com/coms465/texts/ibm_blockchain.pdf.
2. https://www.blockchainexpert.uk/book/blockchain-book.pdf

MOOCs:

1. https://www.upgrad.com/blog/blockchain-free-online-course/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE63A.1	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-	-
22ISE63A.2	3	2	1	-	-	-	-	2	-	-	-	-	-	3	-	-
22ISE63A.3	3	2	1	-	-	-	-	3	-	-	-	-	-	3	-	-
22ISE63A.4	3	3	1	2	-	-	-	3	-	-	-	-	-	3	-	-
22ISE63A.5	3	-	1	-	-	-	-	3	-	-	-	-	-	3	-	-
Average	3	3	1	2	-	-	-	3	-	-	-	-	-	3	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Ethical Hacking

Course Code	22ISE63B	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Basic awareness about Networks, Internet

Course Learning Objectives

CLO1	To understand and analyze Information security threats & countermeasures.
CLO2	To perform security auditing & testing.
CLO3	To study & employ network defense measures.
CLO4	To study & employ network defense measures
CLO5	To understand penetration and security testing issues

Contents	No. of Hours RBT Level
MODULE-1 **ETHICALHACKINGOVERVIEW** Understanding Ethical Hacking Terminology, Identifying Different Types of Hacking Technologies, Understanding the Different Phases Involved in Ethical Hacking and Listing the Five Stages of Ethical Hacking, Hacktivism, Vulnerability Research, Creating a Security Evaluation Plan, Types of Ethical Hacks, Testing Types, Ethical Hacking Report, Understanding the Legal Implications of Hacking Understanding 18 U.S.C. § 1029 and 1030 U.S. Federal Law	**08 Hours** **L2**
MODULE-2 **FOOTPRINTING&PORTSCANNING** Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS	**08 Hours** **L2**
MODULE-3 **SYSTEMHACKING** Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.	**08 Hours** **L3**
MODULE-4 **HACKINGWEBSERVICES&SESSIONHIJACKING** Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.	**08 Hours** **L3**
MODULE-5 **HACKINGWIRELESSNETWORKS& Penetration Testing** Introductionto802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks. Defining Security Assessments, Overview of Penetration Testing Methodologies, Penetration Testing Steps, Overview of the Pen-Test Legal Framework, Automated Penetration Testing Tools, Overview of the Pen-Test Deliverables.	**08 Hours** **L3**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE63B.1	Understand vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks.
22ISE63B.2	Perform Port scanning and security testing.
22ISE63B.3	Become a professional Ethical hacker.
22ISE63B.4	To understand and analyze Information security threats & countermeasures, perform security auditing & testing.
22ISE63B.5	Understand issues relating to ethical hacking to study & employ network defense measures and understand penetration and security testing issues.

Textbooks

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Défense", Course Technology, 2010

References:

1. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006
2. Ramachandran V, Backtrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.). Packt Publishing, 2011
3. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

MOOCs

1. **https://archive.nptel.ac.in/courses/106/105/106105217**
2. **https://www.coursera.org/learn/ethical-hacking-essentials-ehe**
3. **https://www.scribd.com/document/435345901/Ethical-Hacking-pdf**

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
22ISE63B.1	3	2	2	1	3	-	-	2	-	-	-	1	3	2	3
22ISE63B.2	3	3	3	3	3	-	-	2	1	-	1	1	3	2	3
22ISE63B.3	3	2	3	2	3	2	1	3	2	1	1	1	3	3	3
22ISE63B.4	3	3	-	-	3	-	-	-	-	-	-	-	3	-	-
22ISE63B.5	3	3	3	-	-	-	-	-	-	1	-	-	3	-	-
Average	3	3	2	2	2	-	-	-	-	1	-	-	3	-	-

Low-1: Medium-2: High-3

SEMESTER-VI

Course: Wireless Sensor Networks

Course Code	22ISE63C	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisite: Basics of Data communication Networks

Course Learning Objectives:

CLO1	Describe the network architecture and OSI Model for IoT/M2M Systems.
CLO2	Understand the architecture and design principles for device supporting IoT
CLO3	Develop competence in programming for IoT Applications
CLO4	Identify the uplink and downlink communication protocols which best suits the specific application of IoT/WSNs.

Content	No.of Hours/ RBT levels
Module 1 **Overview of Wireless Sensor Networks:** Challenges for Wireless Sensor Networks,Enabling Technologies for Wireless Sensor Networks. **Architecture:** Single Node Architecture - Hardware Components, EnergyConsumption of Sensor Nodes, Operating Systems and Execution Environments,Network Architecture - Sensor Network Scenarios, Design Principles of WSN's.	**08 Hours** **L3**
Module 2 **Communication Protocols:** Physical Layer and Transceiver Design Considerations. **MAC Protocols:** Fundamentals of MAC Protocols, Low Duty Cycle Protocols And Wakeup Concepts, Contention-based protocols, Schedule-based protocols, IEEE 802.15.4 MAC Protocol.	**08 Hours** **L3**
Module 3 **Overview of Internet of Things:** IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M communication, Examples of IoT. **Design Principles for Connected Devices**: IoT/M2M Systems layers and design standardization, Data enrichment, Data consolidation and device management at Gateway.	**08 Hours** **L2**
Module 4 **Internet Connectivity Principles**: Internet connectivity, Internet-based communication, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS, FTP, TELNET and others. **Data Collection, Storage and Computing using a Cloud Platform:** Introduction, Cloud computing paradigm for data collection, storage and computing. Cloud service models, IoT Cloud- based services using xively, Nimbits and other platforms.	**08 Hours** **L2**
Module 5 **Prototyping and designing software for IoT Applications:** Introduction, Prototyping Embedded device software, Devices, gateways, Internet and web/ cloud services software development, Prototyping online component API's & Web API's.	**08 Hours** **L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE63C.1	Understand the basic architecture and communication protocols of WSNs
22ISE63C.2	Illustrate the communication protocols associated with physical layer and MAC Layer.
22ISE63C.3	Interpret the basic concepts of IoT and applications of M2M communication protocols.
22ISE63C4	Describe cloud computing and design principles of IoT.
22ISE63C.5	Outline the concept of prototyping and designing software for IoT applications.

Textbooks:

1. Protocols And Architectures for Wireless Sensor Networks, Holger Karl & Andreas Willig, John Wiley, 2005.
2. Internet of Things - Architecture and design principles, Raj Kamal, McGraw Hill Education.

Reference books:

1. Wireless Sensor Networks - An Information Processing Approach, Feng Zhao & Leonidas J Guibas , Elsevier 2007.
2. Internet of Things, Srinivasa K G , CENCAGE Learning India,2017.

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE): SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.
Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Marks scored in each test is reduced to 20 and added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and three tests.
Quizzes are to be conducted and each quiz can be evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs:
Seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-athon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE63C.1	3	2	--	--	2	2	--	2	--	--	--	3	--	3	--	--
22ISE63C.2	3	2	--	--	2	2	--	2	--	--	--	3	--	3	--	--
22ISE63C.3	3	2	--	--	2	2	--	2	--	--	--	3	--	3	--	--
22ISE63C.4	3	2	--	--	2	2	--	2	--	--	--	3	--	3	--	--
22ISE63C.5	3	2	--	--	2	2	--	2	--	--	--	3	--	3	--	--
Avg	**3**	**2**	--	--	**2**	**2**	--	**2**	--	--	--	**3**	--	**3**	**--**	**--**

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Computer Graphics

Course Code	22ISE63D	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basics of Computers, Programming Language- C

Course Learning Objectives

CLO1	To understand computer graphics fundamentals
CLO2	To become familiar with raster technology for enabling users to interact with popular I/O devices.
CLO3	To represent 2D/3D geometric objects and apply transformations, viewing techniques, lighting, and shading effects.
CLO4	Familiarity with standard rasterization algorithms.

Contents	No. of Hours RBT Level
Module 1 **Computer Graphics**: Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan displays, color CRT monitors, Flat panel displays. Raster-scan systems: video controller, raster scan Display processor, graphics workstations and viewing systems, Input devices, graphics networks, graphics on the internet, graphics software. **Line Drawing Algorithms:** DDA, Bresenham's Circle Drawing – Bresenham's	**08 Hours L3**
Module 2 **Fill area Primitives:** Polygon fill-areas, fill area attributes, general scan line polygon fill algorithm. **2D Geometric Transformations:** Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2D Composite transformations, other 2D transformations, raster methods for geometric transformations,	**08 Hours L3**
Module 3 **3D Geometric Transformations:** 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine transformations. **Colour Models:** Properties of light, colour models, RGB and CMY colour models. **Illumination Models:** Light sources, basic illumination models-Ambient light, diffuse reflection, specular and Phong model.	**08 Hours L3**
Module 4 **Clipping:** window, normalization and viewport transformations, clipping algorithms, 2D point clipping, 2D line clipping algorithms: Cohen-Sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm.	**08 Hours L3**
Module 5 **3D Viewing:** 3D viewing concepts, 3D viewing pipeline, 3D viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, The viewport transformation and 3D screen coordinates. **Curved surfaces:** Quadric surfaces and Cubic-Surface, Bezier Spline Curves, Bezier surfaces.	**08 Hours L3**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE63D.1	Understand the fundamentals of computer graphics
22ISE63D.2	Demonstrate the concepts of Fill area Primitives and 2D Geometric Transformations
22ISE63D.3	Demonstrate the 3D Geometric Transformations and Color/Illumination models
22ISE63D.4	Apply the concepts of clipping on window and viewport transformations
22ISE63D.5	Understand the concepts of 3D Viewing, Projection transformation and Curved Surfaces

Text Books

1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd/ 4thEdition, Pearson Education,2011

Reference Books

1. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: pearson education
2. Xiang, Plastock : Computer Graphics , Sham's outline series, 2nd edition, TMG.
3. Kelvin Sung, Peter Shirley, Steven Baer: Interactive Computer Graphics, concepts and applications, Cengage Learning

MOOCs (Format is given below)

1. https://www.udemy.com/course/computer-graphics/
2. https://www.courses.com/indian-institute-of-technology-madras/computer-graphics
3. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE63D.1	3	3	3	-	-	-	-	-	-	-	-	-	**3**	-	-	-
22ISE63D.2	3	3	3	-	-	-	-	-	-	-	-	-	**3**	-	-	-
22ISE63D.3	3	3	3	-	-	-	-	-	-	-	-	-	**3**	-	-	-
22ISE63D.4	3	3	3	-	-	-	-	-	-	-	-	-	**3**	-	-	-
22ISE63D.5	3	3	3	-	-	-	-	-	-	-	-	-	**3**	-	-	-
Average	3	3	3	-	-	-	-	-	-	-	-	-	**3**	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Introduction to Data Structures

Course Code	22ISE64A	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: C Language

Course Learning Objectives

CLO1	Explain fundamentals of data structures and their applications essential for programming/problem solving.
CLO2	Find suitable data structure during application development/Problem Solving.
CLO3	Illustrate linear representation of data structures: Stack, Queues and Lists in memory
CLO4	Illustrate linear representation of data structures: Trees and Graphs in memory.

