GOGTE INSTITUTE OF TECHNOLOGY

UDYAMBAG, BELAGAVI-590008

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi) (APPROVED BY AICTE, NEW DELHI)



Third to Eighth semester B.E. (2022 Scheme) INFORMATION SCIENCE AND ENGINEERING

INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

QUALITY POLICY

- Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
- Fostering cultural, ethical, moral and social values in the human resources of the institution.
- Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

DEPARTMENT VISION

Department of Information Science & Engineering shall provide excellent learning environment with focus on innovation, research and entrepreneurship among aspiring engineers to contribute to the workforce of the nation

MISSION

To impart Quality Technical Education in the field of Information Technology and enhance intellectual and professional competence among the aspiring engineers

	PROGRAM OUTCOMES (POs)
1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

	PROGRAM SPECIFIC OUTCOMES (PSOs)
1	Problem solving Skills: An ability to analyze a problem design, implement and evaluate software solutions related to algorithms, system software, web design big data analytics & networking.
2	Professional skills: An ability to develop standard software solutions for existing and emerging industry verticals and research domains
3	Career Skills: An ability to harness Information Science & Engineering knowledge with ethics and societal concern for career and further educational abilities along with entrepreneurial skills.

KLS Gogte Institute of Technology 3rd to 8thsem B.E. Scheme of Teaching and Examination- 2022

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2023-24)

Total credits for B.E. Program: 160

Credit definition:

Offline Courses	Online Courses
• 1-hour Lecture (L) per week = 1 Credit	04 weeks =1 Credit
 2 hours Tutorial (T) per week = 1 Credit, 2 hours Practical /Drawing (P) per week = 1 Credit 	08 weeks = 2 Credit 12 weeks = 3 Credit

Semester wise distribution of credits for B.E program

Year	Semester	Credits	Total/Year	Cumulative Credits
	I	20	40	40
1 st	Ш	20	40	40
	II	20	40	80
2nd	IV	20	40	80
	V	22	40	120
3rd	VI	18	40	120
	VII	24	40	160
4 _{th}	VIII	16	40	100
	Total		160	

Curriculum frame work:

Structure of Undergraduate Engineering program

S.No.	Category of courses	VTU Breakup of credits	KLSGIT Breakup of credits
1	Humanities and Social Sciences including Management courses (English, Kannada, Indian Constitution, Environmental Sciences, Health and Management)	9	10
2	Basic Science courses	22	22
3	Engineering Science courses including ETC, PLC & Drawing	24	24
4	Professional Core Courses	54	54
5	Professional Elective courses relevant to chosen	12	12

specialization/branch	

	TOTAL	160	160
10	Universal Human Values	2	2
	Certification Course		
	Online		
9	Methodology, NCC/NSS/ Sports/Ex- Curricular,	8	7
8	Ability Exhangement Courses including Descerab	10	10
0	Summer Internship and Research /Industrial Internship	10	10
7	Mini, Project, Major Project work and Seminar	10	10
0	commerce	5	5
6	Open subjects – Electives from other technical, emerging, arts,	٩	0

L-T-P Model for Courses

		Conta	Cred	its		
S.No.	L-T-P	Lecture	Tutorial	Practical	L-T-P	Total
1	3 - 0 - 0	3	0	0	3 - 0 - 0	3
2	3 - 2 - 0	3	2	0	3 - 1 - 0	4
3	3 - 0 - 2	3	0	2	3 - 0 - 1	4
4	2 - 0 - 2	2	0	2	2 - 0 - 1	3
5	1 - 0 - 4	1	0	4	1 - 0 - 2	3

Theory courses having the corresponding lab are converted to integrated type course. Also, the electives (if possible) can also be made integrated type.

Integrated courses (Professional Core/Electives): Integrated courses will have Theory Syllabus with Practical Syllabus of the same course. In such a course there could be no Semester End Examination (SEE) for the practical syllabus of the course, however, Continuous Internal Evaluation (CIE) will be conducted for the practical topics.SEE can include questions from practical topics.

SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC- Emerging Technology Course, AEC- Ability Enhancement Course, HSMS-Humanity and Social Science and Management Course, SDC- Skill Development Course,

KLS Gogte Institute of Technology 3rdYear B.E. Scheme of Teaching and Examination 2022

5 th Semester						Hours/week Total contact				Ex	aminat	ion			
S.No.	Course Type	Course Code	Course Title	Teaching Dept.	L	Т	Р	hours/week	Credits	CIE	SEE	Total			
1	HSMS	221551	Software Project Management	ISE	3	0	0	03	3	100	100	200			
2	IPCC	221552	Internet of Things	ISE	3	0	2	05	4	100	100	200			
3	PCC	221553	Computer Networks and Security	ISE	4	0	0	04	4	100	100	200			
4	PEC	22IS54X	Professional Elective Course	ISE	3	0	0	03	3	100	100	200			
5	PROJ	221555	Mini Project	ISE	0	0	4	04	2	100	-	100			
6	AEC	221556	Research Methodology and IPR		2	0	0	02	2	100	100	200			
7	MC	221557	Environmental Studies		2 0 0 02 2 100 100						200				
8	AEC	22AECIS58A	Employability Skills -1	Bizotic	1	0	0	01	1	100	-	100			
	мс	22IS58B1	National Service Scheme (NSS)	NSS coordinator	THE S		/		/						
9		22IS58B2	Physical Education (PE) (Sports and Athletics) and Yoga	Physical Education dept& Yoga instructor	0	0	2	02	0	100	-	100			
		22IS58B3	Clubs- Social, Cultural & Academic 🥣	Coordinators											
10	PCCL	22ISL59	Computer Networks Lab	ISE	0	0	2	02	1	50	50	100			
Total						•		•	22	950	650	1600			
		r	Professio	onal Elective Cou	rse										
22IS541Data Mining and Warehousing22IS544					Formal Languages and Automata Theory										
22IS542Object Oriented Modelling and Design22IS545								Advan	ced Java						
221554	3	Ui	nix System Programming												
PCC: I Ability	Profession Enhance	nal Core Course ment Course, S Evalu	e, PCCL : Professional Core Course laborato E C : Skill Enhancement Course, L: Lecture, Jation, SEE : Semester End Evaluation. PRC	ry, UHV : Universa T : Tutorial, P : Pra DJ: Project /Mini F	al Hur actical Projec	nan \ S= S t. PE(/alue (DA : Sk C: Prof	Course, MC : Mane Aill Development <i>i</i> Tessional Elective	datory Cou Activity, Cl course	irse (Noi E: Contii	n-credit nuous I	:) , AEC : nternal			

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals 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/Clubs: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga(YOG) and Clubs 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, Yoga and Club 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 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.

S.No.Course TypeCourse CodeCourse TitleTeaching Dept.LTPcontact hours/wee kCreditsCIESEE1IPCC22IS61Artificial Intelligence and Machine LearningISE3020541001002PCC22IS62Cloud ComputingISE3100441001003PEC22IS63XProfessional Elective CourseISE3000331001004OEC22IS64XOpen Elective CourseISE30003331001005PROJ22IS65Major Project Phase IISE00404421006AEC/SDC22AECIS66Employability Skills -2Bizotic10001111007MC22IS671National Service Scheme (NSS)NSS coordinator Athletics) and YogaPhysical Education002020100	6 th Semester					F	lours/w	veek	Total		Ex	kamina	tion
1 IPCC 22IS61 Artificial Intelligence and Machine Learning ISE 3 0 2 05 4 100 100 2 PCC 22IS62 Cloud Computing ISE 3 1 0 04 4 100 100 3 PEC 22IS63X Professional Elective Course ISE 3 0 0 03 3 100 100 4 OEC 22IS64X Open Elective Course ISE 3 0 0 03 3 100 100 5 PROJ 22IS65 Major Project Phase I ISE 0 0 4 04 2 100 6 AEC/SDC 22AECIS66 Employability Skills -2 Bizotic 1 0 0 01 1 100 6 AEC/SDC 22IS671 National Service Scheme (NSS) NSS coordinator NSS coordinator 1 0 0 01 1 100 7 MC 22IS672 Physical Education (PE) (Sports and Athletics) and Yoga	S.No.	Course Type	Course Code	Course Title	Teaching Dept.	L	Т	Р	contact hours/wee k	Credits	CIE	SEE	Total
2 PCC 221S62 Cloud Computing ISE 3 1 0 04 4 100 100 3 PEC 22IS63X Professional Elective Course ISE 3 0 0 03 3 100 100 4 OEC 22IS64X Open Elective Course ISE 3 0 0 033 3 100 100 5 PROJ 22IS65 Major Project Phase I ISE 0 0 4 04 2 100 6 AEC/SDC 22AECIS66 Employability Skills -2 Bizotic 1 0 0 01 1 100 6 AEC/SDC 22AECIS66 Employability Skills -2 Bizotic 1 0 0 01 1 100 7 MC 22IS671 National Service Scheme (NSS) NsS coordinator 0 0 2 02 0 100 7	1	IPCC	221561	Artificial Intelligence and Machine Learning	ISE	3	0	2	05	4	100	100	200
3 PEC 22IS63X Professional Elective Course ISE 3 0 0 03 3 100 100 4 OEC 22IS64X Open Elective Course ISE 3 0 0 03 3 100 100 5 PROJ 22IS65 Major Project Phase I ISE 0 0 4 04 2 100 6 AEC/SDC 22AECIS66 Employability Skills -2 Bizotic 1 0 0 01 1 100 6 AEC/SDC 22AECIS66 Employability Skills -2 Bizotic 1 0 0 01 1 100 6 AEC/SDC 22AECIS66 Employability Skills -2 Bizotic 1 0 0 01 1 100 7 MC 22IS671 National Service Scheme (NSS) NSS coordinator 0 0 2 02 0 100	2	PCC	221562	Cloud Computing	ISE	3	1	0	04	4	100	100	200
4OEC22IS64XOpen Elective CourseISE3000331001005PROJ22IS65Major Project Phase IISE0040421006AEC/SDC22AECIS66Employability Skills - 2Bizotic1000111006AEC/SDC22AECIS66Employability Skills - 2Bizotic1000111007MC22IS671National Service Scheme (NSS)NSS coordinatorNSS coordinatorAAAAAA7MC22IS672Physical Education (PE) (Sports and Athletics) and YogaPhysical Education002020100	3	PEC	22IS63X	Professional Elective Course	ISE	3	0	0	03	3	100	100	200
5PROJ22IS65Major Project Phase IISE0040421006AEC/SDC22AECIS66Employability Skills -2Bizotic1000111006AEC/SDC22AECIS66Employability Skills -2Bizotic1000111007MC22IS671National Service Scheme (NSS)NSS coordinatorNSS coordinatorNSS coordinator7MC22IS672Physical Education (PE) (Sports and Athletics) and YogaPhysical Education002020100	4	OEC	22IS64X	Open Elective Course	ISE	3	0	0	03	3	100	100	200
6 AEC/SDC 22AECIS66 Employability Skills -2 Bizotic 1 0 0 01 1 100 7 MC 22IS671 National Service Scheme (NSS) NSS coordinator NSS coordinator A <td< td=""><td>5</td><td>PROJ</td><td>221565</td><td>Major Project Phase I</td><td>ISE</td><td>0</td><td>0</td><td>4</td><td>04</td><td>2</td><td>100</td><td></td><td>100</td></td<>	5	PROJ	221565	Major Project Phase I	ISE	0	0	4	04	2	100		100
Z2IS671 National Service Scheme (NSS) NSS coordinator 7 MC 22IS672 Physical Education (PE) (Sports and Athletics) and Yoga Physical Education 0 0 2 02 0 100	6	AEC/SDC	22AECIS66	Employability Skills -2	Bizotic	1	0	0	01	1	100		100
7MC22IS672Physical Education (PE) (Sports and Athletics) and YogaPhysical Education dept& Yoga002020100			2215671	National Service Scheme (NSS)	NSS	2							
mistidetor	7	MC	2215672	Physical Education (PE) (Sports and Athletics) and Yoga	Physical Education dept& Yoga instructor	0	0	2	02	0	100		100
22IS673 Clubs- Social, Cultural & Academic Coordinators			22IS673	Clubs- Social, Cultural & Academic	Coordinators		1						
8 PCCL 22ISL68 Robotic Process Automation Lab ISE 0 0 2 02 1 50 50	8	PCCL	22ISL68	Robotic Process Automation Lab	ISE	0	0	2	02	1	50	50	100
Total 18 750 450				Total		in the				18	750	450	1200

	Professional Elective Course									
22IS631	Distributed Computing Systems	2215634	Operations Research							
2215632	Agile Software Development	221\$635	Complier Design							
2215633	Introduction to Sales Force									
	Open Elective Course									
22IS641	Introduction to Data Structures	22MAT661	Linear Algebra							
2215642	IOT- A practical Approach	22MAT662	Applied Statistics							
221S643	Introduction to Big Data	22CH641	Nanoscience and Nanotechnology							
221S644	Introduction to Artificial Intelligence and Machine Learning	22INT61	Marketing Management							

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.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's 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/Clubs: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga(YOG) and Clubs 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, Yoga and Club 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.

KLS Gogte Institute of Technology 4thYear B.E. Scheme of Teaching and Examination 2022

			7 th Semester			Но	urs/v	veek	Total contact		E>	amina	tion
S.No	Course Type	Course TypeCourse CodeCourse TitleTeachingTypeDept.						Ρ	hours/week	Credits	CIE	SEE	Total
1	IPCC	22IS71	Data Science and Visualization	I	SE	3	0	2	05	4	100	100	200
2	2 IPCC 22IS72 Cybersecurity ISE 3 0 2 05 4										100	100	200
3	3 PCC 22IS73 Software Testing ISE 3 2 0 05 4 100 100										100	200	
4	PEC	22IS74X	Professional Elective Course	1	SE	3	0	0	03	3	100	100	200
5	OEC	22IS75X	Open Elective Course	HE OF	SE	3	0	0	03	3	100	100	200
6	PROJ	221576	Major Project Phase-II	30	SE	0	0	12	12	5	100	100	200
7	HSMS	22AECIS77	Indian Knowledge System		E V	1	0	0	01	1	100	-	100
Total 24 700 600 1300													
			Profession	nal Elect	tive Cour	se	7						
22IS741 Mobile Computing and Applications 22IS743 Big Data Management													
22IS742 System Simulation and Modeling 22IS744 Introduction to Prompt Engineering													
			Open	Elective	Course	>/	1						
22IS751 Introduction to Database Application Designing 22MAT761 Optimization Techniques													
22IS75	22IS752Data Science and Analytics22MAT762Complex Analysis and Special Functions												
22IS75	53		Introduction to Cybersecurity	the second	22PH7	751			Introduc	tion to Ast	ronomy	/	
22CV7	754		Disaster Management	0	22INT	71			Human Resource	Manageme	ent for l	Enginee	ers
P(L: L	CC: Profes ecture, T: C	sional Core Cou Tutorial, P : Prac Department, PSB	rse, PCCL : Professional Core Course labora ctical S= SDA : Skill Development Activity, C :: Paper Setting department, OEC : Open Ele	atory, P I Work, C IE : Con ective C	EC : Profes , itinuous li Course, PE	ssiona ntern E C : Pr	al Ele al Ev ofess	ctive (aluational	Course, OEC : Ope on, SEE : Semester Elective Course. F	n Elective C End Evalua PROJ : Proje	Course F ation. T ct work	PR: Proj D- Teac	ect ching
Note:	VII and V	III semesters of	IV years of the program										
(1) Ins	titutions	can swap the VII	and VIII Semester Schemes of Teaching ar	nd Exam	ninations	to ac	comr	nodat	e research intern	ships/ indu	stry int	ernship	s after
the VI	semester	•											
(2) Cr	edits earn	ed for the cours	es of VII and VIII Semester Scheme of Teac	ching ar	nd Examir	natior	ns sha	all be o	counted against tl	ne correspo	onding	semest	ers
wheth	er the VII	or VIII semester	rs is completed during the beginning of the	e IV yea	r or the la	ater p	art o	f IV ye	ears of the progra	m.			
Profes Engine of eng is 10.	ssional Election eering and ineering. However,	ective Courses (Technology cur Each group will this conditional	PEC): A professional elective (PEC) course riculum. Multidisciplinary courses that are provide an option to select one course. Th shall not be applicable to cases where the	e is inte added s e minin admiss	ended to o suppleme num num sion to the	enhai ent the Iber c e proj	nce t e late of stu gram	he de est trei dents' i is les	pth and breadth nd and advanced t strengths for offe s than 10.	of educatic echnology ering profe	onal exp in the s ssional	perienc electec elective	e in the l stream es

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: 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 in group 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 COE. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, 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.