Contents	No. of Hours RBT Level
Module 1 **Introduction:** Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Array Operations: Traversing, inserting, deleting, searching, and sorting. Strings: Basic Terminology, Storing, Operations. Programming Examples.	**08 Hours L3**
Module 2 **Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Priority Queues.	**08 Hours L3**
Module 3 **Review of Structures**, Pointers and Dynamic Memory Allocation Functions. **Linked Lists**: Definition, Representation of linked lists in Memory and its allocation; Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists.	**08 Hours L3**
Module 4 **Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals – In-order, post-order, pre-order, Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples	**08 Hours L3**
Module 5 **Exploring Graphs:** An introduction to graphs – Graph terminologies, Un-directed Graph, Directed Graph, Graph representation in memory. Traversing Graphs, Depth First Search, Breath First Search and Connected components.	**08 Hours L3**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE64A.1	Understand the basic data structures and its representation in memory
22ISE64A.2	Apply appropriate algorithm for problem solving using arrays, strings, stacks, queues.
22ISE64A.3	Understand the representation of linked lists, trees and graphs in memory.
22ISE64A.4	Write programs using linked lists and tree for a given specification.
22ISE64A.5	Write programs to perform operations on graphs and its traversals.

Text Books

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2019.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education 2019

Reference Books

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications,2nd Ed, McGraw Hill, 2013
4. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996
5. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH
6. Classic Data Structures, 2/e, Debasis , Sarnanta,PHI,2009

MOOCs (Format is given below)

1. Data Structures: https://www.coursera.org/learn/data-structures
2. Programming and Data Structures: https://nptel.ac.in/courses/106/106/106106130/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE64A.1	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE64A.2	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE64A.3	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE64A.4	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
22ISE64A.5	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
Average	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Introduction to Operating Systems

Course Code	22ISE64B	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Good knowledge of C, Computer organization

Course Learning Objectives:

CLO1	Understand concepts and terminology used in Operating Systems
CLO2	Illustrate process scheduling and synchronization with semaphores
CLO3	Illustrate the concept of deadlocks and memory management
CLO4	Explain Virtual memory management and file system
CLO5	Discuss secondary storage structure and its protection

Content	No.of Hours/ RBT levels
Module 1 **Introduction to operating systems, System structures: Introduction**: What operating systems do, Computer System organization, Computer System architecture, Operating System structure, Operating System operations, Process management, Memory management, Storage management, Protection and Security. **System Structures**: Operating System Services, User -Operating System interface, System calls, Types of system calls, System programs, Operating system design and implementation, Operating System structure.	**08 Hours L2**
Module 2 **Process Management: Process concept**: Process Concepts, Process scheduling, Operations on processes, Inter process communication. **Process Scheduling**: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling. **Synchronization**: Background, The critical section problem.	**08Hours L3**
Module 3 **Deadlocks:** System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock. **Memory management strategies**: Background, Swapping, Contiguous memory allocation, Segmentation.	**08 Hours L3**
Module 4 **Virtual Memory Management**: Background, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing. **File System:** File concept, Access methods, Directory and Directory structure, File system mounting, File sharing, Protection.	**08 Hours L3**

Module 5	
Mass Storage Structures, Protection: **Mass storage structures**; Overview of Mass storage structure, Disk attachment, Disk scheduling, Disk management, Swap space management. **Protection:** Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights.	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE64B.1	Discuss the fundamentals of operating system and its services
22ISE64B.2	Describe process management and synchronization
22ISE64B.3	Illustrate concept of Deadlock and memory management
22ISE64B.4	Discuss the concept of virtual memory management and file systems
22ISE64B.5	Understand the secondary storage management with its protection

Textbooks:

1. **Operating System Concepts,** Abraham Silberschatz, Peter B Galvin, Greg Gagne: 9th edition, Wiley-India, 2018

Reference books:

1**. Operating Systems**: A Concept Based Approach, D.M Dhamdhere, McGraw- Hill, 2018.
2. **Operating Systems**: Internals and Design Principles, William Stallings, 6th Edition, Pearson

MOOCs:

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE64B.1	3	-	-	-	-	-	-	-	-	-	-	3	-	1	-	-
22ISE64B.2	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
22ISE64B.3	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
22ISE64B.4	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
22ISE64B.5	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
Average	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Introduction to Computer Networks

Course Code	22ISE64C	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: Basics of Data Communication

Course Learning Objectives:

CLO1	Demonstration of Application Layer Protocols
CLO2	Understand the services offered by transport layer and the working of UDP and TCP protocols.
CLO3	Explain the concept of routers, IP and Routing Algorithms in the network layer
CLO4	Discuss the services offered by various layers of TCP/IP and OSI
CLO5	Illustrate the basic concepts of Multimedia networking

Content	No.of Hours/ RBT levels
Module 1 **Application Layer:** Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS- The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables.**T1: Chap 2**	**08 Hours L2**
Module 2 **Transport Layer :** Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control.**T1: Chap 3**	**08Hours L3**

Module 3 **The Network layer**: What's Inside a Router? Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast and Multicast Routing- Broadcast Routing Algorithms, Multicast. **T1: Chap 4: 4.3-4.7**	**08 Hours L3**
Module 4 Foundation of Networking Protocols: 5 Layer TCP/IP Model, 7 Layer OSI Model, Internet Protocols and Addressing: IP Packet, IP Addressing Scheme, Subnet Addressing and masking, Classless Inter-domain Routing (CIDR), Packet Fragmentation and Reassembly, Internet Control and Message Protocol (ICMP), IP Version 6 (IPv6), Equal sized Packets Model: ATM – ATM Protocol structure, ATM cell structure.**T2: Chap 2**	**08 Hours L3**
Module 5 Multimedia Networking: Properties of video, properties of Audio, Types of multimedia Network Applications, Streaming stored video: UDP Streaming, HTTP Streaming, Adaptive streaming and DASH, content distribution Networks Voice-over-IP :Limitations of the Best-Effort IP Service ,Removing Jitter at the Receiver for Audio ,Recovering from Packet Loss Protocols for Real-Time Conversational Applications , RTP , SIP . **T1: Chap 7**	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE64C.1	Explain principles of application layer protocols
22ISE64C.2	Recognize transport layer services and infer UDP and TCP protocols
22ISE64C.3	Classify routers, IP and Routing Algorithms in network layer
22ISE64C.4	Understand the fundamentals of TCP/IP, OSI layers and Addressing Scheme
22ISE64C.5	Describe the basics of Multimedia Networking and its types.

Textbooks:

1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017.
2. Nader F Mir, Computer and Communication Networks, 2nd Edition, Pearson, 2014.

Reference books:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition.
2. Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER.
3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson.
4. Mayank Dave, Computer Networks, Second edition, Cengage Learning.

MOOCs:

1. http://nptel.ac.in/
2. https://www.khanacademy.org/
3. E-learning: www.vtu.ac.in
4. https://www.classcentral.com/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE64C.1	3	2	2	-	-	-	-	1	1	-	-	2	-	3	-	-
22ISE64C.2	3	2	2	-	-	-	-	1	1	-	-	2	1	3	-	-
22ISE64C.3	3	2	2	-	-	-	-	1	1	-	-	2	1	-	-	3
22ISE64C.4	3	2	2	-	-	-	-	1	1	-	-	2	-	3	-	-
22ISE64C.5	3	2	2	-	-	-	-	1	1	-	-	2	-	3	-	1
Average	3	2	2	-	-	-	-	1	1	-	-	2	1	3	-	2

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Introduction to JAVA

Course Code	22ISE64D	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisite: Basic Computer Skills

Course Learning Objectives:

CLO1	Understand the object-oriented concepts in JAVA.
CLO2	Implement the concepts of control structures
CLO3	Discuss the concepts of Inheritance and its types
CLO4	Learn the concepts of importing packages and exception handling mechanism.
CLO5	Discuss the String Handling examples with Object Oriented concepts

Content	No.of Hours/ RBT levels
Module 1 **Introduction to Java**: Java's magic: The Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays.	**08 Hours L2**
Module 2 **Operators:** Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java‟s Selection Statements, Iteration Statements, Jump Statements	**08Hours L2**
Module 3 **Classes:** Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **A Closer Look at Methods and Classes:**Overloading methods, Using Objects as parameters, Returning objects **Inheritance:** Inheritance basics, using super, creating multilevel hierarchy, method overriding, Using Abstract classes.	**08 Hours L3**
Module 4 **Exception handling:** Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces.	**08 Hours L3**
Module 5 **String Handling:** The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf( ), Changing the Case of Characters Within a String , Additional String Methods, StringBuffer, StringBuilder	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE64D.1	Illustrate the fundamentals of Java Programming.
22ISE64D.2	Demonstrate object-oriented concepts in Java.
22ISE64D.3	Implement the concepts of inheritance to solve real world problems in Java
22ISE64D.4	Apply exception handling mechanism in Java application development.
22ISE64D.5	Develop Java programs to process strings using string handler methods.

Textbooks:

1. **Java the Complete Reference,** Herbert Schildt, 11th Edition, Tata McGraw Hill, 2019.

Reference books:

1. **Starting Out with Java**: From Control Structures through Objects Tony Gaddis, Haywood Community College.—6th edition, Pearson Education.2017
2. **Big Java**: **Early Objects**, Cay S. Horstmann, 7th Edition, Wiley Publication.
3. **Advanced JAVA programming**, Uttam K Roy, Oxford University press, 2015.