	8 th Semester				Н	Hours/week				Ex	amina	tion
S.No.	Cour se Type	Course Code	Course Title	Teaching Dept.	L	т	Р	Total contact hours/week	Credits	CIE	SEE	Total
1	PEC	22IS81X	Professional Elective (Online Course 12 weeks)		3	0	0	03	3	100	-	100
2	OEC	22IS82X	Open Elective		3	0	0	03	3	100	-	100
			(Online Course 12 weeks)									
3	INT	221583	Internship (Industry/Research) (14 - 20 weeks)		0	0	20	20	10	100	100	200
			Total	EOFTE	N	0			16	300	100	400
			Professional Elective	e Course (On	line co	urses)						
22 \$811			Block chain Technology	2215817	2	Cyber Security and Privacy						
2215812	2IS812 Human-Computer Interfaces			2215818	12	Reinforcement Learning						
22 \$813	3 Social Network Analysis			2215819	居。	1	Multi-Core Computer Architecture					
2215814	Game Theory			2215820	24	>//		Ethical Hac	king			
2215815	Computer Vision			22IS821	5	11		Parallel Comp	outing			
2215816			Deep learning	2215822	2	3E		UI/UX Desig	UI/UX Designing			
			Open Elective Co	urses (Online	Cours	ses)						
22 \$821			Ethical Hacking	2215827	1	Web Development						
2215822	00000000000000000000000000000000000000			2215828		Big Data Computing						
2215823	S823 Data Science			2215829		Software Testing						
2215824	S824 Computer			2215830				Software Engir	neering			
	Graphics											
2215825	S825 Introduction To Industry 4.0 And Industrial Internet Of Things			22IS831	Cloud Computing							
2215826	22IS826 Data Visualization 22IS832 AI ML											
L: Lect Departm	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

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

• 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 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 center, Incubation center, Start-up, center 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 flavor 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. College 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 NPTEL/SWAYAM/INDUSTRY offered courses suggested by the respective Board of Studies. Details of these courses shall be made available for students on the college web portal.

SOFTWARE PROJECT MANAGEMENT

Course Code	22IS51	Course type HSMS		Credits L-T-P	3 - 0 - 0
Hours/week: L - T- P	3 - 0 - 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Cou	Course Learning Objectives (CLOs)					
1.	To understand the importance of software project management and the concept of					
	managerial economics.					
3.	To plan stakeholders' needs, interpret objectives into work breakdowns structures.					
4.	To devise a schedule monitoring evaluate project for its scope, cost, timing and quality.					
5.	To apply the methods to calculate requirements of resources, related expenses & time using					
	project management tools.					

Required Knowledge of: Software engineering basics

Unit – I : Introduction and Software Project Planning	Contact Hours = 8 Hours							
Introduction: Projects meaning, Comparison of project types, Activities of Project Management,								
Categorizing software projects, Management concerns in software projects, Management controls,								
stakeholders, requirement specification, Information and control	stakeholders, requirement specification, Information and control in organizations.							
Unit – II : Software Project Planning	Contact Hours = 8 Hours							
Planning Objectives, Project Plan, Types of project plan, Structure o	f a Software Project Management							
Plan								
step-wise project planning: select project, identify the project sc	ope and objectives, identification							
of project infrastructure, analyze project characteristics, identify the	ne project products and activities,							
estimate efforts for each activity, identify activity risk, allocation o	f resources, Review							
and publicize plan, Plan execution.								
Unit – III : Project Evaluation & Approaches Contact Hours = 8 Hours								
Evaluation: Strategic assessment, Technical assessment, cost-ber	efit analysis, cash flow							
forecasting, cost-benefit evaluation technique, projects risk evalu	ation.							
Approaches: Technical plan contents, choice of technologies, cho	ice of process models: Waterfall							
model, V-process model, Spiral model, selection of appropriate process model, structured								
methods.								
Unit – IV: Resource Allocation and Risk management	Contact Hours = 8 Hours							
Resource: Introduction, Nature of resources and categories, iden	ntifying resource requirements,							
Scheduling resources, creating critical paths, Counting the cost, more specific about availability,								

Resource: Introduction, Nature of resources and categories, identifying resource requirements, Scheduling resources, creating critical paths, Counting the cost, more specific about availability, criticality, risk, training, team building, publishing the resource schedule, Cost schedules, Scheduling sequence. Risk Management: The nature of risk, managing the risk, Risk identification: Factors to consider application, staff, project type, methods, hardware/software, changeover, supplier, environment, health & safety, Risk analysis, Reducing the risks, Evaluating the risk to schedule, calculating 'z' values.

Unit –V : MANAGERIAL ECONOMICS	Contact Hours = 8 Hours				
Introduction: Nature and Scope of Managerial Economics, Objectives of Business Firms, Som					
Fundamental Concepts and Business Decision Rules, Basic Tools of Economic Analysis an					
Optimization Techniques, Method of Estimating a Function: The Regression Technique,					
Theory of Consumer Demand and Demand Forecasting: Analys	sis of Consumer Demand, Analysis of				
Market Demand, Elasticity of Demand, Demand Forecasting.					

Flipped Classroom Details:

Unit No.	I	II	111	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit	Self-Study Topics
No.	
1	Comparison between project management and software project management.
2	Use of 'Microsoft Project' application for project management.
3	Distributed Software Development and key roles in development team
4	Importance & classification of project resource management, process, methods and
	tools

Bo	oks
	Text Books:
1.	Bob Hughes & Mike Cottrell- Software Project Management 2nd Edition- The McGraw-Hill
	Publishing Company ISBN 0077095057
2.	D.N. Dwivedi- Managerial Economics, 8/e , Vikas Publishing
	Reference Books:
1.	Newton & Richard-Project management step by step: how to plan and manage a highly
	successful project: Willy's Publications 2020
2.	Russ J. Martinelli, Dragan Z. Milosevic- Project Management Tool Box: Tools and Techniques for
	the Practicing Project Manager, 2nd Edition.
3.	S Choudhury- Project Management - Mc Graw Hill Education (India) Pvt. Ltd. New Delhi, 2016
	E-resources:
1.	Project Mgmt. 8 weeks course Link: https://onlinecourses.nptel.ac.in/noc19_mg30/preview

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	

2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At	the end of the course, the student will be able to	Learning Level	PO(s)	PSO(s)
1.	Understand the basic concepts of managerial economics	Un	1,12	2,3
2.	Describe the importance of Project Management during different phases of software development and plan the sequence of software project management activities.	Ар	1,11,12	1,2,3
3.	Compare and differentiate organization structures and project structures.	Ар	1,12	1,2,3
4.	Analyze the use cases against a project schedule, expenses and available resources using suitable project management tools also detect & classify the types of risk associated with projects and suggest methods to alleviate using risk break down	An	1,11,12	1,2,3
	structure.			

Scheme of Contii	nuous Internal Eva	aluation (CIE):		
Components	Addition of two IA tests	Two Assignments (Open /Industry/ Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30= 60	10+10 =20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme	of Semester End Examination (SEE)
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be \geq 35%, however overall score of
	CIE + SEE should be \geq 40%.
3.	Question paper contains three parts A,B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each
	unit, each Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Manning (planned)						CO-PS	О Марр	ing							
		γ ρ ιη <u></u> σ (planne	u)									(plann	ed)	
СO	PO	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	РО	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	٧											٧	-	V	٧
2	٧										٧	٧	v	V	٧
3	٧											٧	v	V	٧
4	٧										V	V	٧	v	٧

SI	Skill & competence enhanced after	Applicable Industry	Job roles students can take
No	undergoing the course	Sectors & domains	up after undergoing the course
1	Understand Stakeholders'	Software	Project Manager / Project
	requirements	Development	Executive
2	Counsel project objectives	Business /	Business Development
		Commercial domain	Executive / Team leader
3	Devise project structures	Academic / Education	Committee head / Team
	and associated activities		Leader /counselor / advisor

INTERNET OF THINGS

Course Code	221552	Course type	IPCC	Credits L-T-P	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2		Total credits	4	
Total Contact Hours	L = 40 Hrs; T = 0	Hrs; P = 20 Hrs	CIF Marks	100	
	Total = 60 Hrs				100
Flipped Classes content	05 Hours			SEE Marks	100

Cours	Course Learning Objectives				
1.	To design embedded system using microcontroller and peripheral circuit				
2.	To demonstrate technique of interfacing the sensors and actuators with IoT development				
	boards.				

Required Knowledge of: Programming Knowledge

Unit – I	Contact Hours = 8 Hours
Emboddod Computing	

Embedded Computing:

Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process. Instruction Sets, CPUs: Preliminaries, ARM Processor - Introduction, Preliminaries.

Unit – II	Contact Hours = 8 Hours			
Introduction to Internet of Things:				
Definition and Characteristics of IoT, physical design of IoT, IoT Protocols, IoT communication models,				
IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates.				

Unit – III	Contact Hours = 8 Hours			
Prototyping IoT:				
IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable Devices, Standard				
Devices. Software, Technology & Protocols. Domain Specific IoTs: Home Automation, Cities,				
Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.				

Unit – IV	Contact Hours = 8 Hours			
IoT Architecture and Protocols:				
Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model. Protocols- 6LowPAN, RPL, CoAP, MQTT.				

Unit – V	Contact Hours = 8 Hours		
Case Study:			
smart home, smart office, medicines, sports, transportation, Agriculture IoT, Architecture			

Unit No.	I	II	III	IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions	-	-	-	-	-

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	2	Blinking LED / LEDs
I	2	Controlling electromagnetic relay / relays
II	2	Temperature sensor.
	Ζ	Humidity sensor.
111.	2	PIR Human Motion Detection.
	۷.	Ultrasound distance Measurement
IV	1	Bluetooth module – wireless connectivity.
V	1	Device and web / cloud connectivity.

Unit No.	Self-Study Topics
1	IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable
1	Devices, Standard Devices. Software.
2	CPU Power Consumption.
3	Basics of Sensors and actuators.
Δ	Device Discovery capabilities – Registering a device, De-register a device, Querying for
4	devices, Intel IoTivity, XMPP Discovery extension.

Books	6
	Text Books:
1	Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design,
1.	2nd Edition, Elsevier, 2008 onwards.
2	Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-on-Approach)", 1st Edition,
2.	VPT, 2014 onwards.
2	Internet of Things Quick Guide – PDF
5.	https://www.tutorialspoint.com/internet_of_things/internet_of_things_quick_guide.htm
	Reference Books:
1	Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications
1.	and Protocols", Wiley, 2012 onwards.
2	Marco Schwartz, "Internet of Things with Arduino: Build Internet of Things Projects With the
۷.	Arduino Platform", [publisher]
	E-resources:
1.	https://blp.ieee.org/courses/sensor-networks-for-internet-of-things/

Course delivery methods		Assessment methods			
1.	Chalk and Talk	1.	IA tests		
2	DDT and Videoc		Open Assignment (OA)/ Lab Project/ Industry		
Ζ.		Ζ.	assignment/Certification/ Course project		
3.	Flipped Classes	3.	Lab Test		
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination		
5.	Virtual Labs				

Cou	Course Outcome (COs)							
Lear	ning Levels:							
Re -	Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Ev	/aluate; Cr -	Create					
Λ+ +k	be end of the course, the student will be able to	Learning	PO(s)	PSO				
	le end of the course, the student will be able to	Level	10(3)	(s)				
1	Understand and apply the fundamental principles and	lin An	23	1				
1.	methodologies of IoT.	01, др	2,5	-				
2	Analyze IoT protocols and communication models to ensure	lin An	225	1				
۷.	efficient IoT systems.	on, An	2,3,5	1				
2	Evaluate hardware and software solutions for IoT applications,	Fv	23510	2				
considering domain-specific requirements.								
4.	Apply the learnings through a course activity.	Ар	9,10	1				

Scheme of Continuous Internal Evaluation (CIE):								
For integrated cou	urses, a lab test a	lso will be conducted	at the end of the semes	ster. The lab test				
(COMPULSORY) w	vill be part of the	CIE. No SEE for Lab.						
THEORY (60 mark	Total							
IA test 1	IA test 2	Conduction	Lab test	Total				
30 marks	30 marks	10 marks	30 marks	100 marks				
IA Test:								
1. No objective part in IA question paper								
2. All questions de	escriptive							

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks

2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester

2. Timetable, Batch details and examiners will be declared by Exam section

3. Conducting the experiment and writing report: 5 marks

4. Calculations, results, graph and conclusion: 15 marks

5. Viva voce: 10 marks

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE

2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.

3. Lab test is COMPULSORY

3. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

4. Not eligible in any one of the two components will make the student Not Eligible for SEE

Sche	eme of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be \geq 35 &, however overall score of
	CIE+SEE should be ≥40%.
3.	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Manning (planned)									CO-PSO Mapping						
CO-PC										(planned)					
0	РО	PO	РО	PO	PO	РО	PO	PO	РО	РО	РО	РО	PSO	PSO	PSO
0	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		1	1										1		
2		1	1		1								1		
3		1	1		1					1				1	
4									1	1			1		

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up		
	after undergoing the course	Sectors & domains	after undergoing the course		
1	Communication	Telecommunication	Project manager		
2	Networking	Automobiles	Network Designer		

COMPUTER NETWORKS AND SECURITY

Course Code	22IS53 Course type PCC		Credits L-T-P	4-0-0
Hours/week: L - T- P	4-0-0		Total credits	4
Total Contact Hours	L = 40 Hrs; T =	0 Hrs; P = 0 Hrs	CIF Marks	100
	Total = 40 Hrs			100
Flipped Classes content	5 Hours		SEE Marks	100

Со	Course Learning Objectives					
1.	To understand the concept of application layer protocols.					
2.	To discuss transport layer services and understand UDP and TCP protocols.					
3.	To explain the concept of routers, IP and Routing Algorithms in network layer.					
4.	To demonstrate the error detection and correction at link layer.					