MOOCs:

1. Programming in java:https://nptel.ac.in/courses/106/105/106105191/
2. Java Tutorial for Complete Beginners: https://www.udemy.com/course/java-tutorial/
3. Core Java Specialization:https://www.coursera.org/specializations/core-java

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to50. There will be two full questions (with a maximum of four sub questions) from each module carrying20 marks each. Students are required to answer any five full questions choosing at least one fullquestion from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and three tests.Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzeseffectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-athon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE64D.1	3	3	3	-	2	-	-	-	-	-	-	1	1	-	-	-
22ISE64D.2	3	3	3	-	2	-	-	-	-	--	-	1	2	-	-	-
22ISE64D.3	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
22ISE64D.4	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
22ISE64D.5	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
Average	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1.8**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Project Phase-1

Course Code	22ISEP65	CIE Marks	100
Hours/Week (L: T: P)	4 hours/week	SEE Marks	-
No. of Credits	02		

Course Learning Objectives

CLO1	Gains profound insights on the subject matter with practical knowledge.
CLO2	Project creation helps evolve your creative thinking, analytical skills, and reasoning ability
CLO3	Allows you to explore the breadth of research that is being performed.

Project Phase-l:

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary project can be assigned to an individual student or to a group having not more than 3 students. In extraordinary cases, like the funded projects requiring students from different disciplines, the project student strength can be 5 or 6.

1. **Single discipline**: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work phase-I, shall be based on the evaluation of the project work phase -1- Report (covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the Project report shall be the same for all the batch mates.
2. **Inter disciplinary**: Continuous internal Evaluation shall be group wise at the college level with the participation of all guides bf the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work phase -I, shall be based on the evaluation of project work phase -1 Report (covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25.

The marks awarded for the project report shall be the same for all the batch mates as per rubrics covering all Program Outcomes.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO 1	Develop skills in qualitative and quantitative data analysis and presentation.
CO 2	Develop advanced critical thinking skills.
CO 3	Understand to write the report writing

Typical Evaluation pattern for the Course is shown inTable1.

Table1:CIE Evaluation

Components	Marks	Total	
CIE			
Review1	25	100	**100**
Review2	25		
Report	50		

SEMESTER VI

SUBJECT: Machine Learning Lab

Semester:	**6**	**CIE Marks:**	**50**
Course Code:	**22ISEL66**	**SEE Marks:**	**50**
Hours/Week (L: T: P):	**0:0:2**	**Duration of SEE (Hours):**	**3**
Type of Course	**PCCL**	**Credits**	**1**

Prerequisite: Probability, Linear Algebra

Course Learning Objectives:

CLO1	Define machine learning, its applications and problems relevant to problem solved.
CLO2	Familiarize the concepts machine learning and problems relevant to machine learning.
CLO3	Understand supervised, unsupervised & Reinforcement learning algorithms
CLO4	Familiarize neural networks, Bayesian classifier and k nearest neighbour for solving problems in machine learning.

SlNo.	Programs Name
1	Write a python program to consider a dataset containing large number of missing data and develop a program to use pre-processing technique to handle those.
2	Write a python program to develop a program to demonstrate linear and polynomial regression using appropriate data set.
3	Write a python program to develop a program to demonstrate logistic regression using appropriate data set.
4	Write a python program to develop a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5	Write a python program to develop a program to implement the random forest Classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Write a python program to develop a program to construct Support Vector Machine considering a Sample Dataset.
7	Write a python program to develop a program to implement K-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
8	Write a python program to build an Artificial Neural Network using the Back propagation algorithm and test the same using appropriate data sets.
9	Write a python program to develop a program to implement the naïve Bayesian Classifier model. Calculate the accuracy, precision, and recall, ROC curve for your data set.
10	Write a python program to implement K Means algorithm using appropriate Data sets.

COURSE OUTCOMES (CO):
Upon completion of this course, student will be able to:

22ISEL66.1	Understand supervised, unsupervised & Reinforcement learning algorithms
22ISEL66.2	Familiarize neural networks, Bayesian classifier and k nearest neighbour for solving problems in machine learning.
22ISEL66.3	Describe and solve ANN, unsupervised and instance base learning algorithms

Text Books:

1. Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python, Peter Bruce,Andrew Bruce, Peter Gedeck,2nd edition, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
2. Probability and Statistics:The Science of Uncertainty,Second Edition, Michael J. Evans and Jeffrey S.,Rosenthal University of Toronto.
3. Tom M. Mitchell, Machine Learning, McGraw Hill Education, India Edition 2013.
4. Introduction to Machine Learning with Python, Andreas C. Muller and Sarah Guido, O'Reilly Media

Assessment Details (both CIE and SEE) :

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks.**
The split-up of CIE marks for record/ journal and test are in the ratio **60:40.**

● Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubricsfor the evaluation of the journal/write-up for hardware/software experiments are designed by the facultywho is handling the laboratory session and are made known to students at the beginning of the practicalsession.
● Record should contain all the specified experiments in the syllabus and each experiment write-up will beevaluated for 10 marks.
● Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
● Weightage to be given for neatness and submission of record/write-up on time.
● Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
● In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry aweightage of 60% and the rest 40% for viva-voce.
● The suitable rubrics can be designed to evaluate each student's performance and learning ability.
● The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marksscored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

● SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by theHead of the Institute.

● The examination schedule and names of examiners are informed to the university before the conduction ofthe examination. These practical examinations are to be conducted between the schedule mentioned in theacademic calendar of the University.

● All laboratory experiments are to be included for practical examination.

● (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners.

● Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.

● Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

● General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marksshall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

CO-PO & PSO Mapping																
CO/PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISEL66.1	3	3	2	2	3	-	-	-		-	-	2	2	2	-	-
22ISEL66.2	3	3	2	2	3	-	-	-		-	-	2	2	1	-	-
22ISEL66.3	3	3	2	2	3	-	-	-		-	-	2	1	2	-	-
Average	3	3	2	2	3	-	-	-		-	-	2	2	2	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Mobile Application Development

Course Code	22ISE67A	CIE Marks	50
Hours/Week (L: T:P)	0:0:2	SEE Marks	50
No. of Credits	3	Examination Hours	03

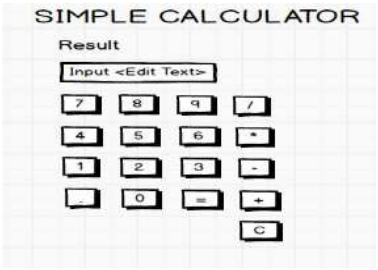
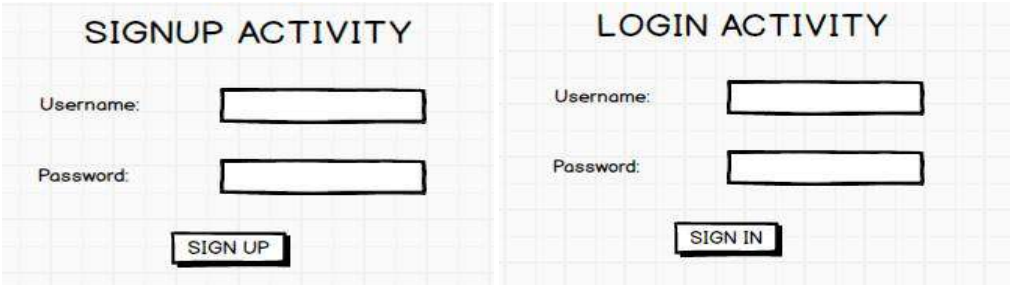
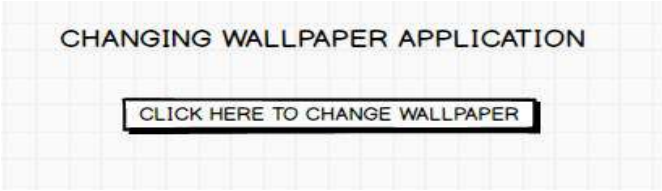
Prerequisites: Java Programming

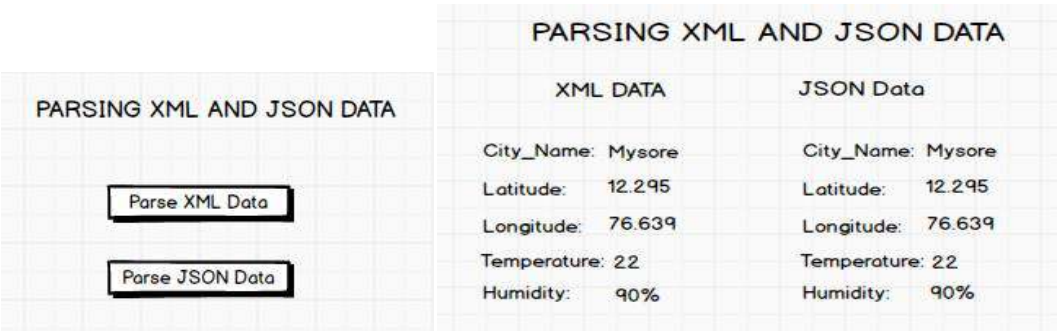
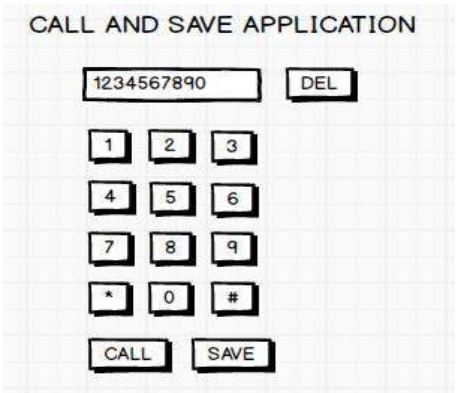
Course Learning Objectives:

CLO1	Learn to setup Android application development environment.
CLO2	Understand and illustrate user interfaces for interacting with apps.
CLO3	Implement views with pictures and menus for enhanced UI development.
CLO4	Identify options to save persistent application data.
CLO5	Publish robust android applications to cater to queries.

Content	No. of Hours/ RBT levels
Module1 Getting Started with Android Programming, Using Android Studio for Android Development, Activities, Fragments and Intents	**08 Hours L3**
Module2 Android User Interface, User Interface design with Views, User Interface Design with Layouts, Utilizing the Action Bar	**08 Hours L3**
Module3 Displaying pictures and menus with views, Using menus with views	**08 Hours L3**
Module4 Data Persistence: Saving and loading user preferences, Modifying and retrieving preference values, Persisting data to files	**08 Hours L3**
Module5 Creating and using data bases, content providers, predefined query string constants	**08HoursL3**

Programs List	
1.	Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number. 

2	Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division. 
3	Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules: • Password should contain uppercase and lowercase letters. • Password should contain letters and numbers. • Password should contain special characters. • Minimum length of the password (the default value is 8). On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched, then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed". The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button. Use Bundle to transfer information from one activity to another. 
4	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds. 
5	Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a TextView control. 

6	Create two files of XML and JSON type with values for City Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side. 
7	Develop a simple application with one Edit Text so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice. 
8	Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts. 