Pre-requisites: Fundamentals of basic mathematics, Data Structures and algorithms, Operating systems.

Unit – I	Contact Hours = 8 Hours				
Introduction to Computer Networks and the Internet: What Is the Internet? The Network Edge,					
The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and					
Their Service Models					

Unit – II	Contact Hours = 8 Hours					
Application Layer and Network Security: Principles of Network Applications, Cookies, Web Caches,						
File Transfer: FTP Commands and Replies, Electronic Mail in the	Internet, DNS Name Resolution,					
DNS Records, Peer-to-Peer Applications-Bit Torrent File distribution protocol. The RSA algorithm:						
Description of the algorithm, The security of RSA, Deffie Heillma	an Key Exchange Algorithm.					

Unit – III	Contact Hours = 8 Hours
Transport Layer and Public-Key Cryptography: Introduction and	d Transport-Layer Services,
Connectionless Transport: UDP, Principles of Reliable Data Tran	sfer: Go Back-N and Selective
Repeat, Connection-Oriented Transport: TCP.	
Principles of public-key cryptosystems. Public key cryptosystem	s. Applications for public-key
cryptosystems, Requirements for public key cryptography.	

Unit – IV	Contact Hours = 8 Hours				
The Network layer: Introduction, Virtual Circuit and Datagram Networks, What's Inside a Router?					
The Internet Protocol (IP): Forwarding and Addressing in the Int	ernet.				

Unit – V	Contact Hours = 8 Hours
The Link Layer: Links, Access Networks, and LANs: Introduction	to the Link Layer, Error Detection

and Correction Techniques, Multiple Access Links and Protocols, Introduction to Link Virtualization and Data Center Networking.

Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Unit No.	Self-Study Topics
5	Introduction to Link Virtualization

Book	5
	Text Books:
1.	James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth
	edition, Pearson,2017 .
2.	Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER
3.	William Stallings, Cryptography and Network Security, Pearson 6th edition.
	Reference Books:
1.	Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill,
	Indian Edition
2.	Andew S Tanenbaum and David Wetherall, Computer Networks, Fifth Edition Pearson
	E-resources:
1.	https://nptel.ac.in/courses/106105081/

Course delivery methods		Assess	ment methods
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes		Open Assignment (OA)/ Certification
4.	Online classes		Course Project
		5.	Semester End Examination

Course Outcome (COs)							
At the end of the course, the student will be able to (Highlight the action verb representing the							
learning level.)							
Learning Levels: Re - Remember; Un - Understand; Ap - Apply;	Learning						
An - Analysis; Ev - Evaluate; Cr - Create	Level	FO(3)	F 30(3)				

1	Explain the various application layer protocols, performance		1,2,10	1,2
	parameters and algorithms to provide secure communication.	Un		
2	Apply the principles of reliable data transfer and security	Ар	1,2,10	2
	mechanisms to ensure data integrity and flow control.			
3	Analyze QOS factors that contribute in enhancing the	An	1,2,10	1,2,3
	network performance in real time scenario.			
4	Apply the learning through course activity	Ар	10	1

Scheme of Continuous Internal Evaluation (CIE):										
Components	Addition of two IA	Two Assignments – (Open	Course project (CP)/	Total						
components	tests	/Industry/Certification etc.)	Case study etc.	Marks						
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100						

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sche	Scheme of Semester End Examination (SEE):								
1.	It will be conducted for 100 marks of 3 hours duration.								
2.	Minimum marks required in SEE to pass: Score should be \geq 35%, however overall score of								
	CIE + SEE should be \geq 40%.								
3.	Question paper contains three parts A, B and C. Students have to answer								
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.								
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,								
	each Question Carries 10 Marks.								
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.								