Course out comes:
Upon the completion of this course, student will be able to:

22ISE67A.1	Develop Android application by setting up Android development environment
22ISE67A.2	Implement adaptive, responsive user interfaces that work across a wide range of devices.
22ISE67A.3	Demonstrate enriched user interface design for Android applications
22ISE67A.4	Integrate different data storage and retrieval preferences.
22ISE67A.5	Apply query strings for robust applications.

Textbooks:

1. JFD iMarzio, “Beginning Android Programming withAndroidStudio”,4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13:978-812656558
2. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference”, Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developerfundamentals- course-concepts/details

Reference books:

1. Erik Hellman, “Android Programming–PushingtheLimits” ,1stEdition,WileyIndiaPvtLtd,2014.
2. Dawn Griffiths and David Griffiths, “Head First Android Development”, 1st Edition, ’Reilly SPD Publishers, 2015.
3. Anubhav Pradhan, Anil V Deshpande, “Composing Mobile Apps” using Android, Wiley2014, ISBN:978-81- 265-4660-2
4. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference”, Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developer fundamentals course-concepts/details (Download pdf file from the above link)

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40marks each. Marks scored in each test is reduced to 30 One lab CIE is conducted for 20 marks each and average is added to theory component.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ miniprojects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a- thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table2.

Table2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIETest-1	**30**	**50**
	CIETest-2	**30**	
	CIETest-3	**30**	
	Lab	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
22ISE67A.1	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE67A.2	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE67A.3	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE67A.4	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
22ISE67A.5	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2
Average	3	3	3	-	2	-	-	1	1	1	-	3	2	2	2	2

SEMESTER-VI

TOSCA – Automated Software Testing

Subject Code	**22ISE67B**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**SEE Marks**	**50**
Total Hours	**25**	**Examination Hours**	**01**
No. of Credits: 01			

Prerequisite: Knowledge of Automation Tools

Course Learning Objectives:

The course will enable students to

CLO1	Learn the fundamentals of automation testing
CLO2	Design automated test cases
CLO3	Perform test executions on different browsers.
CLO4	Get an overview of test case designs and modules used in Tosca automation tool.

CONTENTS	No. of Hours
MODULE 1 **Introduction to Tosca:** Introduction to Automation Testing, Various Automation Testing Tools, Pros and Cons of automation testing. **Overview of Tosca:** Introduction to Tosca , Comparing Pros and Cons with other tools, Working with Tosca Automation Tool Testing Syntax , Reading Tosca Automation Tool Testing Data Sets ,Tosca Installation Process ,Importing Standard Module ,Architecture of Tosca.	**05**
MODULE 2 **Tosca Commander**: Actions/Sections – Requirements, Modules, Test Cases, Execution List, Test Case Design, Check-in, check out and Update All. **Modules and Test Cases**: Object Identification, How Tosca Identifies objects? ,Scanning and creating a module, Create a basic test case , Object Identification methods – By properties, By Anchor, By image, By Index.	**05**
MODULE 3 **Standard Modules**: Buffer Operations – Setting buffer, Deleting buffer, Partial buffer, Expression evaluator, Process Operations, Window Operations – Send Keys, Window Operations, **Record/Playback**: Record and Playback features, Generate script through recording.	**05**
MODULE 4 **Designing Test Cases and Modules** : Data creation in Test Case design , Conversion of Mapping and Template, Generating test cases from instances, Adding Technical Parameters, Steering Parameters, Dynamic objects handling.	**05**
MODULE 5 **Reusable Test Step blocks**: Creating and Using Libraries, Examples **Conditions and Loops**: Conditional Statement, If and Else Iterations/Repetitions **Tables**: Use of constraint, Dynamic data handling.	**05**

Course Outcomes:

Upon successful completion of this course, student will be able to

22ISE67B.1	Understand the fundamentals of automation testing using Tosca
22ISE67B.2	Illustrate the automated test cases using simulation
22ISE67B.3	Use Tosca simulator to generate scripts using recording
22ISE67B.4	Implement Dynamic objects by generating test cases
22ISE67B.5	Illustrate dynamic data handling using reusable Test Step blocks

Text Books:

1. TOSCA: Automate Application In 24 Hours For Beginners - Simple, Concise & Easy Guide To Automation Testing Using Tosca,2023.

E-Books/Web References:

1. https://www.tricentis.com/products/automate-continuous-testing-tosca/model-based-test-automation
2. https://documentation.tricentis.com/tosca/1600/en/content/first_steps/get_started.htm

MOOCs:

1. https://www.h2kinfosys.com/courses/tosca-automation-tool-training-and-certification-program/
2. https://www.udemy.com/topic/tricentis-tosca/

Mapping of CO-PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE67B.1	2	2	2	-	-	1	-	1	-	1	-	1	2	-	-	-
22ISE67B.2	2	2	2	-	-	1	-	1	-	1	-	1	2	-	-	-
22ISE67B.3	2	2	2	-	-	1	-	1	-	1	-	1	2	-	-	-
22ISE67B.4	2	2	2	-	-	1	-	1	-	1	-	1	2	-	-	-
22ISE67B.5	2	2	2	-	-	1	-	1	-	1	-	1	2	-	-	-
Average	**2**	**2**	**2**	**-**	**-**	**1**	**-**	**1**	**-**	**1**	**-**	**1**	**2**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VI

Course: IT law and Ethics

Course Code	22ISE67C	CIE Marks	50
Hours/Week (L: T: P)	1:0:0	SEE Marks	50
No. of Credits	01	Examination Hours	01

Course Learning Objectives:

CLO1	Understand the Cyber Law, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space.
CLO2	Understand the Information Technology Act, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.
CLO3	Understand the Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes.
CLO4	Understand the Electronic Business and Legal Issues.
CLO5	Understand the Importance of Cyber Law, Significance of cyber Ethics.

Contents	No. of Hours RBT Level
Module 1 **Introduction to Cyber Law:** Evolution of computer technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.	**05 Hours** **L2**
Module 2 **Information Technology Act:** Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.	**05 Hours** **L3**
Module 3 **Cyber Law and Related Legislation:** Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).	**05 Hours** **L3**
Module 4 **Electronic Business and Legal Issues:** Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.	**05 Hours** **L3**

Module 5	05 Hours L2
Cyber Ethics: The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics	

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE67C.1	Understand Cyber laws, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space
22ISE67C.2	Describe Information Technology act and Related Legislation &Cyber Law and Related Legislation.
22ISE67C.3	Demonstrate Electronic business and legal issues.
22ISE67C.4	Interpret Cyber Ethics, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society.

Text Books

1. Cyber Security and Cyber Laws, Nilakshi Jain, Ramesh Menon, Wiley
2. Cyber Laws and IT protection, Harish Chander PHI publications

Reference Books

1. Cyber Laws and Ethics, ISBN: 9789390450244, Edition: 1st, 2021, Technical Publications
2. Cyber Law and Ethics Regulation of the Connected World By Mark Grabowski, Eric P. Robinson

MOOCs

1. https://www.khanacademy.org/
2. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE67C.1	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-
22ISE67C.2	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-
22ISE67C.3	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-
22ISE67C.4	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-
Average	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER -VI

Course: Devops

Course Code	22ISE67D	CIE Marks	50
Hours/Week (L: T: P)	1:0:0	SEE Marks	50
No. of Credits	01	Examination Hours	01

Prerequisites: Knowledge of cloud computing and Software Engineering

Course Learning Objectives:

CLO1	Introduce concepts of Devops and Continuous delivery
CLO2	Learn about need of Coding and Building the code
CLO3	Learn about importance of Testing and Deploying the Code
CLO4	Learn about need and importance ofMonitoring the Code and Issue Tracking
CLO5	Gather knowledge about Challenges, Story and Myths related to Devops

Content	No.of Hours/ RBT levels
Module-1: **Introduction to DevOps and Continuous Delivery** **Introduction:** Introducing DevOps, How fast is fast? The Agile wheel of wheels, Beware the cargo cult Agile fallacy, DevOps and ITIL, Summary **A View from Orbit**: The DevOps process and Continuous Delivery – an overview, Release management, Scrum, Kanban, and the delivery pipeline, Wrapping up – a complete example, Identifying bottlenecks, Summary **How DevOps Affects Architecture:**Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, The principle of cohesion, Coupling, Back to the monolithic scenario, A practical example, Three-tier systems, The presentation tier, The logic tier, The data tier, Handling database migrations, Rolling upgrades, Hello world in Liquibase,The changelog file, The pom.xml file, Manual installation, Microservices, Interlude – Conway's Law, How to keep service interfaces forward compatible, Microservices and the data tier, DevOps, architecture, and resilience, Summary **Textbook 1: Chapter 1, 2 & 3**	**05 hours** **L2**
Module-2: **Coding and Building the code** **Everything is Code:** The need for source code control, The history of source code management, Roles and code, Which source code management system?, A word about source code management system migrations, Choosing a branching strategy, Branching problem areas, Artifact version naming , Choosing a client, Setting up a basic Git server, Shared authentication, Hosted Git servers, Large binary files, Trying out different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab, Summary **Building the Code:** Why do we build code?, The many faces of build systems, The Jenkins build server, Managing build dependencies, The final artifact, Cheating with FPM, Continuous Integration, Continuous Delivery, Jenkins plugins, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, A look at the Jenkins filesystem layout, Build servers and infrastructure as code, Build phases, Alternative build servers, Collating quality measures, About build status visualization, Taking build errors seriously, Robustness, Summary **Textbook 1: Chapter 4 &5**	**05 hours** **L2**