CO-PO Manning (Planned)									CO-PSO Mapping						
	CO-PO Mapping (Planned)								(Plann	ed)					
~~~	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
co	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	~	~								~			~	~	
2	~	~								~				~	
3	~	~								~			~	$\checkmark$	~
4										~			~		

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Analytical Skills	Software Engineer	Network administrator
2	Programming skills	Software Developer	Network architect

#### DATA MINING AND WAREHOUSING

Course Code	22IS541	Course type	PEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs			CIE Marks	100
Flipped Classes content	5 Hours		SEE Marks	100	

Course Learning Objectives		
1.	Define multi-dimensional data models.	
2.	Explain rules related to association, classification, and clustering analysis.	
3.	Compare and contrast between different classification and clustering algorithms.	

Pre-requisites: Engineering Mathematics (Statistics), DBMS

Unit – I	Contact Hours =7 Hours	
Introduction to Data Mining: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data,		
Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity.		
Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative		
Methods for Generating Frequent Item sets, FP-Growth Algorithm	n, Evaluation of Association Patterns.	

Unit – II	Contact Hours = 7 Hours
Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers,	
Nearest neighbour Classifiers, Bayesian Classifiers.	

Unit – III	Contact Hours = 10 Hours	
Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical 8 Hours Clustering, DBSCAN,		
Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms.		

Unit – IV	Contact Hours = 8 Hours			
Data Warehousing & Modeling: Basic Concepts, Data Warehousing, A multitier Architecture, Data				
warehouse models: Enterprise warehouse, Data mart and	d virtual warehouse, Extraction,			
Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact				
constellations: Schemas for multidimensional Data models,	Dimensions: The role of concept			
Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.				

Unit – V	Contact Hours = 8 Hours
Data warehouse implementation Efficient Data Cube computation	: An overview, Indexing OLAP Data:
Bitmap index and join index, Efficient processing of OLAP Queries,	OLAP server Architecture ROLAP
versus MOLAP Versus HOLAP.	

Flipped Classroom Details:

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Books	5
	Text Books:
1.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First
	impression,2014.
2.	Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition,
	Morgan Kaufmann Publisher, 2012.
	Reference Books:
1.	Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson, Tenth
	Impression,2012.
2.	Michael.J.Berry,Gordon.S.Linoff: Mastering Data Mining , Wiley Edition, second
	edtion,2012.
	E-resources:
1.	NPTEL Course: https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2.	Swayam Course: https://onlinecourses.swayam2.ac.in/cec19_cs01/preview

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3. Open Assignment (OA)/ Certification		
4.	Online classes	4. Course Project		
		5.	Semester End Examination	

Course Outcome (COs)					
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)					
Loor	ning Lovels: Do Romember: Un Understand: An Apply:				
Lear	ning Levels: Re - Remember; On - Onderstand; Ap - Apply;	Learning	PO(s)	PSO(s)	
An -	Analysis; Ev - Evaluate; Cr - Create	Level		(- )	
1	Identify data mining problems and design data Warehouse	11			
1.	Model.	Un,Ap	1,2,3,10	T	
2.	Construct association rules for given data patterns.	Un,Ap	1,2,3,10	1	
2	Compare classification and clustering techniques using real	2.10		2	
5.	world scenarios.	Ар	3,10	2	
	Design solutions for real-world problems related to the				
4.	domain of Data Mining and warehousing and present	Ар	1,3,9,10,12	2,3	
	effectively.				

Scheme of Continuous Internal Evaluation (CIE):							
Components	Addition of two IA tests Conents Addition of two IA (Open / Industry/ Certification etc.)		Course project (CP)/ Case study etc.	Total Marks			
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100			

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme	Scheme of Semester End Examination (SEE):						
1.	It will be conducted for 100 marks of 3 hours duration.						
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE + SEE should be > 40%.						
3.	Question paper contains three parts A, B and C. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.						

CO-PO Mapping (Planned)								CO-F (Plar	PSO Ma nned)	pping					
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	1	1	~							1			1		
2	1	1	1							1			1		
3			1							1				✓	
4	1		1						✓	1		1		1	✓

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up
	after undergoing the course	Sectors & domains	after undergoing the course
1	Design and implementation of efficient Data Warehouse and	IT Sector/Software Industry	Software Engineer/ Data Engineer
	Data Mining application as per user specifications		

#### **OBJECT ORIENTED MODELLING AND DESIGN**

Course Code	22IS542Course typePEC		Credits L-T-P	3-0-0	
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0	Hrs; P = 0 Hrs	CIE Marks	100	
	Total = 40 Hrs				
Flipped Classes content	05 Hours			SEE Marks	100

Cours	Course Learning Objectives				
1.	To bring out key features and objectives of object-oriented software development.				
2.	To study and understand UML notations as applicable to different software development				
	stages.				
3.	To model a system for real world problems using UML diagrams.				

**Pre-requisites**: Knowledge of problem solving and software engineering fundamentals

Unit – I	Contact Hours = 8 Hours

#### Introduction, Modeling Concepts, Class Modeling:

Introduction to Object Orientated (OO) development. OO themes; OO modeling history Modeling as Design Technique: Modeling; abstraction; The three models.

Class Modeling: Object and class concepts; Link and associations concepts; Generalization and Inheritance; Advanced object and class concepts; Association ends; N-ary associations; Aggregation.

Unit – II	Contact Hours = 8 Hours
State Modeling, Advanced State Modeling:	
State Modeling: Events, States, Transitions and Conc	litions; State diagrams; State diagram behavior;
A design of Charles Mandalling, New York, and the second New York, and	

Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model;

Unit – III	Contact Hours = 8 Hours
Interaction Modeling, Advanced interaction Modeling:	
Interaction Modeling: Use case models; Sequence models; Acti	vity models. Use case relationships;
Procedural sequence models; Special constructs for activity model	S

Unit – IV	Contact Hours = 8 Hours				
Domain Analysis:					
Overview of domain analysis; Domain class model; Domain state model; Domain interaction model;					
Iterating the analysis.					

Unit – V	Contact Hours = 8 Hours

## Application Analysis:

Application interaction model; Application class model; Application state model; Adding operations.

#### **Flipped Classroom Details**

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Books	
	Text Books:
1.	Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML,
	Pearson Education, 2nd Edition and onwards.
2.	Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language User Guide",
	Publisher: Addison Wesley.
	Reference Books:
1.	Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3 rd Edition,
	Pearson Education, 2007 and onwards.
2.	Brahma Dathan, SarnathRamnath: Object-Oriented Analysis, Design, and Implementation,
	Universities Press, 2009 and onwards.
	E-resources
1.	https://nptel.ac.in/courses/106105153/

Course delivery methods		Assessment methods			
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2. Online Quizzes (Surprise and Schedu			
3.	Flipped Classes	3. Open Assignment (OA)/ Certification			
4.	Online classes		Course Project		
		5.	Semester End Examination		

Cou At th leve	rse Outcome (COs) ne end of the course, the student will be able to (Highlight the action I.)	on verb repro	esenting	the learning
Lear - Ana	ning Levels: Re - Remember; Un - Understand; Ap - Apply; An alysis; Ev - Evaluate; Cr - Create	Learning Level	PO(s)	PSO(s)
1.	<b>Identify</b> and <b>explain</b> different UML notations for a given problem.	Re, Un	1, 2	1
2.	<b>Explain</b> and <b>Apply</b> UML notation to model real world problems at the different stages of development.	Un, Ap	3, 5	2

3.	Perform a domain and application <b>analysis</b> for given real world problem.	An	3, 4, 5	2, 3
4.	Apply the learnings through a course activity.	Ар	9,10	1

Scheme of Continuous Internal Evaluation (CIE):								
Components	Addition of two IA tests	Two Aassignments – (Open/Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks				
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100				

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	Scheme of Semester End Examination (SEE):					
1.	It will be conducted for 100 marks of 3 hours' duration.					
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE + SEE					
	should be $\geq$ 40%.					
3.	Question paper contains three parts A, B and C. Students have to answer					
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.					
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each					
	Question Carries 10 Marks.					
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.					

CO_PO Manning (Planned)								CO-PSO Mapping							
0-1		phing	Fiailin	euj									(Planr	ned)	
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
1	1	1											1		
2			1		1									1	
3			1	1	1									1	1
4									1	1			1		

SI No	Skill & competence enhanced	kill & competence enhanced Applicable Industry			
	after undergoing the course	Sectors & domains	after undergoing the course		
1	Apply and adapt agile tools and techniques in the software development lifecycle from product ideation to deployment	IT sector	Software Engineer		
#### UNIX SYSTEM PROGRAMMING

Course Code	22IS543 Course type PEC			Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Cours	e Learning Objectives
1.	To introduce Unix and POSIX File System
2.	To develop the ability to handle processes and its related functionalities.
3.	To apply inter process communication using various methods of inter process
	communication
4.	To give basic knowledge about UNIX signals handling.

## Pre-requisites: Operating Systems, Basic Knowledge of data Structure

Unit – I	Contact Hours = 8 Hours		
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 Li	nks.		

Unit – II	Contact Hours = 8 Hours	
UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, FIFO File APIs.		
UNIX PROCESSES: UNIX Kernel Support for Processes, Process APIs, Process Attributes, Change		
Process Attributes, A Minishell Example		

Unit – III Contact Hours = 8 Hours					
Process Control: Introduction, Process Identifiers, fork, vfork	, exit, wait, waitpid, waited, Race				
Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, PROCES					
RELATIONSHIPS: Introduction, Terminal Logins, Network Logins, Process					
Groups, Sessions, Controlling Terminal.					

Omt - IV	U	n	it	_	IV
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Contact Hours = 8 Hours

**Signals and Daemon Processes**: Signals: The UNIX Kernel Support for Signals, signal, SignalMask, sigaction, The SIGCHLD Signal and waitpid API, The sigsetjmp and siglongjmp Functions, kill, alarm, Interval Timers.

**Daemon Processes**: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client Server Model.

Unit – V Contact Hours =8 Hours					
Inter-process Communication: Introduc	ion, Pipes, popen and pclose Functions,				
Co processes, FIFOs, Message Queues, Semaphores, Shared Memory.					
Vulnerabilities in UNIX programming: Understanding Linux Kernel Vulnerabilities, Classification,					
Vulnerabilities Distribution.					

# Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped	2	2	2	2	2
Classroom Sessions					

Uni	Self-Study Topics
t	
No.	
I	Application Program Interface to Files.
Ш	UNIX Kernel Support for Processes.
V	Socket Descriptors.

Books	5
	Text Books:
1.	Terrence Chan: UNIX System Programming Using C++, Prentice Hall India, 1999 and
	onwards.
2.	W. Richard Stevens, —Advanced Programming in the UNIX Environment, Pearson
	Education, 2nd Edition and onwards.
	Reference Books:
1.	W. Richard Stevens, Bill Fenner, Andrew M. R., —UNIX [®] Network Programming The
	Sockets Networking API  , Volume 1, Prentice Hall India, 2nd edition and onwards.
2.	Marc J. Rochkind, Advanced Unix Programming, Pearson Education, 2nd
	Edition/2005.
	E-resources:
1.	https://www.udemy.com/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1. IA tests	
2.	PPT and Videos	2.	Open Assignment (OA)/ Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

<b>Cou</b> At t lear	<b>Course Outcome (COs)</b> At the end of the course, the student will be able to (Highlight the <b>action verb</b> representing the learning level.)				
Leai App	Learning Levels: Re - Remember; Un - Understand; Ap - Learning Apply; An - Analysis; Ev - Evaluate; Cr - Create PO(s) PSO(s)				
1.	Describe the need for standardizing the UNIX Environment.	Un	1,2	1	
2.	Apply appropriate file API s and signal related API sto solve the given problem.	Ар	1,2,3	1,2	
3.	Demonstrate inter-process communication using different IPC structure .	Ар	1,2,3	1	
	Understand the learnings inculcated throughout the		1,2,3,9,10,12	1,2,3	
4.	course and present a course seminar or develop a	Re,Un,Ap			
	course project.				

## Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Aassignments – (Open/Industry/ Certification etc.)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10+10=20	20 marks (with report & presentation)	100
- Certification e	arned by passin	g the standard Online MOO	Cs course (1 course of at least 8 l	nours

defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	Scheme of Semester End Examination (SEE):				
1.	It will be conducted for 100 marks of 3 hours duration.				
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of				
	CIE + SEE should be $\geq$ 40%.				
3.	Question paper contains three parts A,B and C. Students have to answer				
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.				
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,				
	each Question Carries 10 Marks.				
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.				

CO-I	PO Ma	pping	(Planr	ned)									CO-PS (Planr	O Map ied)	ping
C	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PS	PSO
0	1	2	3	4	5	6	7	8	9	10	11	12	1	0	3
														2	
1	$\checkmark$	$\checkmark$											$\checkmark$		
2	$\checkmark$	$\checkmark$	$\checkmark$										~	~	
3	$\checkmark$	$\checkmark$	$\checkmark$										~		
4	$\checkmark$	$\checkmark$	$\checkmark$						$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Apply appropriate Unix APIs	IT Sector/Software	Software Engineer
	to solve the given problem.	Industry	

### FORMAL LANGUAGES AND AUTOMATA THEORY

Course Code	22IS544 Course type PEC		Credits L-T-P	3-0-0	
<b>Hours/week: L - T - P</b> 3 - 0 - 0			Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Cours	Course Learning Objectives		
1.	To study abstract computing machines		
2.	To employ finite state machines to solve problems in computing		
3.	To discuss the hierarchy of regular languages and expressions arising in the problem statements		
4.	To understand Turing theory and its significance		

Pre-requisites : Basic knowledge of problem solving and Discrete mathematics

Unit – I	Contact Hours = 8 Hours		
Introduction to Finite Automata: Introduction to Finite Automata, Structural Representation. The central			
concepts of Automata theory - Alphabet, Strings & Languages. Deterministic Finite Automata (DFA), Non-			
Deterministic and Equivalence of NFA and DFA.			

Unit – II	Contact Hours = 8 Hours
Regular Expressions and languages: Regular Expressions, Finite	Automata and Regular Expressions,
Properties of Regular Languages (RL): Proving Languages not to be R	egular. Equivalence and Minimization
of Automata.	

Unit – III	Contact Hours = 8 Hours
Context-Free Grammars (CFG) and Languages (CFL): Context-Free G	rammars, Parse Trees, Applications
of Context-Free Grammars, Ambiguity in Grammars and Languages.	Normal forms for Context Free
Grammar.	

Unit – IV	Contact Hours = 8 Hours
Pushdown Automata (PDA): Definition of Pushdown Automata, Th	e languages of a PDA: Acceptance by
Final state & Empty stack.	
Introduction to Turing Machines (TM): Turing Machine model: Def	inition of Turing Machine, Transition
Function, Instantaneous Description & Moves, Programming a Turi	ng Machine, Language recognition by

Turing Machine.

Unit – V

**Contact Hours = 8 Hours** 

**LEX and YACC Tools**: The Simplest Lex Program, Recognizing Words with Lex. Grammars: Parser- lexer communication, A Yacc Parser, Rules section. Running Lex and Yacc and examples Using Lex: Regular Expressions and examples. Using Yacc: Shift reduce parsing, Arithmetic Expressions and Ambiguity.

### Flipped Classroom Details:

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Unit No.	Self-Study Topics
1	FA with Epsilon ( $\epsilon$ ) transitions and Applications of Finite automata
2	Closure properties of Regular Languages and Applications of Regular Expressions
3	Pumping lemma for Context Free Languages.

Books	5
	Text Books:
1.	John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory,
	Languages and Computation", Pearson Education, 2021.
	Reference Books:
1.	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman , "Compilers Principles, Techniques and
	Tools",Pearson Education , 2 / E,2021
	E-resources :
1.	https://archive.nptel.ac.in/courses/106/106/106106049/
2.	https://nptel.ac.in/courses/106105196

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3. Open Assignment (OA)/ Certification		
4.	Online classes	4. Course Project		
		5.	Semester End Examination	

Course Outcome (COs)						
At th	ne end of the course, the student will be able to					
Lear	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis: Ev - Evaluate: Cr - Create					
	Flaborate on concept of abstract automata machines to	Un	1 2 10	1		
1.	recognize the given language.		1,2, 10	-		

2.	<b>Design</b> the Automata to recognize the input concerned with grammar and language statements.	An	1,2,10	1
3.	<b>Design</b> the programs to implement lexical analyzer and parser associate the same with automata machines.	Un, Ap	1,2,3, 5,10	1,2
4.	<b>Utilize</b> Automata theory and Formal languages to build an application considering real world problem.	Ар	1,2,3,5,10	1,2

Scheme of Continuous Internal Evaluation (CIE):						
Components	Addition of two IA tests	Two Aassignments– (Open/Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks		
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100		

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	eme of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of CIE + SEE
	should be $\geq$ 40%.
3.	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.

CO-PO Manning(nlanned)									CO-PSO	О Марр	ing				
										(plann	ed)				
	PO	РО	PO	PO	PO	PO	PSO	PSO	PSO						
со	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	~	~								~			~		
2	~	~								~			~		
3	~	~	~		~					~			~	~	
4	~	~	~		~					~			~	~	

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course	
1	Communication, Design skills, usage of Tools	System Software, Tools operations	Software Design	

### ADVANCED JAVA

Course Code	22IS545Course typePEC		Credits L-T-P	2-0-1
Hours/week: L - T- P			Total credits	3
Total Contact Hours	L = 30 Hrs; T = Hrs	; P = 20 Hrs	CIF Marks	100
Total contact hours	Total = 50 Hrs			100
Flipped Classes content	10 Hours		SEE Marks	100

Cours	Course Learning Objectives				
1.	To introduce different ways of handling streams related with file input and output.				
2.	To provide knowledge of multithreaded concepts and its applications.				
3.	To familiarize JDBC to interact with applications.				
4.	To demonstrate fundamental concepts of swing applications.				

Required Knowledge of: Java programming concepts

Unit – IContact Hours = 8 HoursJava I/O: Byte streams and Character streams, The Byte Stream classes, The Character Stream classes,<br/>Predefined streams, Using Java's Type Wrappers to Convert Numeric Strings.

Unit – II	Contact Hours = 8 Hours		
File I/O: Reading and Writing Files using Byte Streams, Automatically closing a file, Reading and			
Writing Binary data, Random-Access Files, Using Java's Character-based Streams			

Unit – III	Contact Hours = 8 Hours				
Multithreaded Programming: Multithreading Fundamentals,	The Thread class and Runnable				
interface, Creating a thread, Creating multiple threads, Determining when a thread ends, Thread					
Priorities, Synchronization, Using Synchronized Methods, The synchronized statement, Thread					
communication using notify(), wait() and notifyall(), Suspending,					

Unit – IV	Contact Hours = 8 Hours		
JDBC: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process			
Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects;			
ResultSet; Transaction Processing - commit(), rollback(), SavePoint.			

Unit – V	Contact Hours = 8 Hours
Introducing Swing: The Origin of Swing, Swing Is Built on AWT,	Two Key Swing Features, The MVC
Connection, Components and Containers, The Swing Packages,	A Simple Swing Application, Event
Handling, Painting in Swing, Exploring Swing : JLabel and Image	lcon,JTextField,The Swing Buttons-
JButton, JToggleButton, CheckBoxes, Radio Buttons	

# **Flipped Classroom Details**

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

# List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment			
1	2	Stream classes in Java, type wrappers			
2	2	Reading and writing binary operations in Java, File I/O operations in Java.			
3	2	Multithreading, Synchronization in Java			
4	1	JDBC packages in Java.			
5	1	Java Swings.			

Unit No.	Self-Study Topics
1	Using Byte Streams
2	File I/O using Character Streams,

Books	
	Text Books:
1.	Herbert Schildt and Dale Skrien, "Java Fundamentals A Comprehensive Introduction", TMH. Special Indian edition.
	Reference Books:
1.	Y. Daniel Liang , "Introduction to JAVA Programming", Pearson's , Seventh Edition
	E-resources
1.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Cours	e delivery methods	Assessment methods			
1.	Chalk and Talk	1. IA tests- Theory & Lab based			
2.	PPT and Videos	2.	Project phase 1 & 2		
3.	Flipped Classes	3.	SEE- Project evaluation		
4.	Practice session/Demonstrations in Labs	4.	SEE- Solving an Open ended problem		
5.	Virtual Labs ( if present)				

Cou	rse Outcome (COs)				
Lear	ning Levels:				
Re -	Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Eval	uate; Cr - Cr	eate		
At th	At the end of the course, the student will be able to				
1.	<b>Interpret</b> the need for Advanced Java concept of streams to provide modular and efficient applications.	Un	1,3	1	
2.	Build multi-threaded applications and synchronize them.	Un, Ap	1,3	1	
3.	<b>Apply</b> JDBC concepts and utilize swings to provide better GUI.	Ар	1,3,5,10	1	
4.	<b>Model</b> the use of object oriented application considering real world problem.	Ар	1,3,5,10	2	

# Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY	(40 marks)	F	PROJECT (60 marks)			
IA test	IA test	Project Phase 1	Project Phase 2	Project report	Total	
(Theory)	(Lab)	Froject Filase I	Project Phase 2	Project report		
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks	
-Theory IA	test should be	of one-hour duration	n.			
-Lab IA test	should be of t	wo/three-hour dura	tion.			
-Project bat	tch will ideally	consist of 2 students	s (maximum of 3).			
-Project Ph	ase 1 presenta	tion will be conducte	ed after 6 weeks and	Project Phase 2 pr	resentation will	
be conduct	be conducted after 13 weeks from the start of the semester.					
-Submissio	-Submission of Project report is compulsory.					
Eligibility for SEE:						
1. 40% and above (16 marks and above) in theory component						
2. 40% and above (24 marks and above) in project component						
3. Not eligi	ble in any one o	of the two compone	nts will make the stu	ident <b>Not Eligible</b> f	or SEE	

# Semester End Examination (SEE):

1.	It will be conducted for 100 marks having 3 hours duration.		
	Lab Open ended program/problem/experiment		
	Write-up & execution (1 open ended expt)- (20 marks write-up +	50 marks	
	20 marks algorithm/flowchart + 10 marks execution)		
	Project evaluation		
	a. Initial write up stating the objectives, methodology and the		
2	outcome	10 marks	100 marks
	b. Hardware project: Exhibiting and demonstration of working of		100 110110
	project	30 marks	
	Software project: Demonstration of the programming		
	capabilities by writing flowchart, algorithm and codes related		
	to a section of the project.	10 marks	
	c. Viva-voce		
3.	Minimum marks required in SEE to pass: Score should be > 35%, ho	wever overa	all score of
	CIE + SEE should be $\geq$ 40%.		
4.	SEE will be conducted in project batches by Internal & External exar	niners toget	ther.

CO-	PO Ma	pping	(planı	ned)									CO-P	SO Map	oping
													(plan	ned)	
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	~		~										~		
2	~		~										~		
3	~		~		~					~			~		
4	~		~		~					~			~	~	

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Communication, Design skills, usage of Tools.	Software, Tools operations.	Application development

### **RESEARCH METHODOLOGY AND IPR**

Course Code	22IS56	Course type	AEC	Credits L-T-P	2-0-0
Hours/week: L-T-P	2-0-0	2-0-0			2
Total Contact Hours	L = 30 Hrs; Tota	L = 30 Hrs; Total = 30 Hrs			100
Flipped Classes content	05 Hours	05 Hours			100

Course	Course Learning Objectives		
1.	Understand the basic concepts of research and its methodologies		
2.	Identify and select the appropriate research.		
3.	Understand the basic concepts & types of hypothesis.		
4.	Create the awareness about Intellectual Property Rights for the protection of inventions.		

### Required Knowledge of: --

Unit – I	Contact Hours = 5 Hours

### Research Methodology: Introduction

Meaning, Objectives, types, Research Approaches. Significance of Research, Research Methods versus Methodology, Research and scientific method, research Process, Criteria of good research, Problems encountered by researchers.

Unit – II	Contact Hours = 6 Hours			
Research Problem: Defining a research problem, selecting a	research problem, necessity and			
techniques involved in defining the research problem.				
Data Collection Methods: Collection of Primary Data, Observation Method, Interview Method,				
Questionnaires, Schedules, Collection of Secondary Data, Case study method.				

Unit – III	Contact Hours = 9 Hours
Processing and Analysis of Data	

Processing operations, Elements/ types of analysis, Statistics in research- measures of central tendency or statistical averages, measures of dispersion, measures of asymmetry (skewness), measures of relationship.

### **Testing of hypothesis 1**

Definition, basic concepts, procedure, flow diagram, measuring the power of hypothesis tests, tests of hypothesis.

### Chi-square test

Chi-square as a test for comparing variance, steps involved in applying chi-square test.

Unit – IV	Contact Hours = 5 Hours		
Intellectual Property Rights – IPR- Invention and Creativity- Intellectual Property-Importance and			
Protection of Intellectual Property Rights (IPRs)- A brief summary of: Patents, Copyrights,			

Trademarks, Industrial Designs- Integrated Circuits-Geographical Indications-Establishment of WIPO-Application and Procedures. Research ethics, Plagiarism, Prior art search.

Unit – V	Contact Hours = 5 Hours		
Interpretation and Report Writing: Meaning of interpretation, Why interpretation, Technique of			
interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing			
report, Layout of the research report, Types of reports, Mech	nanics of writing research report.		

## Flipped Classroom Details:

Unit No.	I	II		IV	V
No. for Flipped Classroom Sessions	01	01	01	01	01

Unit No.	Self-Study Topics [Mention if applicable else NIL]	
1	Significance of Research Methodology.	
2	Limitations of test of hypothesis.	
3	Other measures-Index numbers, Time series analysis.	

Во	oks
	Text Books:
1	C R. Kothari, "Research Methodology", New Age International Publishers, 2 nd edition, 2007.
2	Dr. B.L. Wadhera, "Intellectual Property Rights", Universal Law Publishing Co. Ltd 2002
	Reference Books:
1	Panneer Selvam, "Research Methodology", PHI Learning Pvt. Ltd., 2007.
	E-resources:
1	https://onlinecourses.swayam2.ac.in/cec20_ge37

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Open Assignments (OA)	
3.	Flipped Classes	3.	Case studies	
4.		4.	Semester End Examination	

Course Outcome (COs)					
Learning Levels:					
Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create					
At the end of the course, the student will be able to Learning PO(s) PSO(s)					
	Level				

1	Identify and select an appropriate methodology	Un	1,2,9,10	1
	for research.			
2	Analyze and interpret data collected.	Ар	1,2,9,10	1
3	Analyze the significance of hypothesis testing.	An	1,2,9,10	1

4	Discuss the significance of Intellectual Property	Ар	1,2,3,9,10,12	1,2,3
	Rights & report writing.			

## Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	Scheme of Semester End Examination (SEE):						
1	It will be conducted for 100 marks of 3 hours duration.						
2	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of						
	CIE + SEE should be $\geq$ 40%.						
3	Question paper contains three parts A, B and C. Students have to answer						
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.						
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,						
	each Question Carries 10 Marks.						
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.						

CO-PO Manning (nlanned)								CO-P	SO Map	ping					
								(plan	ned)						
C O	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	1	1							1	1			1		
2	1	1							1	1			1		
3	1	1							1	1			~		
4	1	1	1						1	1		1	1	1	1

#### **EMPLOYABILITY SKILLS - I**

Course Code	22AECIS58A	Course type	AEC	Credits L-T-P	1-0-0
Hours/week: L - T- P	1-0-0		Total credits	1	
Total Contact Hours	L = 30 Hrs; T = 0	Hrs; P = 0 Hrs	CIE Marks	100	
	Total = 30 Hrs				100

Cours	e Learning Objectives
1.	Skill development is/are personal attributes that influence how well an individual works or
	interacts with others.
2.	Skill development is/are personal attributes that influence how well an individual works or
	interacts with others.
3.	In essence, they are essential for individual success in the workplace, their company's success,
	and their personal life also

# Pre-requisites: NA

Unit – I	Contact Hours = 6 Hours				
Quantitative Aptitude: Number System (2 Hours), HCF, LCM and Decimal Fractions (1 Hour),					
Simplification (1 Hour)					
Logical Reasoning: Blood Relations (1 Hour), Direction Sense Test	(1 Hour)				

Unit – II	Contact Hours = 6 Hours			
Quantitative Aptitude: Percentages (2 Hours), Profit, Loss and Discounts (2 Hours)				
Verbal Ability: Change of Speech and Voice (2 Hours)				

Unit – III	Contact Hours = 6 Hours			
Quantitative Aptitude: Simple and Compound Interest (2 Hours)				
Logical Reasoning: Number and Letter Series (2 Hours)				
Verbal Ability: Sentence Correction (2 Hours)				

	Contact Hours = 6 Hours				
Quantitative Aptitude: Averages (2 Hours)					
Logical Reasoning: Coding and Decoding (1 Hour), Analogy (1 Hou	ur)				
Soft Skills: Body Language (1 Hour), Grooming and Etiquette (1 H	our)				

Unit – V	Contact Hours = 6 Hours		
Quantitative Aptitude: Alligations and Mixtures (2 Hours)			
Verbal Ability: Sentence Completion (2 Hours)			
Soft Skills: Group Discussion and Mock GDs (2 Hours)			

Books	5
	Text Books:
1.	The Aptitude Triad , BIZOTIC
2.	How to prepare for Quantitative Aptitude for CAT & other Management Examinations, Arun
	Sharma, McGraw Hill Education(India) Private Limited, 4 th Edition, 2018.
3.	How to prepare for Logical Reasoning for CAT & other Management Examinations, Arun
	Sharma,
	McGraw Hill Education(India) Private Limited, 8 th Edition, 2018.
4.	How to prepare for Verbal Ability and Reading Comprehension for CAT & other Management
	Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 8 th Edition, 2018.
5.	How to prepare for Data Interpretation for CAT & other Management Examinations, Arun
	Sharma, McGraw Hill Education(India) Private Limited, 5 th Edition, 2018.

Course delivery methods			Assessment methods
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Assignments
		4.	Seminar

<b>Course Outcome (COs)</b> At the end of the course, the student will be able to (Highlight the <b>action verb</b> representing the learning level.)					
Lear	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Learning PSO				
Ana	ysis; Ev - Evaluate; Cr - Create	Level	FO(3)	(s)	
1.	Clear the Aptitude round of recruiters during placements	Un	10, 12		
2.	Perform confidently during the GD and Interview process	Un	10, 12		
3.	Develop behaviors that are appropriate for a professional	Un	10, 12		

# Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Online Quiz	Addition of two Assignments	Total Marks	
Marks	30+30 = 60	20	10+10 =20	100	
- Writing 2 IA tests are compulsory					

-Student should score minimum 40% of 100 marks to pass the course.

	CO-PO Mapping (Planned)								CO-	PSO Map (Planned	ping )				
со	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1										~		~			
2										~		~			
3										~		~			

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up after
	after undergoing the course	Sectors & domains	undergoing the course
1	Logical Thinking	IT Industry	Software Engineer
2	Problem Solving	Automotive	Developer
3	Communication Skills	Education Sector	Project Manager

### **ENVIRONMENTAL STUDIES**

Course Code	221557	Course type	MC	Credits L-T-P	2-0-0
Hours/week: L-T-P	2-0-0		Total credits	2	
Total Contact Hours	L = 30 Hrs; Tota	al = 30 Hrs	CIE Marks	100	
Flipped Classes content	5 Hours		SEE Marks	100	

Cours	Course Learning Objectives				
1.	To understand the scope of Environmental Engineering.				
2.	Identify the Environmental impact due to Human activities.				
3.	Identify the renewable and non-renewable sources of energy.				
4.	To understand the concept of Disaster Management.				
5.	Identify the various Legal aspects in Environmental Protection.				

# Required Knowledge of : Nil

Unit – I	Contact Hours = 6 Hours			
Definition of Environment, Ecology and Ecosystem, Structure and functions of ecosystem,				
balanced ecosystem, Introduction to Environmental Impact Assessment				
Natural Resources: Material Cycles – Oxygen, Carbon, Nitrogen and Hydrological cycle.				
Importance of water quality, Water borne diseases, Water induced diseases, Significance of				
Fluoride in drinking water.				

Unit – II	Contact Hours = 6 Hours		
Energy – Different types of energy, Conventional and Non – Conventional sources – Advantages			
and Limitations of Wind Mills, Hydro Electric, Fossil fuel, Nuclear,	Solar, Biomass and Biogas,		
Geothermal energy.			

Unit – III	Contact Hours = 6 Hours			
Disasters – Natural Disasters: Meaning and nature of natural disasters, their types and effects				
(Floods, drought, cyclone, earthquakes, Tsunami). Man Made Disasters: Nuclear disasters,				
chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution,				
water pollution, deforestation, industrial waste water pollution a	nd marine pollution.			

Unit – IV	Contact Hours = 6 Hours			
Disaster Management: International strategy for disaster reduction. Concept of disaster				
management and national disaster management framework.				

Unit – V	Contact Hours = 6 Hours
Environmental Protection: Role of Government, Legal aspects, Ini	tiatives by Non – Governmental
Organizations (NGO), Environmental Education, Women Educatio	on. E-waste and solid waste
management rules.	

# Flipped Classroom Details

Unit No.	Ι	II		IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics [Mention if applicable else NIL]

Books	5
	Text Books:
1.	Benny Joseph, "Environmental Studies", Tata McGraw – Hill Publishing Company Limited
	(2005).
2.	Sanjay K. Sharma, "Environment Engineering and Disaster Management", USP (2011).
3.	Harsh K. Gupta, "Disaster Management", Universities Press (India) Pvt. Ltd (2003).
4.	Ranjit Daniels R.J. and Jagdish Krishnaswamy, "Environmental Studies", Wiley India Private
	Ltd., New Delhi (2009).
	Reference Books:
1.	Meenakshi P., "Elements of Environmental Science and Engineering", Prentice Hall of
	India Private Limited, New Delhi (2006).
2.	Tyler Miller Jr. G., "Environmental Science – Working with the Earth", Tenth Edition,
	Thomson Brooks/Cole (2004).

Course delivery methods			Assessment methods
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project

4.	Online classes	4.	Semester End Examination
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<b>Cours</b> Learni Re - Re	<b>e Outcome (COs) ng Levels:</b> emember; Un - Understand; Ap - Apply; An - Analysis _;	; Ev - Evaluate; C	r - Create	
At t	he end of the course, the student will be able to	Learning	РО	PSO
		Level	(s)	(s)
1.	Understand the importance of the Environment	Un	6,7	1
	and different sources of energy and energy crises.			
2.	Understand various environmental disasters and	Ар	6,7	1
	its management.			
3.	Understand the various Legislations related to	Un	6,7	1
	Environment.			

## Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA Two Assignments – (Open		Course project (CP)/ Case	Total	
	tests	/Industry/Certification etc)	study etc	Marks	
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & 100 presentation)		
-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours					

defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sche	me of Semester End Examination (SEE):
1	It will be conducted for 100 marks of 3 hours' duration.
2	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of
	CIE + SEE should be $\geq$ 40%.
3	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,
	each Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-P	O Maj	oping	(plann	ed)									CO-P (plan	SO Map ned)	oping
0	PO1	PO2	PO3	PO4	PO5	PO6	PO7	POS	PO9	PO10	PO11	PO12	PSO	PSO	PSO
00	101	102	105	104	105	100	107	100	105	1010	1011	1012	1	2	3
1						٧	٧						٧		
2						٧	٧						٧		
3						٧	٧						V		

#### COMPUTER NETWORKS LAB

Course Code 22ISL59 Course		22ISL59 Course type F		Credits L-T-P	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2		Total credits	1	
Total Contact Hours	L = 0 Hrs; T = 0	Hrs; P = 20 Hrs	CIE Marks	50	
	Total = 20 Hrs				
				SEE Marks	50

Cours	Course Learning Objectives		
1.	To understand the concept of application layer protocols.		
2.	To discuss transport layer services and understand UDP and TCP protocols.		
3.	To implement secure ways to exchange keys		
4.	To employ encryption techniques to secure data in transit across data networks		

# Required Knowledge of :Operating System

Lab Experiment – I	Contact Hours = 2 Hours
Introduction to computer networks and physical me	dia
Lab Experiment – 2	Contact Hours = 2 Hours
Application Network Security	
Lab Experiment – 3	Contact Hours = 2 Hours
Transport Protocol	
Lab Experiment – 4	Contact Hours = 2 Hours
Key Exchange algorithm	
Lab Experiment – 5	Contact Hours = 2 Hours
Congestion control Algorithm	· · · · ·
Lab Experiment – 6	Contact Hours = 2 Hours
Error detection technique.	i
Lab Experiment – 7	Contact Hours = 2 Hours
Symmetric Cipher	
Lab Experiment – 8	Contact Hours = 2 Hours
Asymmetric Cipher	

Books	5
	Text Books:
1.	James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition,
	Pearson,2017 .
2.	William Stallings, Cryptography and Network Security, Pearson 6th edition.

	E-resources
1.	https://nptel.ac.in/courses/106105031
2.	https://nptel.ac.in/courses/106105081

	Course delivery methods	Assessment methods			
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments		
2.	Virtual Labs ( if present)	2. Journal writing			
3.	Chalk and Talk	3. Lab project/ Open ended experiment			
4.		4.	Lab Test		
5.		5.	Semester End Examination		

# Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate	; Cr - Create	
	Learning	

At th	ne end of the course, the student will be able to	Level	PO(s)	PSO(s)
1.	Differentiate between connection Oriented and Connectionless Service	An	1,2,5,10	1
2.	Compare different types of Encryption Techniques.	Un	1,2,10	1,3
3.	Perform error detection and correction at link layer.	Ар	1,2,10	1

Т

# Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments	lournal	Lab project/	Lab Tast	Total				
& viva-voce	Journal	Open ended expt	Lab Test	Total				
20 marks	5 marks	10 marks	15	50 marks				
Conduct of Lab:		·						
1. Conduction of the experime	nt: 15 marks + Viva vo	ce: 5 marks						
2. Calculations, results, graph, o	conclusion and Outcor	me recorded in Journal:	5 marks					
3. Lab project/ Open ended exp	ot: 10 marks							
3. Lab Test: 15 marks								
Eligibility for SEE:	Eligibility for SEE:							
1. 40% and above (20 marks and above)								
2. Lab test is COMPULSORY								

Sch	neme of Semester End Examination (SEE):				
1.	It will be conducted for 50 marks of 2/3 hours' duration.				
2.	Minimum marks required in SEE to pass: Score should be ≥35%, however overall score of CIE+SEE				
	should be ≥40%.				
2.	One or Two experiments to be conducted.				
3.	Minimum marks required in SEE to pass: 20 out of 50				

4.	Initial write up	10 marks	50 marks				
	Conduct of experiments, results and conclusion	20 marks					
	One mark question	10 marks					
	Viva- voce	10 marks					
5.	Viva-voce shall be conducted for individual student and not in a group.						

CO-PO Mapping (planned)								CO-I	PSO Map (planned)	ping					
со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	~	~											~		
2	~	~											~		$\checkmark$
3	~	~											$\checkmark$		

SI No	Skill & competence enhanced	kill & competence enhanced Applicable Industry			
	after undergoing the course	Sectors & domains	after undergoing the course		
1	Analytical Skills	Software Engineer	Network administrator		
2	Programming skills	Software Developer	Network architect		

### ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	221561	Course type	IPCC	Credits L-T-P	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2		Total credits	4	
Total Contact Hours	L = 40 Hrs; T = 0 H Total = 60 Hrs	lrs; P = 20 Hrs	CIE Marks	100	
Flipped Classes content	05 Hours			SEE Marks	100

Cours	e learning objectives
1.	To understand the fundamental concepts and principles of Artificial Intelligence
	&Machine Learning.
2.	To apply mathematical concepts to machine learning algorithms and models.
3.	To learn designing, training, and evaluating deep learning models.
4.	To develop AI solutions for real world problems.
5.	To gain proficiency in using MATLAB as an environment for AI and ML tasks.

**Required Knowledge of**: Linear Algebra, Probability and Statistics, Introduction to Programming, Multivariable Calculus.

Unit – I	Contact Hours = 8 Hours	
Introduction to AI - Supervised vs unsupervised learning, Applications of machine learning,		
Introduction to Programming, Linear Algebra, Probability & Statistics.		

Unit – II	Contact Hours = 8 Hours	
Gradient Descent, Supervised Learning Regression, Feature Engineering - PCA, SVDOver-		
fitting, Bias and Variance.		

Unit – III	Contact Hours = 8 Hours	
Supervised Learning Classification - naive Bayes, Decision Tree, Log	istic Regression, Support Vector	
nachines .Unsupervised Learning Clustering - kNN, hierarchical clustering.		

Unit – IV	Contact Hours = 8 Hours	
Fundamentals of Neural Networks - neuron, backpropagation, activation functions, loss function		
ntroduction to Image Processing - Basics, thresholding, filtering, edge detection, convolution.		

	Unit – V Contact Hours = 8 Hours
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Deep Learning CNN - CNN fundamentals, CNN layers, building CNN from scratch, transfer learning Deep Learning RNN - RNN fundamentals, RNN layers, building CNN from scratch, transfer learning AI deployment on low-cost hardware, mobile phone.

# Flipped Classroom Details

Unit No.	1	II	111	IV	V
No. for Flipped	Week 1-	Week 2-	Week 7-	Week 11-	Week 12-
Classroom Sessions	Intro to	Mathematic	Supervised	Image	Deep
	Programming	S	Learning	Processing	Learning

### List of Experiments

Unit No.	No. of Experiment s	Topic(s) related to Experiment	
I	1	Intro to programming	
II	3	Gradient Descent, Regression, Bias and Variance	
111	2	Classification, Clustering	
IV	1	Shallow neural networks	
V	3	CNN, RNN, deployment of AI algorithms to hardware	

Unit	Self-Study Topics
No.	
I	Linear Algebra
	KNN algorithm
V	Recurrent Neural Network

Books	5
	Text Books:
1.	Kevin P. Murphy - "Machine Learning: A Probabilistic Perspective" - MIT Press, 2012.
2.	Introduction to Linear Algebra 5th edition by Gilbert Strang
3.	"Deep Learning" by Ian Goodfellow, Yoshua Bengio and Aaron Courville
	Reference Books:
1.	Trevor Hastie, Robert Tibshirani, and Jerome Friedman - "Elements of Statistical
	Learning: Data Mining, Inference, and Prediction" - Springer, 2nd Edition, 2009.
2.	Introduction to Probability theory 2nd edition by Bertsekas and Tsitsiklis
3.	"An Introduction to Statistical Learning" by Gareth James et al
	E-resources
1.	Neural Networks: <u>https://github.com/ppotoc/Fundamentals-of-Neural-Networks</u>

2.	Build a network from scratch to assess Brain MRI		
	https://github.com/matlab-deep-learning/Brain-MRI-Age-Classification-using-Deep-Learning		
3.	End to end implementation of AI for Computer Vision to classify Pills using different Deep		
	Learning networks		
	https://github.com/mathworks/AI-Workshop-for-Visual-Inspection		

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Open Assignment (OA)/ Lab Project/ Industry assignment/Certification/ Course project	
3.	Flipped Classes	3.	Lab Test	
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination	
5.	Virtual Labs ( if present)			

Cou	rse Outcome(COs)								
Lear	Learning Levels:								
Re -	Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Eva	luate; Cr - Cre	eate						
At th	At the end of the course, the student will be able to Learning Level PO(s) PSO(s)								
1.	Understand the fundamental concepts and principles of Artificial Intelligence.	Un	1	1					
2.	Analyze , Apply and Evaluate various machine learning and deep learning models using MATLAB.	An,Ap,Ev	1,2,3,4,5	1,2					
3.	Develop practical AI solutions for real world problems to demonstrate effective teamwork , communication and problem solving skills in AI project.	Ар	3,4,5,9,10	1,2					
4.	Critically evaluate AI applications and ethicalconsiderations.	Ev	6	3					

Scheme of Continuous Internal Evaluation (CIE):									
For integrated cours (COMPULSORY) will	For integrated courses, a lab test also will be conducted at the end of the semester. The lab test <b>(COMPULSORY)</b> will be part of the CIE. <b>No SEE for Lab</b> .								
THEORY (60 marks)		LAB (40 marks)		Total					
IA test 1	IA test 2	Conduction	Lab test	Total					
30 marks	30 marks	10 marks	30 marks	100 marks					
IA Test:			·						
<ol> <li>No objective part</li> <li>All questions desc</li> </ol>	in IA question pape criptive	er							
Conduct of Lab:									
1. Conducting the ex	periment and jour	nal: 5 marks							
2. Calculations, resu	lts, graph, conclusio	on and Outcome: 5 ma	rks						
Lab test: (Batch wise with 15 students/batch)									
1. Test will be condu	ucted at the end of	the semester							
2. Timetable, Batch	details and examine	ers will be declared by	Exam section						
3. Conducting the ex	periment and writi	ng report: 5 marks							
4. Calculations, resu	Its, graph and conc	usion: 15 marks							
5. Viva voce: 10 mar	5. Viva voce: 10 marks								
Eligibility for SEE:									
1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test									
will make the student Not Eligible for SEE									
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks									
(i.e. 16 marks) in Lab component.									
3. Lab test is COMPULSORY									

4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Sch	eme of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should
	be ≥40%.
3.	Question paper contains three parts A,B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question
	Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (planned)								CO-PSC (planne	) Mapping ed)	5					
С	РО	РО	PO	РО	РО	РО	РО	РО	PO	РО	РО	РО	PSO	PSO	PSO
0	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	√												√		
2	$\checkmark$	√	√		~								√	√	
3		√	√	~	~								√	√	
4	$\checkmark$	√			~								√	√	
5			√	√	1				√	√			√	√	
6						1									√

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up
	after undergoing the course	Sectors & domains	after undergoing the course
1	A good understanding of what Al is, its applications, and its use cases.		
2	Ability to explain terms such as machine learning, deep learning and neural networks.	Healthcare, Education	Al Engineer, Al Data Analyst, Computer Vision Engineer.
3	Develop practical AI solutions for real world problems to demonstrate effective teamwork, communication and problem solving skills in AI project		

### CLOUD COMPUTING

Course Code	221562	Course type	PCC	Credits L-T-P	3-1-0	
Hours/week: L - T- P	3-2-0		3-2-0		Total credits	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs		CIE Marks	100		
Flipped Classes content	05 Hours		SEE Marks	100		

	Course learning objectives						
1.	To understand various cloud services.						
2.	2. To realize the importance of cloud virtualization.						
3.	To study case study of AWS (Amazon Web Services).						

Pre-requisites: Fundamentals of networking.

Unit – I	Contact Hours = 8 Hours
Introduction to Cloud Computing: Cloud Computing in a Nutshell, Ro	ots of Cloud Computing, Layers and
Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure M	anagement.

Migrating into a Cloud: Introduction, The Promise of the Cloud, Cloud Service Offerings and Deployment Models: Iaas, PaaS, SaaS, Challenges in the Cloud, Broad Approaches to Migrating into the Cloud: Cloudonomics, Deciding on the Cloud Migration, The Seven-Step Model of Migration into a Cloud: Migration Risks and Mitigation, seven Step illustrations and Iteration, Conclusions.

Unit – II	Contact Hours = 8 Hours				
Cloud Computing Architecture: Introduction, Architecture, Infrastrue	cture / Hardware as a Service				
, Platform as a Service, ,Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Cloud					
Community Clouds, Economics of the Cloud.					

Unit – III	Contact Hours = 8 Hours
Virtualization: Introduction, Characteristics of Virtualized Envir	onments, Taxonomy of Virtualization
Techniques, Executing Virtualization, Other Types of Virtualization	n, Virtualization and Cloud Computing,
Pros and Cons of Virtualization Technology with Examples.	

Unit – IV	Contact Hours = 8 Hours			
Cloud Platforms in Industry: Amazon Web Services, Compute Serv	ices, Storage Services, Communication			
Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle,				
Cost Model.				

### Unit – V

Contact Hours = 8 Hours

Hardware-Enhanced Security for Cloud Computing: Introduction, Security Concerns, Approaches to Securing Cloud Computing, Hardware-Enhanced Security with HyperWall, HyperWall Architecture Summary, Trust Evidence. Further Research Directions.

### **Flipped Classroom Details**

Unit No.	I	II	III	IV	V
No. for Flipped	01	01	01	01	01
<b>Classroom Sessions</b>					

Unit No.	Self-Study Topics
1.	The Seven-Step Model of Migration into a Cloud
2.	Economics of the Cloud.

	Books
	Text Books:
1.	Rajkumar Buyya, James Broberg, Andrzej Goscinski Cloud Computing Principles and
	Paradigms - Wiley Series 2016
2.	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing  , Tata
	Mcgraw Hill, 2013.
3.	Sushil Jajodia · Krishna Kant, Pierangela Samarati · Anoop Singhal, Vipin Swarup · Cli-
	WangSecure Cloud Computing- Springer publication, 2019
	Reference Books:
1.	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the
	Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly
2.	JJ Geewax - Google Cloud Platform in Action-Manning Publications Co. 2018
	E-resources :
1.	IBM Cloud Computing- <u>http://www.ibm.com/cloud-computing/us/en/</u>

Course delivery methods			Assessment methods		
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)		
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification		
4.	Online classes	4.	Course Project		
		5.	Semester End Examination		

	Course Outcome (COs)					
	At the end of the course, the student will be able to (Highlight the <b>action verb</b> representing the					
	learning level.)					
Lear	ning Levels: Re - Remember; Un - Understand; Ap - Apply;	Learning	PO(s)			
An -	Analysis; Ev - Evaluate; Cr - Create	Level	FO(3)	F 30(3)		
1	Interpret the main concepts, key technologies, strengths and	Ro Lln	1,2,12	1,2		
1.	limitations of cloud computing.	Re, Off				
2.	Apply cloud computing services to the application of IoT.	Un, Ap	2,3	1,2		

3.	Analyze various virtualization techniques.	An	2,3	1,2
4.	Apply the learnings through a course activity.	Ар	9,10	1

Scheme of Continuous Internal Evaluation (CIE):							
Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks			
Marks30+30 = 6010 + 10 = 2020 marks (with report & presentation)100							
-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by							

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	eme of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE + SEE
	should be <u>&gt;</u> 40%.
3.	Question paper contains three parts A,B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,
	each Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)									CO-F	PSO Mapp Planned)	oing				
0	РО	РО	РО	РО	РО	РО	РО	РО	РО	PO	PO	РО	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	$\checkmark$	$\checkmark$											$\checkmark$	$\checkmark$	
2		$\checkmark$	$\checkmark$										$\checkmark$	$\checkmark$	
3		$\checkmark$	$\checkmark$										$\checkmark$	$\checkmark$	
4									$\checkmark$	$\checkmark$			$\checkmark$		

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up
	after undergoing the course	Sectors & domains	after undergoing the course
1	Cloud Computing Application Developer	IT	Android Application Developer

### DISTRIBUTED COMPUTING SYSTEM

Course Code	22IS631	Course type	PEC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0	Total credits	3		
Total Contact Hours	L = 40 Hrs; T = 0 H	rs; P = 0 Hrs		CIE Marks	100
	Total = 40 Hrs				
Flipped Classes content	05 Hours	SEE Marks	100		

	Course learning objectives				
1.	To learn the concepts of Distributed Systems.				
2.	To understand File Sharing, Distributed File System implementation.				
3.	To understand the concepts of Crypt analysis, Access control.				
4.	To understand the concepts of Distributed Multimedia Systems.				

Pre-requisites: Basics Computer Concepts, Operating Systems.

Unit – I	Contact Hours = 8 Hours			
Characterization of Distributed Systems: Introduction, Examples of Distributed Systems,				
Challenges: Heterogeneity, Openness, Security, Scalability, Failure Handling.				
System Model: Architectural Models, Fundamental models.				
Case study : world wide web.				

Unit – II	Contact Hours = 8 Hours
Inter Process Communication: Introduction, API for Internet Proto	ocols, External Data
Representation and Marshalling, Client – Server Communication.	
Distributed Object and RMI: Introduction, Communication betwee	en Distributed Objects, RPC.

Unit – III	Contact Hours = 8 Hours
Distributed File System: Introduction, File Service architecture.	
Security in distributed systems: Introduction, Overview of security	y techniques: Cryptography,
Certificates, Access control. Cryptographic Algorithm: Symmetric:	Ex Substitution algorithm. ,
Asymmetric: RSA	

Unit – IV	Contact Hours = 8 Hours
Time and Global states: clocks, Logical time and logical clocks, Glo	pal states.
Coordination and Agreement: Introduction, Distributed mutual exclusion-The central server	
algorithm, A ring-based algorithm.	

Unit – V

Contact Hours = 8 Hours