Module-3: **Testing the Code and Deploying the Code** **Testing the Code:** Manual testing, Pros and cons with test automation, Unit testing, JUnit in general and JUnit in particular, A JUnit example, Mocking, Test Coverage, Performance testing, Automated acceptance testing, Automated GUI testing, Integrating Selenium tests in Jenkins, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development, A complete test automation scenario, Automated integration testing, Summary **Deploying the Code:**Why are there so many deployment systems?,Virtualization stacks, Executing code on the client, The Puppet master and Puppet agents, Ansible, PalletOps, Deploying with Chef, Deploying with SaltStack, Salt versus Ansible versus Puppet versus PalletOpsexecution models, Vagrant, Deploying with Docker, Comparison tables, Cloud solutions, AWS, Azure, Summary **Textbook 1: Chapters 6 & 7**	**05 hours** **L2**
Module-4: **Monitoring the Code and Issue Tracking** **Monitoring the Code:** Nagios, Munin, Ganglia, Graphite, Log handling, Summary **Issue Tracking:** What are issue trackers used for?,Some examples of workflows and issues, What do we need from an issue tracker?, Problems with issue tracker proliferation, All the trackers, Summary **Textbook 1: Chapters 9, 11 and 12**	**05 hours** **L3**
Module-5: **Challenges, Story and Myths** Using DevOps to Solve New Challenges:Mobile Applications, ALM Processes, ScalingAgile, Multiple-Tier Applications, DevOps in the Enterprise, Supply Chains The Internet of Things. Taking a Look at the Executive's Role, Putting Together the Team, Setting DevOps Goals, learning from the DevOps Transformation, Looking at the DevOps Results DevOps Is Only for "Born on the Web" Shops, DevOps Is Operations Learning How to Code, DevOps Is Just for Development and Operations, DevOps Isn't for ITIL Shops , DevOps Isn't for Regulated Industries, DevOps Isn't for Outsourced Development, No Cloud Means No DevOps, DevOps Isn't for Large, Complex Systems, DevOps Is Only about Communication, DevOps Means Continuous Change Deployment **Textbook 2: Chapters 5, 6 and 7**	**05 Hours** **L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE67D.1	Understand the fundamentals of DevOps and Continuous Delivery
22ISE67D.2	Explain need of Coding and Building the code in Devop process
22ISE67D.3	Illustrate the process of Testing and Deploying the Code in Devop Process
22ISE67D.4	Summarize the importance of Monitoring the Code and Issue Tracking related to Devops
22ISE67D.5	Outline about Challenges, Story and Myths related to Devops

Textbooks:

1. **Practical DevOps:** Harness the power of DevOps to boost your skill set and make your IT organization perform better by Joakim Verona, Published by Packt Publishing Ltd, 2016, ISBN 978-1-78588-287-6 https://github.com/sreddy-bwi/Free-DevOps-Books-1/blob/master/book/Practical%20DevOps.pdf
2. **DevOps For Dummies®,** 2nd IBM Limited Edition by Sanjeev Sharma and Bernie Coyne , Published by John Wiley & Sons, Inc. 2015 https://www.immagic.com/eLibrary/ARCHIVES/EBOOKS/W150421S.pdf

Reference books:

1. Learning DevOps: The complete guide to accelerate collaboration with Jenkins, Kubernetes, Terraform and Azure DevOps by Mikael Krief, Published by Packt Publishing Ltd. 2019, ISBN 978-1-83864-273-0 https://online-pmo.com/wp-content/Education/Learning%20DevOps.pdf
2. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale by Jennifer Davis and Ryn Daniels Published by O'Reilly Media, Inc.,2018 ISBN: 978-1-492-07309-3 http://www.sauleh.ir/fc98/static_files/materials/Effective_DevOps.pdf

MOOCs

1. https://www.udemy.com/topic/devops/
2. https://aws.amazon.com/solutions/consulting-offers/capgemini-devops-automation-springboard/
3. Azure Devops by Infosys Spring board
4. Azure DevOps and Micro Services & Azure Kubernetes – Deployment Models by NPTEL

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE67D.1	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE67D.2	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE67D3	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE67D.4	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
22ISE67D.5	3	3	3	-	3	-	-	-	-	-	-	2	2	-	-	-
Average	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**

Low-1: Medium-2: High-3

7th Semester Syllabus

SEMESTER – VII

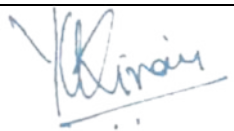
Course: Big Data Analytics (Integrated)

Course Code	22ISE71	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	04	Examination Hours	03

Course Learning Objectives:

CLO1	Understand the fundamentals of Big Data Analytics
CLO2	Explore the Hadoop framework and Hadoop Distributed File system
CLO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
CLO4	Employ MapReduce programming model to process the big data
CLO5	Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.

Content	No. of Hours/ RBT levels
Module 1 Introduction to Big Data Analytics: Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies. Text book 1: Chapter 1: 1.2 -1.7	**08 Hours L2**
Module 2 Introduction to Hadoop (T1): Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools. Hadoop Distributed File System Basics (T2): HDFS Design Features, Components, HDFS User Commands. Essential Hadoop Tools (T2): Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase. Text book 1: Chapter 2 :2.1-2.6 Text Book 2: Chapter 3 , Chapter 7 (except walk through)	**08Hours L3**
Module 3 NoSQL Big Data Management, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases. Text book 1: Chapter 3: 3.1-3.7	**08 Hours L3**
Module 4 MapReduce, Hive and Pig: Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig. Text book 1: Chapter 4: 4.1-4.6	**08 Hours L3**
Module 5 Machine Learning Algorithms for Big Data Analytics: Introduction, Estimating the relationships, Outliers, Variances, Probability Distributions, and Correlations, Regression analysis, Finding Similar Items, Similarity of Sets and Collaborative Filtering, Frequent Item sets and Association Rule Mining. Text, Web Content, Link, and Social Network Analytics: Introduction, Text mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics: Text book 1: Chapter 6: 6.1 to 6.5 Text book 1: Chapter 9: 9.1 to 9.5	**08 Hours L3**



Program List	
1	Working with Data Storage and Analysis
2	Programming on Big Data Analytics Applications
3	Getting familiar with Pig, Hive, Sqoop in Hadoop
4	Getting familiar with Flume, Oozie, HBase in Hadoop
5	Getting familiar with MongoDB Databases
6	Getting familiar with Cassandra Databases
7	Using MapReduce for Calculations
8	Working with MapReduce Algorithms
9	Getting familiar with Machine Learning Algorithms for Big Data Analytics
10	Working with mining algorithms and getting familiar with Social network Analysis, Text mining, Web mining etc.

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE71.1	Understand the fundamentals of Big Data Analytics and its applications.
22ISE71.2	Describe Hadoop and its ecosystem and Hadoop Distributed File system.
22ISE71.3	Demonstrate the concepts of NoSQL using MongoDB and Cassandra Databases for Big Data.
22ISE71.4	Illustrate the MapReduce programming model to process the big data along with Hadoop tools.
22ISE71.5	Apply the knowledge of Hadoop framework, HDFS, MongoDB, Casandra, Machine learning algorithms in solving the real-world problems associated with Big Data.

Textbooks:

1. Raj Kamal and PreetiSaxena, “Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning”, McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966
2. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1 stEdition, Pearson Education, 2016. ISBN13: 978-9332570351

Reference books:

1. Tom White, “Hadoop: The Definitive Guide”, 4th Edition, O‟Reilly Media, 2015.ISBN-13: 978-9352130672 2.
2. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1 stEdition, Wrox Press, 2014ISBN-13: 978-8126551071
3. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators",1 stEdition, O'Reilly Media, 2012.ISBN-13: 978-9350239261
4. ArshdeepBahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577

MOOCs:

1. http://nptel.ac.in/
2. https://www.khanacademy.org/
3. E-learning: www.vtu.ac.in
4. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
5. https://www.classcentral.com/course/big-data-analytics-18252

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component**.**

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE71.1	3	2	2	2	1	1	-	1	-	-	-	2	-	3	-	-
22ISE71.2	3	2	2	2	1	1	-	1	-	-	-	2	1	3	-	-
22ISE71.3	3	2	2	2	1	1	-	1	-	-	-	2	1		-	3
22ISE71.4	3	2	2	2	1	1	-	1	-	-	-	2	-	3	-	-
22ISE71.5	3	2	2	2	1	1	-	1	-	-	-	2	-	3	-	1
Average	3	2	2	2	1	1	-	1	-	-	-	2	1	3	-	2

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Industrial Internet of Things (Integrated)

Course Code	22ISE72	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Prerequisites:

- Basic understanding of computing and the internet
- Knowledge of computer hardware and software

Course Learning Objectives

CLO1	To gain knowledge of Industrial IoT and its fundamentals.
CLO2	To understand the recent application domains of Industrial Internet of Things (IIoT) in everyday life.
CLO3	To understand the various IoT protocols and explore on the current trends of associated IOT technologies.
CLO4	Classify sensor technologies for sensing real world entities and distinguish the role of IoT in various domains in real world scenario.

Contents	No. of Hours RBT Level
Module 1 What is IoT? Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	**08 Hours** **L2**
Module 2 Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	**08 Hours** **L2**
Module 3 IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming, IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi.	**08 Hours** **L2**
Module 4 Manufacturing - An Introduction to Connected Manufacturing, An IoT Strategy for Connected Manufacturing, Business Improvements Driven Through IoT, An Architecture for the Connected Factory, Industrial Automation and Control Systems Reference Model, The CPwE Reference Model, CPwE Resilient Network Design, Resilient Ethernet Protocol (REP), Business Value of Resiliency in Converged Networks, CPwE Wireless, CPwE Wireless Network Architecture, Real-Time Location System (RTLS), Industrial Automation Control Protocols, EtherNet/IP and CIP, PROFINET, The PROFINET Architecture, Media Redundancy Protocol (MRP), Modbus/TCP, Connected Factory Security, A Holistic Approach to Industrial Security, Network Address Translation in the Factory, The Industrial DMZ, Factory Security Identity Services, Edge Computing in the Connected Factory, Connected Machines and Edge Computing.	**08 Hours** **L3**

Module 5	
Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples, Case studies on Smart City Streetlights Control and Monitoring. IOT Case studies: Introduction, Design Layers, Design Complexity and Designing using Cloud PaaS, IoT/IIot Applications in the premises, Supply-Chain and Customer Monitoring, Connected Car and its Applications and Services, IoT Applications for Smart Homes, Cities, Environment-Monitoring and Agriculture.	**08 Hours L3**

Program List	
1	To interface LED switch with a push button.
2	To interface RGB LED with the Arduino.
3	Light detection using photo resistor.
4	Interfacing of temperature sensor LM35 with Arduino
5	Interfacing Servo motor with Arduino
6	Interfacing relay with Arduino.
7	Building intrusion detection system with Arduino and Ultrasonic Sensor
8	Directional control of the DC motor using Arduino.
9	To monitor the temperature and to display the read temperature on LCD.
10	Interfacing light sensor.

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE72.1	Understand the basic architecture and communication protocols of WSN.
22ISE72.2	Compare and contrast the deployment of smart objects and the technologies to connect themto network.
22ISE72.3	Understand the different components required to develop IoT applications.
22ISE72.4	Identify the applications of IoT in Industries.
22ISE72.5	Comprehend the role of IoT in various fields through case studies.

Text Books

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,**"IoTFundamentals: Networking Technologies, Protocols, and Use Cases for the Internet ofThings",** 1stEdition, Pearson Education (Cisco Press Indian Reprint). (**ISBN:** 978-9386873743)
2. **Srinivasa K G,** "Internet of Things",**CENGAGE Leaning India, 2017.**

Reference Books

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
2. Vijay Madisetti and ArshdeepBahga, **"Internet of Things (A Hands-on-Approach)", 1st**Edition, VPT, 2014. (**ISBN:** 978-8173719547).
3. Raj Kamal, **"Internet of Things: Architecture and Design Principles",** 1st Edition,McGraw Hill Education, 2017. (ISBN: 978-9352605224)

MOOCs

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. https://www.emqx.com/en/blog/industrial-iot-applications#examples-of-iiot-applications-by-industry
3. https://archive.nptel.ac.in/courses/106/105/106105166/
4. https://onlinecourses.nptel.ac.in/noc23_cs82/preview

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs: Seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ Poster Presentation/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Laboratory Test	**20**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE72.1	3	2	2	-	3	3	3	2	-	-	-	3	-	2	-	-
22ISE72.2	3	2	2	-	3	3	3	2	-	-	-	3	-	2	-	-
22ISE72.3	3	2	2	-	3	3	3	2	-	-	-	3	-	2	-	-
22ISE72.4	3	2	2	-	3	3	3	2	-	-	-	3	-	2	-	-
22ISE72.5	3	2	2	-	3	3	3	2	-	-	-	3	-	2	-	-
Average	**3**	**2**	**2**	**-**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Information And Network Security

Course Code	22ISE73	CIE Marks	50
Hours/Week (L: T: P)	4:0:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Course Learning Objectives:

CLO1	Understand the basics of, Security, its principle and Cryptography.
CLO2	To study various cryptographic Algorithm.
CLO3	Apply the knowledge of Cryptography to various fields.
CLO4	Understand and apply various Hash functions
CLO5	Discuss about various key management scenario.

Content	No. of Hours/ RBT levels
Module 1 **Introduction.** How to Speak Crypto. Classic Crypto. Simple Substitution Cipher. Cryptanalysis of a Simple Substitution. Definition of Secure. Double Transposition Cipher. One-time Pad. Project VENONA. Codebook Cipher. Ciphers of the Election of 1876. Modern Crypto History. Taxonomy of Cryptography. Taxonomy of Cryptanalysis. Textbook:1-Chapter 2	**10 Hours L2**
Module 2 **What is a Hash Function?** The Birthday Problem. Non-cryptographic Hashes. Tiger Hash. HMAC. Uses of Hash Functions. Online Bids. Spam Reduction. Other Crypto-Related Topics. Secret Sharing. Key Escrow. Random Numbers. Texas Hold 'em Poker. Generating Random Bits. Information Hiding. Textbook:1-Chapter 5	**10 Hours L2,**
Module 3 Random number generation, Providing Freshness, Fundamentals of entity authentication, Passwords, Dynamic password schemes, Zero-knowledge mechanisms, further reading. **Cryptographic Protocols:** Protocol Basics, From objectives to a protocol, Analysing a simple protocol, Authentication and key establishment protocols**.** Textbook:2-Chapter 8, Chapter 9	**10 Hours L2**
Module 4 Key management fundamentals, Key lengths and lifetimes, Key generation, Key establishment, Key storage, Key usage, Governing key management. **Public-Key Management:** Certification of public keys, The certificate lifecycle, Public-key management models, Alternative approaches**.** Textbook:2-Chapter 10, Chapter 11	**10 Hours L2**
Module 5 **Cryptographic Applications:** Cryptography for securing the Internet, Cryptography for wireless local area networks, Cryptography for mobile telecommunications, Cryptography for secure payment card transactions, Cryptography for video broadcasting, Cryptography for identity cards. Textbook:2-Chapter 12 (12.1 to 12.6).	**10 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22ISE73.1	Understand the basic concepts of Security and Cryptography.
22ISE73.2	Apply different hash functions.
22ISE73.3	Describe the Random number generation and Cryptographic Protocols.
22ISE73.4	Explain key management scenario.
22ISE73.5	Apply the Concept of Cryptography for more security in different fields.

Textbook

1. Information Security: Principles and Practice, 2nd Edition by Mark Stamp, Wiley

2. Everyday Cryptography: Fundamental Principles and Applications Keith M. Martin Oxford Scholarship Online: December 2013.

Reference Books:

1. **Applied Cryptography Protocols, Algorithms, and Source Code in C by Bruce Schneier**

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table : Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE73.1	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2	2
22ISE73.2	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2	2
22ISE73.3	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2	2
22ISE73.4	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2	2
22ISE73.5	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2	2
Average	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2	2

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Deep Learning

Course Code	22ISE74A	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Machine Learning Basics

Course Learning Objectives:

CLO1	Understand the fundamentals of deep learning.
CLO2	Know the theory behind Convolutional Neural Networks, Autoencoders, RNN.
CLO3	Illustrate the strength and weaknesses of many popular deep learning approaches.
CLO4	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
CLO5	Understand the deep learning algorithms for the given types of learning tasks in varied domain

Content	No.of Hours/ RBT levels
Module 1 **Introduction to Deep Learning:** Introduction, Deep learning Model, Historical Trends in Deep Learning, **Machine Learning Basics:** Learning Algorithms, Supervised Learning Algorithms, Unsupervised Learning Algorithms. **Textbook 1: Chapter1 – 1.1, 1.2, 5.1,5.7-5.8.**	**08 Hours** **L2**
Module 2 **Feedforward Networks**: Introduction to feed forward neural networks, Gradient-Based Learning, Back Propagation and Other Differentiation Algorithms. Regularization for Deep Learning, **Textbook 1: Chapter 6, 7**	**08 Hours** **L3**
Module 3 **Optimization for Training Deep Models:** Empirical Risk Minimization, Challenges in Neural Network Optimization, **Basic Algorithms:** Stochastic Gradient Descent, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates: The AdaGrad algorithm, The RMSProp algorithm, Choosing the Right Optimization Algorithm. **Textbook 1: Chapter: 8.1-8.5**	**08 Hours** **L3**
Module 4 **Convolutional Networks:** The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features- LeNet, AlexNet. **Textbook 1: Chapter: 9.1-9.9.**	**08 Hours** **L3**

Module 5	
Recurrent and Recursive Neural Networks: Unfolding Computational Graphs, Recurrent Neural Network, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Long Short Term Memory and Other Gated RNNs. **Applications:** Large-Scale Deep Learning, Computer, Speech Recognition, Natural Language Processing and Other Applications. **Textbook 1: Chapter: 10.1-10.3, 10.5, 10.6, 10.10, 12.**	**08 Hours** **L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE74A.1	Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc.,
22ISE74A..2	Describe various knowledge on deep learning and algorithms
22ISE74A..3	Apply CNN and RNN model for real time applications
22ISE74A..4	Identify various challenges involved in designing and implementing deep learning algorithms.
22ISE74A..5	Relate the deep learning algorithms for the given types of learning tasks in varied domain

Textbooks:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

Reference books:

1. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning, 2009.

2. N.D.Lewis, "Deep Learning Made Easy with R: A Gentle Introduction for Data Science", January 2016.

3.Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications.

4. Navin Kumar Manaswi ,Deep Learning with Applications Using Python Chatbots and Face, Object, and Speech Recognition With TensorFlow and Keras ,Apress,2018.

MOOCs:

1. https://nptel.ac.in/courses/106106184
2. https://faculty.iitmandi.ac.in/~aditya/cs671/index.html

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Two lab CIE is conducted for 20 marks each and average is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE74A..1	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
22ISE74A..2	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
22ISE74A..3	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
22ISE74A..4	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
22ISE74A..5	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
Average	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Quantum Computing

Course Code	22ISE74B	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Machine Learning,

Course Learning Objectives

CLO1	To acquire the knowledge on the fundamental of Quantum Computation
CLO2	To acquire the knowledge of different Quantum Algorithms
CLO3	To understand the operation for Quantum computation
CLO4	To examine error correction principles in Quantum Cryptography
CLO5	Understand the Principles of quantum cryptography

Contents	No. of Hours/ RBT Level
Module 1 **Fundamental concepts**:Introduction and overview Quantum bits Multiple qubits Quantum computation, Single qubit gates, Multiple qubit gates, Measurements in bases other than the computational basis Quantum circuits Qubit copying circuit Example: Bell states	**8 Hours L2**
Module 2 **Quantum algorithms:** Classical computations on a quantum computer Quantum parallelism Deutsch's algorithm The Deutsch–Jozsa algorithm Shor's Grovers AlgorithmBernstein-Vazirani algorithm, Simon's algorithm	**8 Hours L2**
Module 3 **Quantum computation:**Quantum circuits Quantum algorithms Single qubit operations Controlled operations Measurement Universal quantum gates	**8 Hours L2**
Module 4 **Quantum Error Correction**Quantum noise and decoherenceBasic principles of quantum error correction Quantum error-correcting codes: Shor code, Steane code Fault-tolerant quantum computation	**8 Hours L2**
Module 5 **Quantum Cryptography**Principles of quantum cryptographyQuantum key distribution (QKD): BB84 protocolSecurity of quantum cryptographic protocols post-quantum cryptographyQuantum cryptography Private key cryptography Privacy amplification and information reconciliation Quantum key distribution Privacy and coherent information The security of quantum key distribution	**8 Hours L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE74B.1	Understand the key concepts of Quantum computing
22ISE74B.2	Understandthe basic algorithms in Quantum computing
22ISE74B.3	Understand different circuits in quantum computation.
22ISE74B.4	Understand the principles of error correction in Quantum computing
22ISE74B.5	Understand the Principles of quantum cryptography

Text Books

1. Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang

Reference Books

1. Quantum Computing: A Gentle Introduction" by Eleanor G. Rieffel and Wolfgang H. Polak
2. Online resources: Qiskit documentation, IBM Quantum Experience tutorials, arXiv papers on quantum computing

MOOCs

1. https://www.courses.com/indian-institute-of-technology-madras/Quantumcomputing
2. Online resources: Qiskit documentation, IBM Quantum Experience tutorials, arXiv papers on quantum computing

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE74B.1	3	3	3	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE74B.2	3	3	3	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE74B.3	3	3	3	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE74B.4	3	3	3	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE74B.5	3	3	3	-	2	-	-	-	-	-	-	2	2	-	-	-
Average	3	3	3	-	2	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Information Retrieval and Natural Language Processing