**Distributed Multimedia Systems:** Introduction, Characteristics of multimedia data, Quality service management, resource management, stream adaption. Case study :BitTorrent.

### Flipped Classroom Details

Unit No.	I	II	III	IV	v
No. for Flipped	1	1	1	1	1
<b>Classroom Sessions</b>					

Unit No.	Self-Study Topics
1	Fundamental models.
2	Events and Notifications.
3	Clocks, events and process states.

	Books
	Text Books:
1.	George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems Concepts and
	Design, Pearson Education, Third edition.
2.	Dan Marinescu : Cloud Computing Theory and Practice, ELSEVIER.
	Reference Books:
	Name of the author(s), Title of the Book, Publisher, Edition/Yearand onwards
1.	Kai Hwang, Geofrey C, Fox, Jack J, Dongarra: Distributed and Cloud Computing From
	Parallel processing to the Internet of Things.
2.	Sunita Mahajan, Seema Shah: Distributing Computing, Published by Oxford University
	press 2010.
	E-resourses: https://nptel.ac.in/courses/106106168/

Course delivery methods Assessment methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

	Course Outcome (COs)			
At t	At the end of the course, the student will be able to (Highlight the <b>action verb</b> representing the learning			
	level.)			
Lear	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; Learning			PSO(c)
An -	Analysis; Ev - Evaluate; Cr - Create	Level	FO(3)	F 30(3)
1.	Explain the importance of Distributed systems.	Un	1,10	2
2	Explain the inter process communication and security in	Lln	1,10	2
۷.	Distributed systems.	UII		
R	Describe File systems and Remote method invocation in	Lln	1,2,10	2
5.	Distributed systems.	UII		
л	Explain clocks, coordination and distributed multimedia	Un	1,10	2
4.	systems.	OII		
5	Apply the learning through a course activity.	Ар	9,10	1

Scheme of Continuous Internal Evaluation (CIE):				
Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks	
30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100	
earned by passing the onsidered as a Course a uld score minimum 409 mum score in IA test w	standard Online MOOCs cou activity and awarded maximu % of 60 marks (i.e. 24 marks) ill make the student Not Elig	irse (1 course of at least 8 hours of im of 10 marks. in IA tests. ible for SEE	defined by	
	Addition of two IA tests 30+30 = 60 earned by passing the onsidered as a Course a uld score minimum 409 mum score in IA test w	Addition of two IA testsTwo Assignments – (Open /Industry/Certification etc.)30+30 = 6010 + 10 = 20earned by passing the standard Online MOOCs cou onsidered as a Course activity and awarded maximu uld score minimum 40% of 60 marks (i.e. 24 marks) mum score in IA test will make the student Not Eligi for SEE: 40 OUT OF 100	Addition of two IA testsTwo Assignments – (Open /Industry/Certification etc.)Course project (CP)/ Case study etc. $30+30 = 60$ $10 + 10 = 20$ $20$ marks (with report & presentation) $0$ earned by passing the standard Online MOOCs course (1 course of at least 8 hours of onsidered as a Course activity and awarded maximum of 10 marks. $0$ uld score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.mum score in IA test will make the student Not Eligible for SEE ore in CIE to be eligible for SEE to be eligible for SEE to be eligible for SEE.	

Scheme of Semester End Examination (SEE):		
1.	It will be conducted for 100 marks of 3 hours duration.	
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE + SEE	
	should be <u>&gt;</u> 40%.	
3. Question paper contains three parts **A,B and C**. Students have to answer

1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.

2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.

3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

	CO-PO Mapping (Planned)						CO-	PSO Map (Planned)	ping )						
со	РО 1	PO 2	PO 3	PO 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	$\checkmark$									$\checkmark$					
2	1									~					
3	√	1								~					
4	√									~					
5	1	1								~					

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up	
	after undergoing the course	Sectors & domains	after undergoing the course	
1	Concepts and Algorithms of	Network industry	Network programmer	
	distributed systems.			

### AGILE SOFTWARE DEVELOPMENT

Course Code	2215632	Course type	PEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0	Total	3		
		credits			
Total Contact Hours	L = 40 Hrs; T = 0 H	CIF Marks	100		
	Total = 40 Hrs				
Flipped Classes content	05 Hours			SEE Marks	100

Course learning objectives				
1.	To understand the basics of Agile software development technologies.			
2.	To apply principles of agile technologies in the real time problem solving.			

**Pre-requisites:** Knowledge of software engineering fundamentals

Unit – I	Contact Hours = 8 Hours
Introduction:	

Why Agile? Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile?: Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor. The Genesis of Agile, Introduction and background, Agile Manifesto, and Principles, Simple Design, User Stories, Agile Testing, Agile Tools.

Unit – II	Contact Hours = 8 Hours				
Understanding XP:					
The XP Lifecycle, The XP Team, XP concepts, Adopting XP: Is XP R	ight for us ?Go!, Assess Your Agility.				
Overview of Extreme Programming, The Practices of Extreme Programming, Conclusion, Bibliography,					
Planning Initial Exploration, Release Planning, Iteration Planning, Defining "Done", Task Planning					
Iterating, Tracking.					

Unit – III	Contact Hours = 8 Hours					
Practicing XP:						
Thinking: Pair Programming, Energized Work, Informative Workspace, Root Cause Analysis,						
Collaborating: Trust, Sit Together, Real Customer Involvement.						
Releasing: "Done Done", No Bugs, Version Control,.						

Unit – IV	Contact Hours = 8 Hours				
Planning:					
Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories,					
Estimating.					

# Developing:

Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization.

Unit – V	Contact Hours = 8 Hours
Deliver Value:	

Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence: Software Doesn't Exist Design Is For Understanding, Design Trade-offs, Quality with a Name, Great Design.

### **Flipped Classroom Details**

Unit No.	I	II	III	IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

	Books					
	Text Books:					
1.	James shore, Chromatic, O'Reilly, The Art of Agile Development, 2007.					
	Reference Books:					
1.	KenSchawber, MikeBeedle, "AgileSoftwareDevelopmentwithScrum", Pearson, 2008.					
2.	Agile-Principles-Patterns-and-Practices-in-CbyRobertCMartin&MicMartin					
	E-resources:					
1.	https://www.nptelvideos.com/video.php?id=904.					
2.	https://www.youtube.com/watch?v=x90kIAFGYKE					
3.	http://www.digimat.in/nptel/courses/video/110104073/L02.html					
4.	https://onlinecourses.nptel.ac.in/noc19_mg30/preview					
	https://www.edx.org/course/data-analytics-and-learning					

Course delivery methods			Assessment methods		
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)		
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification		
4.	Online classes	4.	Course Project		
		5.	Semester End Examination		

Course Outcome (COs):

Learn	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create							
At th	e end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)				
1.	Explain the fundamentals of Agile software development.	Un	2	1				
2.	Apply principles of XP Programming in real time scenarios.	Ар	3, 4	2				
3.	Compare Agile with the traditional software development.	An	4	2				
4.	Apply the learnings through a course activity.	Ap	9,10	1				

Scheme of Continuous Internal Evaluation (CIE):						
Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks		
Marks	30+30 = 60     10 + 10 = 20     20 marks (with report & presentation)					
-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by 3OS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. -Lack of minimum score in IA test will make the student Not Eligible for SEE -Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.						

Sch	eme of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of CIE + SEE
	should be <u>&gt;</u> 40%.
3.	Question paper contains three parts A,B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question
	Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

	CO-PO Manning (Planned)							CO-P	SO Map	oping					
	CO-PO Mapping (Planned)								(	Planned	I)				
0	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		1											1		
2			1	1										1	
3				1										1	
4									1	1			1		

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up
	after undergoing the course	Sectors & domains	after undergoing the course
1	Apply and adapt agile tools and techniques in the software development lifecycle from product ideation to deployment	IT sector	Software Engineer

### INTRODUCTION TO SALESFORCE

Course Code	22IS633	Course type	PEC	Credits L-T-P	2 - 0 - 1
Hours/week: L - T- P	2 - 0 - 2			Total credits	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

### **Course learning objectives**

1.	To introduce fundamentals of Salesforce and its components used for multiple domains
2.	To gain an understanding of the Salesforce terminologies and the different operations
	involved in constructing an informative system
3.	To develop ability to access or populate tables as an object in Salesforce database to
	create new processes based on the demands by users.
4.	Implement Salesforce Lightning tools and components providing solutions to real world
	problems.

**Required Knowledge of:** Database Management Systems(DBMS) and Enterprise Management

# Unit – IContact Hours = 8HoursIntroduction to salesforce & related clouds: Getting Around the App, Salesforce Platform Basics: Get<br/>started with salesforce platform. Discover Use Cases for the Platform, Understand the Salesforce<br/>Architecture, Navigate Setup, Power Up with AppExchange, Data Model: Understand Custom &<br/>Standard Objects, Create Object Relationships, Work with Schema Builder, Lightning Experience: Get<br/>Your Bearings, Navigate Around, Work with List Views, Work with Your Data, Company-Wide Org<br/>Settings: Learn About Regional Settings, Discover Multiple Currency Settings

Unit – II	Contact Hours = 8 Hours
Getting Profile Organization Ready for Users: Lightning Experier	nce Productivity: Elevate Your Daily
Productivity, Work with Notes and Files, Manage Your Tasks, Eve	nts, and Email, Find Your Stuff with
Search, Collaborate with Feeds and Groups, Analyze Your Da	ata with Reports and Dashboards,
Configuring Search Settings: Choose the Right Search Solution, (	Optimize Search Results, Setting Up
Chatter (Classic): Get Started with Chatter, Enable Feed Tracking	, Create Publisher Actions, Approve
Records from the Feed, Develop a Rollout Strategy, Support a New	Business Unit: Manage User Access,
Manage Chatter, Modify Your Data Model, Configure an Email L	etterhead and Template, Automate
Your Business Process, Mobile Access with Salesforce1	

### Unit – III

### **Contact Hours = 8 Hours**

Setting Up and Managing Users: Managing Users and Introduction to Data Security, Activity Management: Activities: Tasks, Events, and Calendars Documentation, Security and Data Access: Data Security, Who Sees What, Object Customizations: Creating Picklist and Picklist Administration, Creating Formula Fields and Validation Rule, Working with Page Layouts, Working with Record Types, Introduction to Business Process, Maintaining Data Quality, Managing Data: Import Wizards, Export Wizards, Use Data Loader To Export Data, Data Loader To Import.

Unit – IV	Contact Hours = 8 Hours
Lightning Experience Customization: Customize the Lightning writing any code, Reports and Dashboards: Introduction to Repor Reports with the Report Builder, Running and Modifying Repor Tabular, Matrix and Joined, Building Dashboards, Email To Templates and Letterheads, Automation: Difference Between W Process Builder, Lead Automation.	Experience user interface without orts and Dashboards, Creating New rts, Format Reports with Summary, emplates and Letterheads: Email Vorkflow Rules and Process Builder,

Unit – V	Contact Hours = 8 Hours
Managing the Support Process: Managing and Resolving Case	es, Customizing a Support Process,
Automating Support, Understanding the Salesforce Console for S	Service, Collaborating in the Service
Cloud, Analyzing Support Data, Lightning App Builder: Build cus	tom pages for Lightning Experience
and the Salesforce mobile app quickly with point-and-click tools	ì.

# Flipped Classroom Details

Unit No.	I	II	Ш	IV	v
No. for Flipped Classroom	2	2	2	2	2

# List of Experiments

Unit No.	No. of Experiment s	Topic(s) related to Experiment				
I	1	Salesforce Trailhead account/ profile creating and customizing the interface				
II	2	Create users & rights, Lightning Experience, Elevate Daily Productivity using tools, Notes and Files, Manage Your Tasks, Events, and Email				
III	3	Introduction to Business Process: Who Sees What, Object Customizations: Creating Picklist and Picklist Administration, Creating Formula Fields and Validation Rule, Working with Page Layouts, Working with Record Types				
IV	2	Lightning Experience Customization: Customize the Lightning Experience user interface without writing any code, Reports and Dashboards: Introduction to Reports and Dashboards, Creating New Reports with the Report Builder				
V	2	Customizing a Support Process, Automating Support, Understanding the Salesforce Console for Service, Collaborating in the Service Cloud, Analyzing Support Data, Lightning App Builder				

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Unit No.	Self-Study Topics						
1	alesforce platform features and facilities available for business application development. A						
	brief historical background towards customer relationship management (CRM)						
2	Getting Profile Organization Ready for Users & Lightning Experience in salesforce						
3	Salesforce business use-cases, modular approach to Project design and development						
4	Salesforce clouds and interfaces for business development						
5	Business support and customer relationship management for business continuity						

3	Course Outcome (COs)			
Lea F	arnin <mark>g Levels:</mark> te - Remember;  Un - Understand; Ap - Apply;       An - Analysis;	; Ev - Evalua	ite; Cr - C	reate
At t	he end of the course, the student will be able to	Learning Level	PO(s)	PSO(s)
1.	Understand the Salesforce terminologies to make use for products of different commodity	Re	1,2,12	1,2
2.	Describe the uses of Salesforce in the business world as a good promotional means for marketing the products.	Un	2,3,5	1,2
3.	Apply the techniques to retrieve the customer needs by means of Salesforce designs and options	Ар	3,4,5,10	1,2,3
4.	Categorize and build the solutions with suitable mode of representation for the domain requirements using the lightning trends.	Ар	3,4,6,9,	2,3

Books	
	Text Books:
1.	Paul Goodey-Salesforce CRM - The Definitive Admin Handbook,4 th Edition- Packt
	Publishing © 2016
	Reference Books:
1.	Basics of salesforce- Salesforce Docs @salesforcedocs 19 Dec 2019
2.	Best Practices for Implementing Salesforce CRM- SalesforceDocs @ salesforcedocs 2019
3	Salesforce Solutions Help & Training by Bruce F. Magwn © 2012 Integration Technologies,
	Inc.
	E-resources (NPTEL/SWAYAM Any Other)- mention links.
1.	https://salesforce.trailhead.com

Course delivery methods			Assessment methods			
1.	Chalk and Talk	1.	IA tests			
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project			
3.	Flipped Classes	3.	Lab Test			
4.	Practice session/Demonstrations in Labs	4.	Course End Project Demonstration & Viva			
5.	Virtual Labs ( if present)					

# Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab.** 

•					
THEOF	RY (40 marks)		PROJECT (6	0 marks)	
IA test (Theory)	IA test (Lab)	Project Phase 1	Project Phase 2	Project report	Total
25 marks	<u>15 marks</u>	25 marks	<u>25 marks</u>	<u>10 marks</u>	100 marks

- Theory IA test should be of one-hour duration.

- Lab IA test should be of two/three-hour duration.

- Project batch will ideally consist of 2 students (maximum of 3).

- Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester.
- Submitting Project report is compulsory.

# Eligibility for SEE:

- 1. 40% and above (16 marks and above) in theory component
- 2. 40% and above (24 marks and above) in project component
- 3. Not eligible in any one of the two components will make the student Not Eligible for SEE

Sen	lester End Examination (SEE):		
1	It will be conducted for 100 marks having 3 hours duration.		
	Lab Open ended program/problem/experiment Write-up & execution (1 open ended expt.)- (20 algorithm and flowchart + 20 marks write-up method / mode + 10 marks) execution)	50 marks	
	<b>Project evaluation</b> a. Initial write up stating the objectives, methodology and the outcome	10 marks	
2.	b. Hardware project: Exhibiting and demonstration of working of Project. Software project: Demonstration of the programming canabilities by writing flowchart, algorithm and codes related to a	30 marks	100 marks
	section of the project. c. Viva-voce	10 marks	
3.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overa should be $\geq$ 40%.	ll score of Cl	E + SEE
4.	SEE will be conducted in project batches by Internal & External examiners toget	her.	

	CO DO Monning (planned)								CO-P	SO Map	ping				
	CO-PO Mapping (planned)								(	planned	)				
60	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
0	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	~	1										1	~	~	-
2		1	1		1								~	~	-
3			1	1	1					1			1	~	<
4			1	1		1			1					1	1

SI No	Skill & competence enhanced	Applicable Industry Sectors	Job roles students can take up
	after undergoing the course	& domains	after undergoing the course
1	Skills of customer relationship	IT Industry	<b>Business Administrator</b>
	management		
2	Architect, Business process	Commercial Domain	Consultant
	automations		

### **OPERATIONS RESEARCH**

Course Code	2215634	Course type	PEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T =	0 Hrs; P = 0 Hrs	CIE Marks	100	
	Total = 40 Hrs				
Flipped Classes content	05 Hours	95 Hours			100

	Course Learning Objectives					
1.	To introduce the basic concepts and techniques of Operations Research.					
2.	To provide knowledge and skills to formulate and solve optimization problems using mathematical models.					
3.	To familiarize with various optimization techniques and algorithms applicable to engineering problems.					

# Pre-requisites: Basic knowledge of mathematics.

Unit – I	Contact Hours = 8 Hours
Introduction to Operations Research: Overview of Operations	Research, History and development of
Operations Research, Scope and applications in Computer/In	nformation Science and Engineering,
Introduction to modeling and optimization.	

Unit – II	Contact Hours = 8 Hours			