Course Code	22ISE74C	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites:

- Basics of Engineering Mathematics, Algorithms and Programming skills
- Probability and Statistics, Machine learning and deep learning concepts

Course Learning Objectives

CLO1	Identify NLP applications in business and social contexts.
CLO2	Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.
CLO3	Understand approaches to syntax and semantics in NLP
CLO4	Understand machine learning techniques used in NLP
CLO5	Apply fundamental algorithms and techniques in the area of NLP

Contents	No. of Hours/ RBT Level
Module 1 **Overview and language modeling**: **Overview**: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. **Language Modeling**: Various Grammar- based Language Models-Statistical Language Model. **Textbook 1: Ch. 1,**2	**08 Hours L2**
Module 2 **Word level and syntactic analysis**: **Word Level Analysis**: Regular Expressions-Finite State Automata-Morphological Parsing-Spelling Error Detection and Correction-Words and Word Classes-Part-of Speech Tagging. **Syntactic Analysis**: Context-free Grammar Constituency- Parsing-Probabilistic Parsing. **Textbook 1: Ch. 3,4**	**08 Hours L3**
Module 3 **Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles**: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. **A Case Study in Natural Language Based Web Search**: InFact System Overview, The GlobalSecurity.org Experience. **Textbook 2: Ch. 4,5**	**08 Hours L3**
Module 4 **Automatic Document Separation**: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results. **Evolving Explanatory Novel Patterns for Semantically-Based Text Mining**: Related Work, A Semantically Guided Model for Effective Text Mining. **Textbook 2: Ch. 8,9**	**08 Hours L3**

Module 5	
INFORMATION RETRIEVAL AND LEXICAL RESOURCES: **Information Retrieval**: Design features of Information Retrieval Systems, Information Retrieval Models - Classical, Non classical, Alternative Models of IR, Evaluation of IR System. **Lexical Resources**: WordNet, FrameNet, Stemmers, POS Tagger. **Textbook 1: Ch. 9,12**	**08 Hours** **L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE74C.1	Understand the natural language text data and perform processing
22ISE74C.2	Define the importance of natural language processing.
22ISE74C.3	Understand the concepts and importance of Text mining.
22ISE74C.4	Demonstrate the machine learning techniques used in NLP
22ISE74C.5	Illustrate information retrieval techniques.

Text Books

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer-Verlag London Limited 2007.

Reference Books

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2008.
2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummings publishing company, 1995.
3. Gerald J. Kowalski and Mark T. Maybury, "Information Storage and Retrieval systems", Kluwer academic Publishers, 2000.

MOOCs

1. https://www.upf.edu/web/mtg/nlp-tutorial
2. https://nlp.stanford.edu/fsnlp
3. http://nptel.ac.in
3. https://www.khanacademy.org/
4. https://www.class-central.com (MOOCS)
5. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.

CIE is executed by way of two quizzes/Alternate Assessment Tools (AATs), and three tests.

Two quizzes can be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE74C.1	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-	-
22ISE74C.2	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-	-
22ISE74C.3	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-	-
22ISE74C.4	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-	-
22ISE74C.5	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-	-
Average	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: .Net Framework for Applications

Course Code	22ISE74D	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: Basics of Programming

Course Learning Objectives:

CLO1	Inspect Visual Studio programming environment and toolset designed to build applications for Microsoft Windows
CLO2	Understand Object Oriented Programming concepts in C# programming language.
CLO3	Interpret Interfaces and define custom interfaces for application.
CLO4	Build custom collections and generics in C#
CLO5	Construct events and query data using query expressions

Content	No. of Hours/ RBT levels
Module 1 **Introducing Microsoft Visual C# and Microsoft Visual Studio 2015:** Welcome to C#, Working with variables, operators and expressions, Writing methods and applying scope, Using decision statements, Using compound assignment and iteration statements, Managing errors and exceptions	**08 Hours L2**
Module 2 **Understanding the C# object model:** Creating and Managing classes and objects, Understanding values and references, Creating value types with enumerations and structures, Using arrays	**08Hours L2**
Module 3 **Understanding parameter arrays,** Working with inheritance, Creating interfaces and defining abstract classes, Using garbage collection and resource management.	**08 Hours L3**
Module 4 **Defining Extensible Types with C#:** Implementing properties to access fields, Using indexers, Introducing generics, Using collections	**08 Hours L3**
Module 5 **Enumerating Collections,** Decoupling application logic and handling events, Querying inmemory data by using query expressions, Operator overloading	**08 Hours L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

22ISE74D.1	Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#
22ISE74D.2	Demonstrate Object Oriented Programming concepts in C# programming language
22ISE74D.3	Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications.
22ISE74D.4	Illustrate the use of generics and collections in C#
22ISE74D.5	Compose queries to query in-memory data and define own operator behavior.

Textbooks:

1.John Sharp, Microsoft Visual C# Step by Step, 8th Edition, PHI Learning Pvt. Ltd. 2016

Reference books:

1. Christian Nagel, "C# 6 and .NET Core 1.0", 1st Edition, Wiley India Pvt Ltd, 2016. Andrew Stellman and Jennifer Greene, "Head First C#", 3rd Edition, O'Reilly Publications, 2013.
2. Mark Michaelis, "Essential C# 6.0", 5th Edition, Pearson Education India, 2016.
3. Andrew Troelsen, "Prof C# 5.0 and the .NET 4.5 Framework", 6th Edition, Apress and Dreamtech Press, 2012.

MOOCs

1. http://nptel.ac.in
2. https://www.coursera.org/
3. https://www.udemy.com

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full questionfrom each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average marks scored is added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE74D.1	3	3	-	-	3	-	-	-	-	-	-	-	2	-	-	-
22ISE74D.2	3	3	-	-	3	-	-	-	-	-	-	-	2	-	-	-
22ISE74D.3	3	3	-	-	3	-	-	-	-	-	-	-	2	-	-	-
22ISE74D.4	3	3	-	-	3	-	-	-	-	-	-	-	2	-	-	-
22ISE74D.5	3	3	-	-	3	-	-	-	-	-	-	-	2	-	-	-
Average	3	3	-	-	3	-	-	-	-	-	-	-	2	-	-	-

Low1: Medium-2: High-3

SEMESTER-VII

Course: Introduction to DBMS

Course Code	22ISE75A	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: Basics of Database

Course Learning Objectives:

CLO1	To understand the fundamental concepts and architecture of DBMS.
CLO2	Explain the basic concepts of Conceptual Data Modeling, Database Design and Relational Database Constraints.
CLO3	Practice Relational Algebra and SQL queries through a variety of database problems.
CLO4	To develop and evaluate a real database application using a database management system.
CLO5	To explain the Normalization and Transaction Processing Concepts.

Content	No.of Hours/ RBT levels
Module 1 **Databases and Database Users -**Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of using the DBMS Approach, A Brief History of Database Applications. **Database System Concepts and Architecture -** Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces.	**08Hours L2**
Module 2 **Conceptual Data Modeling and Database Design-** High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams. **The Relational Data Model and Relational Database Constraints -**Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions, Dealing with Constraint Violations.	**08Hours L3**
Module 3 **Relational Algebra-** Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations **SQL-** SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT DELETE, and UPDATE Statements in SQL, Additional Features of SQL.	**08 Hours L3**
Module 4 **More SQL: Complex Queries, Triggers, Views, and Schema Modification-** More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. **Database Application Development:** Accessing databases from applications, An Introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures.	**08 Hours L3**
Module 5 **Basics of Functional Dependencies and Normalization for Relational Databases -**Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms , Boyce-Codd Normal	**08 Hours L3**

Form, Multivalued Dependency and Fourth Normal Form , Join Dependencies and Fifth Normal Form. **Introduction to Transaction Processing Concepts and Theory** -Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability.	

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE75A.1	Explain the fundamental concepts and architecture of DBMS.
22ISE75A.2	Design entity relationship diagrams to represent simple database application scenarios.
22ISE75A.3	Use Relational algebra operation and Structured Query Language (SQL) for database manipulation.
22ISE75A.4	Apply advanced queries for database design and develop application.
22ISE75A.5	Implement normalization algorithms using database design theory for different applications and transaction processing in databases.

Textbooks:

1. Fundamentals of Database Systems, RamezElmasriandShamkant B. Navathe,7th Edition,2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rdEdition, 2014, McGrawHill

Reference books:

1. **Database Management Systems**, Raghu Rama Krishnan, Tata Mcgraw Hill,6th edition,2010.
2. **Database System Concepts,**Abraham Silberschatz, Henry F.Korth and S.Sudarshan, Tata Mc Graw Hill, 6th edition, 2011.

MOOCs (Format is given below)

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com(MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full questionfrom each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and three tests.

Quizzes are to be conducted and each quiz can be evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO-PO mapping															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
22ISE75A.1	3	2	3	-	-	-	-	-	-	-	-	2	2	1	1
22ISE75A.2	3	2	3	-	-	-	-	-	-	-	-	2	2	1	1
22ISE75A.3	3	2	3	-	-	-	-	-	-	-	-	2	2	1	1
22ISE75A.4	3	2	3	-	-	-	-	-	-	-	-	2	2	1	1
22ISE75A.5	3	2	3	-	-	-	-	-	-	-	-	2	2	1	1
Average	3	2	3	-	-	-	-	-	-	-	-	2	2	1	1

Low-1: Medium-2: High-3

SEMESTER – VII

Course: ReactJs

Course Code	22ISE75B	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisite: Web Technology

Course Learning Objectives:

CLO1	Understand the fundamentals of JavaScript and its application in client-side scripting.
CLO2	Develop components in React and manage their lifecycle.
CLO3	Implement advanced features in React such as state management and props handling.
CLO4	Create complex components and enhance them with functionalities like sorting, searching, and editing
CLO5	Set up a modern development environment and build a full React application.

Content	No.of Hours/ RBT levels
Module 1 **JavaScript Client-Side Scripting:** what is JavaScript and What can it do? Where does JavaScript Go? Syntax, JavaScript Objects. **Hello World:** Setup, Hello React World,what Just Happened?React.DOM.*,SpecialDOM Attributes, React DevTools Browser Extension,Next: Custom Components.	**08 Hours L3**
Module 2 **TheLife of a Component:**Bare Minimum,Properties,prop Types,Default PropertyValues,States,AStatefulTextarea Component,A note on DOM Events, Props Versus State, Props in Initial State: An Anti-Pattern, Accessing the Component from the Outside, Changing Properties Mid -Flight. Lifecycle Methods, Lifecycle Example: Log It All, Lifecycle Example: Use a Mixin, Lifecycle Example: Using a Child Component, Performance Win: Prevent Component Updates, PureRenderMixin.	**08Hours L3**
Module 3 **Excel: A Fancy Table Component:** Data First, Table Headers Loop, Debugging the Console Warning, Adding<td>Content, Sorting, Sorting UI Cues, Editing Data, Search, Instant Replay, Download the Table Data.	**08 Hours L3**
Module 4 **JSX:**HelloJSX, TranspilingJSX, Babel, ClientSide, About the JSX transformation, JavaScript in JSX transoformation, JavaScript in JSX, Whitespace in JSX, Comments in JSX, HTML Entities, Spread Attributes, Return Multiple Nodes in JSX, JSX Versus HTML Differences, JSX and Forms,Excel Component in JSX.	**08 Hours L3**
Module 5 **Setting Up for App Development:** A Boilerplate App- Files and Folders, index.html,CSS, JavaScript, JavaScript: Modernized, Installing Prerequisites- Node.js, Browserify, Bable, React, etcLets Build- TranspileJavaScript,Package JavaScript Pacakage CSS.	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

22ISE75B.1	Demonstrate knowledge of JavaScript fundamentals and client-side scripting.
22ISE75B.2	Develop and manage React components and their lifecycle.
22ISE75B.3	Implement state management and handle props in React components.
22ISE75B.4	Create complex and functional React components.
22ISE75B.5	Set up a development environment and build a complete React application.

Textbooks:

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 2nd Edition, Pearson Education India. (ISBN:978-0134481267).
   ecopy:https://vdoc.pub/download/fundamentals-of-web-development-3rhv8jsrftig
2. Stoyan Stefanov," React Up and Running Building web Applications",2nd Edition,O'reilly.
   ecopy:https://dl.ebooksworld.ir/books/React.Up.and.Running.2nd.Edition.Stoyan.Stefanov.OReilly.9781492051466.EBooksWorld.ir.pdf

Reference books:

1. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4th Edition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014

MOOCs:

1. Full Stack Web Development: https://www.simplilearn.com/search?item_type=course%2Cbundle%2Ccohort_master%2Cuniversity_master&tag=reactjs+courses
2. Web Design for Everybody: https://www.coursera.org/search?query=reactjs%20course
3. The Complete 2022 Web Development Bootcamp: https://www.udemy.com/courses/search/?src=ukw&q=reactjs+courses

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:
Seminar/ assignments/term paper/ open ended experiments/ mini-projects/concept videos/ partial reproduction of research work/ oral presentation of research work/ groupactivity/ developing a generic toolbox for problem solving/ report based on participation in create-athon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
22ISE75B.1	3	2	1	-	2	-	-	-	-				2	2	1	
22ISE75B.2	3	3	3	2	3	-	-	-	1				3	2	2	
22ISE75B.3	3	3	3	2	3	-	-	-	2				3	2	3	
22ISE75B.4	3	3	3	3	3	-	-	-	3				3	2	3	
22ISE75B.5	3	3	3	3	3	-	-	-	3				3	3	3	
Average	3	3	3	3	3	-	-	-	2				3	2	3	

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Introduction to Software Engineering

Course Code	22ISE75C	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basics of computers

Course Learning Objectives

CLO1	Discuss the software engineering principles, process, and requirements in building large software programs.
CLO2	To Infer the fundamentals of object-oriented concepts, different system models, and design patterns
CLO3	Discuss the various types of software testing practices and software evolution processes
CLO4	Identify the importance of agile practices in software development and Real Time OS
CLO5	Recognize the Project planning with its methods and methodologies

Contents	No. of Hours RBT Level
Module 1 **Introduction to Software Engineering:** Introduction: Professional Software development , Software Engineering Ethics, Case Studies (Textbook 1: Chapter 1: 1.1 to 1.3) **Software Process:** Software Process models, Process Activities, Process Improvement.(Textbook 1: Chapter 2: 2.1, 2.2, 2.4) **Requirements Engineering**: Functional and non Functional requirements, Requirements Engineering process, Eliciting Requirements, Requirements specification, Validating Requirements, Requirements change. Textbook 1: Chapter 4: 4.1 to 4.6	**08 Hours L2**
Module 2 **Introduction, System Modeling:** Context models, Interaction models, Structural models, Behavioral models, Model-driven architecture Textbook 1: Chapter 5: 5.1 to 5.5 **Architectural Designs :**Architectural design decisions, View, Patterns, Application Architecture Textbook 1: Chapter 6: 6.1 to 6.4	**08 Hours L2**
Module 3 **Software Testing:** A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging. Textbook 2: Chapter 17: 17.1 to 17.8 **Software Evolution:** Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management Textbook 1: Chapter 9: 9.1 to 9.3	**08 Hours L2**
Module 4 **Agile Software Development:** Agile Methods, Agile development techniques, Agile project management, Scaling agile methods Textbook 1: Chapter 3:3.1 to 3.4 **Real-Time Software Engineering:** Embedded system design, Architectural patterns for real-time software systems, Real Time Operating Systems(RTOS) Textbook 1: Chapter 21:21.1 to 21.4	**08 Hours L2**

Module 5	
Introduction to Project Management: Risk Management, Managing people, Teamwork Textbook 1: Chapter 22: 22.1 to 22.3 **Project Planning:** Software pricing, Plan Driven Development, Project scheduling Agile planning, Estimation techniques, COCOMO cost modeling. Textbook 1: Chapter 23: 23.1 to 23.6 **Quality Management:** Software Quality, Software standards, Reviews and inspections, Software measurement. Textbook 1: Chapter 24: 24.1 to 24.3 & 24.5	**08 Hours** **L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE75C.1	Understand the activities involved in software engineering and analyze the role of various process models and Requirements
22ISE75C.2	Explain the basics of class models using modeling techniques and Architectural designs
22ISE75C.3	Illustrate the various software testing methods and understand the importance of agile methodology
22ISE75C.4	Describe software practices in agile methodology
22ISE75C.5	Illustrate the role of project planning and quality management in software development

Text Books

1. Software Engineering, Ian Sommerville, 10th Edition, Pearson Education
2. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.

Reference Books

1. Software Engineering-A Practitioners Approach, Roger S. Pressman, 7th Edition, Tata McGraw Hill.
2. An Integrated Approach to Software Engineering, Pankaj Jalote:, Wiley India

MOOCs (Format is given below)

1. http://nptel.ac.in
2. https://www.class-central.com (MOOCS)
3. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE75C.1	3	3	3	-	-	2	2	3	1	1	-	2	3	2	-	-
22ISE75C.2	3	3	3	-	1	2	2	3	1	1	-	2	3	2	-	-
22ISE75C.3	3	3	2	-	1	2	2	2	1	1	-	2	3	2	-	-
22ISE75C.4	3	3	3	-	2	1	1	1	1	1	1	2	3	2	-	-
22ISE75C.5	3	3	2	-	-	1	1	1	1	1	2	2	3	2	-	-
Average	**3**	**3**	**2.6**	**-**	**1.3**	**1.6**	**1.6**	**2**	**1**	**1**	**1.5**	**2**	**3**	**2**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Web Technology

Course Code	22ISE75D	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Basics of Computer Networks

Course Learning Objectives

CLO1	Understand the basic tags, forms and tables using HTML and CSS
CLO2	Design Client-Side programs using JavaScript and Server-Side programs using PHP
CLO3	Interpret Object Oriented Programming capabilities of PHP
CLO4	Understand query strings, cookies and sessions in web applications.
CLO5	Understand web services and its applications

Contents	No. of Hours RBT Level
Module 1 Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.	**08 Hours L2**
Module 2 HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts.	**08 Hours L3**
Module 3 JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions	**08 Hours L3**
Module 4 PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design	**08 Hours L3**
Module 5 Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching.	**08 Hours L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

22ISE75D.1	Discuss HTML tags and CSS to create web pages
22ISE75D.2	Construct tables and forms using HTML and CSS
22ISE75D.3	Apply JavaScript and PHP concepts for client side and server-side scripting
22ISE75D.4	Illustrate the object-oriented PHP concepts
22ISE75D.5	Discuss web services and its applications

Text Books

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271)

Reference Books

1. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4 thEdition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014

MOOCs

1. https://nptel.ac.in/courses/106105084
2. https://www.coursera.org/learn/django-database-web-apps
3. https://www.udemy.com/topic/javascript/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
22ISE75D.1	2	-	-	-	2	-	-	-	-	-	-	2	-	-	-	-
22ISE75D.2	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE75D.3	2	2	2	-	2	-	-	-	-	-	-	2	-	-	-	-
22ISE75D.4	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-
22ISE75D.5	2	-	-	-	2	-	-	-	-	-	-	2	2	-	-	-
Average	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Major Project Phase-II

Course Code	22ISEP76	CIE Marks	100
Hours/Week (L: T: P)	12hours/week	SEE Marks	100
No. of Credits	06	Examination Hours	03

Course Learning Objectives

CLO1	Gains profound insights on the subject matter with practical knowledge.
CLO2	Project creation helps evolve your creative thinking, analytical skills, and reasoning ability
CLO3	Allows you to explore the breadth of research that is being performed.

CIE for Project Phase -II:

1. **Single discipline:** The CIE marks awarded for the project work phase -2, shall be based on theevaluation of project work phase -2 Report, project presentation skill and question and answersession in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates using Rubrics.
2. **Interdisciplinary:** Continuous internal Evaluation shall be group wise at the college level with theparticipation of all guides of the college. Participation of external guide/s, if any, is desirable. TheCIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates as per Rubrics covering all Program Outcomes.

SEE for Project Phase–II:

1. Single discipline: Contribution to the project and-the performance of each group member shall beassessedindividuallyinsemesterendexamination(SEE) conductedatthe department.
2. Interdisciplinary: Contribution to the project and the performance of each group member shall beassessed individually in semester end examination (SEE) conducted separately at the departments to whichthestudent/s belongto.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO 1	Develop skills in qualitative and quantitative data analysis and presentation.
CO 2	Develop advanced critical thinking skills.
CO 3	Understand to write the report writing

Typical Evaluation pattern for the Course is shown inTable1.

Table: CIE and SEE Evaluation

Components	Marks	Total	
CIE			
Review1	25	100	**200**
Review2	25		
Demonstration+ Report	50		
SEE			
Semester End Viva	100	100	

H.P. Rajashekhar Swamy
Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Beng... 98

Head of Department
fo. Science Engineer
bal Academy of Techn
Bangalore - 98