Linear Programming: Formulation of linear programming problems, Graphical method for solving LP				
problems, Simplex method and its variants, Duality theory and sensitivity analysis, Applications of LP in				
resource allocation, production planning, and transportation problems.				

Unit – III						Со	Contact Hours = 8 Hours			
Integer Programming : Introduction to integer programming, Formulation of integer programming										
problems,	Branch	and	bound	algorithm,	Applications	in	project	scheduling,	network	
design/optimization, facility location problems and resource allocation.										

Unit – IV	Contact Hours = 8 Hours					
Network Optimization: Introduction to network optimization	problems, Shortest path problems,					
Minimum spanning tree, Maximum flow problems, Applicatio	ns in Network Design and Routing.					
Nonlinear Optimization: Introduction to nonlinear optimization, Unconstrained optimization methods						
(gradient descent, Newton's method), Constrained optimization an	nd Lagrange multipliers, Applications in					
machine learning and data fitting.						

Unit – V	Contact Hours = 8 Hours
Queuing Theory: Introduction to Queuing Systems, Characteristics	of Queues, Markovian Queues,

Applications in Computer Networks and System Design

**Dynamic Programming:** Introduction to dynamic programming, Principle of optimality, Bellman's principle and Bellman equations, Applications in sequence alignment, shortest path problems, and resource allocation.

## Flipped Classroom Details

Unit No.	I	II		IV	v
No. for Flipped	1	1	1	1	1
<b>Classroom Sessions</b>					

	Books					
	Text Books:					
1.	Taha.H.A ,"Operation Research : An Introduction", McMilan publishing Co., 1982. 7th edition onwards.					
	Reference Books:					
1.	Hillier.F.S & Liberman.G.J, "Operation Research", Second Edition onwards, Holden Day Inc, 1974.					
2.	S.D.Sharma, , Kedarnath, Ramnath, "Operations Research" 2015 onwards					
3.	Winston, Wayne L, "Operations Research Applications".					
	E-resources:					
1.	https://onlinecourses.swayam2.ac.in/cec24_ma05/preview					
2.	https://www.coursera.org/learn/operations-research-modeling					

	Course delivery methods	Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3.	Open Book Tests (OBT)	
4.	Online classes	4.	Course Seminar	
		5.	Semester End Examination	

	Course Outcome (COs)						
At	At the end of the course, the student will be able to (Highlight the <b>action verb</b> representing the learning						
	level.)						
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; Learning							
An -	Analysis; Ev - Evaluate; Cr – Create	Level	FO(3)	F 50(5)			
1	Explain the history, development, and scope of Operations	lln	1	1			
1.	Research.	01					

2	Formulate and <b>solve</b> problems from real-world scenarios using		1,2	1
Ζ.	different techniques.	Ар		
2	Analyze and solve network optimization problems, Queuing	۸n	1,2	1
5.	Systems and Dynamic Programming Problems	All		
4.	Apply the learnings through a course activity.	Ар	9,10	1

Scheme of Continuous Internal Evaluation (CIE):							
Components	Addition of two IA tests	Two Assignments – (Open/Industry/ Certification etc.)	Course project (CP)/ Case study etc.	Total Marks			
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100			

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	Scheme of Semester End Examination (SEE):						
1.	It will be conducted for 100 marks of 3 hours' duration.						
2.	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of						
	CIE + SEE should be $\geq$ 40%.						
3.	Question paper contains three parts A, B and C. Students have to answer						
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.						
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each						
	Question Carries 10 Marks.						
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.						

	CO-BO Manning (Blanned)									CO-PSO Mapping					
	CO-PO Mapping (Planned)								(	Planned	l)				
0	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
co	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	~												$\checkmark$		
2	$\checkmark$	$\checkmark$											$\checkmark$		
3	$\checkmark$	$\checkmark$											$\checkmark$		
4	$\checkmark$	$\checkmark$											$\checkmark$		
5									$\checkmark$	$\checkmark$			$\checkmark$		

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up
	after undergoing the course	Sectors & domains	after undergoing the course
1	Analytical skills , Critical-	Logistics, healthcare,	Operations Research Analysts
	thinking skills , Problem-solving	manufacturing, finance	
	skills.	etc.	

### **COMPLIER DESIGN**

Course Code	2215635	Course type	PEC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs		CIE Marks	100	
Flipped Classes content	es content 5 Hours		SEE Marks	100	

Cours	Course learning objectives			
1.	To familiarize the structure of a compiler and activities of different phases of compilation			
	process.			
2.	To provide an insight into the design strategy for front end of a compiler.			
3.	To learn to implement code generator.			

Pre-requisites: Basic knowledge Formal languages and Automata theory

Unit – I	Contact Hours = 8 Hours
Introduction and Lexical Analysis	

Overview of the Translation Process, A Simple Compiler, Difference between interpreter, assembler and compiler. Types of Compiler, The Phases of a Compiler.

Lexical Analysis: The Role of Lexical Analyzer, Input Buffering, Specifications of tokens, Recognition of Tokens.

### Unit – II

**Contact Hours = 8 Hours** 

Syntax Analysis-1:

Introduction, Context free Grammar, Writing Grammar, ambiguity, associativity, precedence, Un ambiguous Grammars, Top-down Parsing.

### Unit – III

**Contact Hours = 8 Hours** 

Syntax Analysis-2:

Bottom-up Parsing, Simple LR, More Powerful LR Parsers (upto constructing LALR parsing tables)

Unit – IV	Contact Hours = 8 Hours	
Syntax Directed Translation and Intermediate Code Generation:		
Syntax Directed Translation: Syntax-directed Definitions, Evaluation Order for SDD, Application of		
Syntax-directed translation: Construction of Syntax trees(Only S-attributed SDD).		
Intermediate Code Generation: Intermediate Languages, Declarat	ions, Assignments.	

Unit – V	Contact Hours = 8 Hours

**Code Generation** 

Issues in the design of code generator, the target language, Basic blocks and Flow graphs, optimization of basic blocks, a simple code generator.

# Flipped Classroom Details:

Unit No.	1	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Unit No.	Self-Study Topics
1	Applications of compiler technology.
2	Intermediate Code Generation: Boolean Expressions.

Books	i
	Text Books:
1.	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman- Compilers- Principles, Techniques
	and Tools", 2/E, Addison-Wesley, 2007 onwards.
	Reference Books:
1.	Andrew W Apple," Modern Compiler Implementation in C", Cambridge University Press, 1997
	onwards.
	E-resources
1.	https://onlinecourses.nptel.ac.in/noc21 cs07/preview

Cours	Course delivery methods Assessment methods		sment methods
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

<b>Cou</b> Lear	Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create					
At th	At the end of the course, the student will be able to Learning Level PO(s) PSO(s)					
1	nalyze and categorize the given grammar to build suitable Un 1		1,2, 5, 10	1		
1.	parser.					
2	Apply the concept of syntax directed translation schemes to	An	1,2,3,5,10	1		
Ζ.	aid intermediate code generation.					
3.	Develop intermediate code for any high level construct and	Un, Ap	1,3, 5,10	1,2		
	generate optimized target code .					

4	Utilize Compiler design to build software considering real	Ар	1,3,5,10	1,2
4.	world problem.			

Scheme of Continuous Internal Evaluation (CIE):						
Components	Addition of two IA tests	Two Assignments– (Open/Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks		
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100		

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. -Lack of minimum score in IA test will make the student Not Eligible for SEE -Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Schem	Scheme of Semester End Examination (SEE):				
1.	It will be conducted for 100 marks of 3 hours duration.				
2					
2.	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of CIE + SEE				
	should be <u>&gt;</u> 40%.				
3.	Question paper contains three parts A, B and C. Students have to answer				
	1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.				
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,				
	each Question Carries 10 Marks.				
	3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.				

CO-PO Mapping(planned)						CO-PSO (pla	Mappir nned)	ng							
CO	PO	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	РО	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	✓	√			√					√			√		
2	✓	✓	✓		✓					✓			$\checkmark$		
3	$\checkmark$		√		$\checkmark$					$\checkmark$			$\checkmark$	$\checkmark$	
4	$\checkmark$		√		$\checkmark$					$\checkmark$			$\checkmark$	$\checkmark$	

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up	
	after undergoing the course	Sectors & domains	after undergoing the course	
1	Communication, Design skills,	System Software, Tools	Software Design	
	usage of Tools	operations		

# INTRODUCTION TO DATA STRUCTURES

Course Code	22IS641	Course type	OEC	Credits L-T-P	3-0-0	
Hours/week: L - T- P 3 - 0 - 0				Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0 H	rs; P = 0 Hrs		CIE Marks 100		
	Total = 40 Hrs				100	
Flipped Classes content	5 Hours			SEE Marks	100	

Cours	Course learning objectives		
1.	To introduce elementary data structures.		
2.	To provide an insight to linear and nonlinear data structures and their applications.		
3.	To provide understanding of selection of appropriate data structures for given problem		
	scenarios.		

Pre-requisites: C Programming

Unit – I	Contact Hours = 8 Hours			
Introduction to Data Structures: Introduction to data structures, C	haracteristics of data structures,			
types of data structures				
Arrays: Introduction, Types of arrays, Representation of 1-D array in memory, Array Traversal,				
Insertion and deletion, Sorting and Searching, 2-D arrays, Matrix C	)perations.			

Unit – II	Contact Hours =7 Hours	
Linear Data Structures-Stacks: Introduction, Stack representation in Memory, Stack Operations, S		
Implementation.		

Unit – III	Contact Hours = 7 Hours	
Linear Data Structures-Queues: Introduction, Queues-Basic concept, Logical representation of		
Queues, Queue Operations, Queue Implementation, Circular Queu	Jes.	

Unit – IV	Contact Hours = 8 Hours
Linked Lists: Introduction, Linked list-Basic Concept, Implementati	on, Types of linked lists, Circular
linked list Doubly linked list.	

Unit – V	Contact Hours = 10 Hours	
Non Linear Data Structures: Trees: Introduction, Basic concept, Bir	hary Tree, Binary Tree	
Representation, Binary Tree Traversal, Binary Search tree, Expression Trees.		
Heaps: Min Heap and Max Heap and their applications.		

Flipped Classroom Details:

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Book	5
	Text Books:
1.	E. Balguruswamy, Data Structures, McGraw Hill Education(india) Private Limited.
2.	Langsam, Augenstein and Tenenbaum—Data Structures using C and C++, Prentice Hall
	India,Second edition and onwards.
	Reference Books:
1.	Ellis Horowitz, Sarataj Sahani, Fundamentals of Data Structures, Computer Science Press,
	Second edition and onwards.
	E-resources :
1.	1. https://nptel.ac.in/courses/106/102/106102064/
2.	https://www.edx.org/course/introduction-to-data-structures

Cours	e delivery methods	Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Cou	Course Outcome (COs)							
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create								
At th	ne end of the course, the student will be able to:	Learning	PO(s)	PSO(c)				
		Level	10(3)	130(3)				
1	Define and discuss basics of linear and nonlinear data structures	lln	1 10	1				
1.	and their applications.	UII	1,10					
2	Discuss advantages and disadvantages of specific data	lln	1 2 10	1				
Ζ.	structure.	UII	1,5,10					
2	Justify the use of dynamic memory blocks for design and	۸n	1 2 10	2				
5.	development of different data structures.	Ар	1,5,10					
Λ	Apply appropriate data structures for solving world problems	۸n	135910	2				
4.	and demonstrate the same through course activities.	Αh	1,3,3,9,10					

Scheme of Continuous Internal Evaluation (CIE):							
Components	Addition of two IA tests	Two Assignments (Open / Industry/ Certification etc.)	Course project (CP)/ Case study etc.	Total Marks			
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100			

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Schen	Scheme of Semester End Examination (SEE):						
1.	It will be conducted for 100 marks of 3 hours duration.						
2.	Minimum marks required in SEE to pass: Score should be <a> 35%, however overall score of CIE + SEE</a>						
	should be <u>&gt;</u> 40%.						
3.	Question paper contains three parts A, B and C. Students have to answer						
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.						
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each						
	Question Carries 10 Marks.						
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.						

CO-PO Mapping (Planned)										CO-PSO (Planne	Mapping d)	5			
0	PO	PO	PO	PSO	PSO	PSO									
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1									1			1		
2	1		1							1			1		
3	1		1							1				1	
4	1		1		1				1	1				1	

Sl. No.	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Design and implementation of efficient software as per user requirements	IT Sector/Software Industry	Software Engineer

### **INTERNET OF THINGS- A PRACTICAL APPROACH**

Course Code	2215642	Course type	OEC	Credits L-T-P	2-0-1
Hours/week: L - T- P	2 - 0 - 2		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0 H	CIE Marks	100		
	Total = 60 Hrs			100	
Flipped Classes content	05 Hours		SEE Marks	100	

Cour	rse learning objectives
1.	To design embedded system using microcontroller and peripheral circuit
2.	To demonstrate technique of interfacing the sensors and actuators with IoT development
	boards

## Required Knowledge of: Basic electronics.

Unit – I	Contact Hours = 8 Hours
Embedded Computing: Introduction, Complex Systems and Micro	processors, Embedded Systems
Design Process.	

Unit – II	Contact Hours = 8 Hours
Introduction To Internet of Things: Definition and Characteristic	s of IoT, physical design of IoT, IoT
Protocols, IoT communication models, , IoT Levels and Templates.	

Unit – III	Contact Hours = 8 Hours		
Prototyping IoT:			
IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable Devices,			
Standard Devices. Software, Technology & Protocols. Domain Spe	cific IoTs: Home Automation.		

Unit – IV	Contact Hours = 8 Hours
IoT Architecture and Protocols: Architecture Reference Model- Int	roduction Protocols- 6LowPAN,
RPL, CoAP, MQTT.	

### Unit – V

**Contact Hours = 8 Hours** 

Case Study: System design of Moving Map

Requirements Analysis of a GPS Moving Map, Specification, Architecture design, Designing hardware and software components, System integration, Formalisms for system design, Structural description, Behavioral description.

Unit No.	I	II		IV	V
No. of flipped	1	1	1	1	1
Classroom Sessions					

# List of Experiments:

Unit No.	No. of Experiments	Topic(s) related to Experiment				
I	2	Blinking LED / LEDs				
		Controlling electromagnetic relay / relays				
II	2	Temperature sensor.				
		Humidity sensor.				
111.	2	PIR Human Motion Detection.				
		Ultrasound distance Measurement.				
IV	1	Bluetooth module – wireless connectivity.				
V	1	Device and web / cloud connectivity.				

Unit No.	Self-Study Topics
1	IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable
	Devices, Standard Devices. Software
2	CPU Power Consumption.
3	Basics of Sensors and actuators.
4	Device Discovery capabilities – Registering a device, De-register a device, Querying for
	devices, Intel IoTivity, XMPP Discovery extension.

Book	5
	Text Books:
1.	Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design,
	2nd Edition, Elsevier, 2008.
2.	Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-on-Approach)", 1
	st Edition,
	VPT, 2014.
3.	Internet of Things Quick Guide – PDF
	https://www.tutorialspoint.com/internet_of_things/internet_of_things_quick_guide.htm
	Reference Books:
1.	Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications
	and Protocols", Wiley, 2012.
2.	Marco Schwartz, "Internet of Things with Arduino: Build Internet of Things Projects With the
	Arduino Platform"
	E-resources:
1.	https://blp.ieee.org/courses/sensor-networks-for-internet-of-things/

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2	2 DDT and Videos		Open Assignment (OA)/ Lab Project/ Industry	
Ζ.		۷.	assignment/Certification/ Course project	
3.	Flipped Classes	3.	Lab Test	
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination	
5.	Virtual Labs			

Cours	Course Outcome (COs)							
Learni	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create							
At the end of the course, the student will be able to:								
1.	<b>Explain and Apply</b> domain specific knowledge for developing IoT application.	Un, Ap	2,3,5	1				
2.	<b>Explain and Apply</b> skills of interfacing sensors and actuators to develop IoT applications.	Un, Ap	2,3,5	1				
3.	Analyze various web IoT web services.	An	2,3,5	1				
4.	Apply the learnings through a course activity.	Ар	9,10	3				

Scheme of Continuous Internal Evaluation (CIE):								
For integrat	For integrated courses, a lab test also will be conducted at the end of the semester. The lab test							
(COMPULSORY) will be part of the CIE. No SEE for Lab.								
THEORY								
IA test	IA test	Project Phase 1	Project Phase 2	Project report	Total			
(Theory)	(Lab)	FIOJECT FILASE I	Floject Flase Z	Fiojectiepoit				
25 marks 15 marks 25 marks 25 marks 10 marks 100 marks								
-Theory IA t	est should be o	of one-hour duratior	۱.					
-Lab IA test	should be of t	wo/three-hour durat	tion.					
-Project bat	ch will ideally	consist of 2 students	(maximum of 3).					
-Project Pha	ase 1 presentat	ion will be conducte	d after 6 weeks and	Project Phase 2 pr	esentation will be			
conducted a	after 13 weeks	from the start of the	e semester.					
-Submission of Project report is compulsory.								
Eligibility for SEE:								
1. 40% and	1. 40% and above (16 marks and above) in theory component							

2. 40% and above (24 marks and above) in project component

3. Not eligible in any one of the two components will make the student Not Eligible for SEE

Sei	Semester End Examination (SEE):						
1.	It will be conducted for 100 marks having 3 hours duration.						
	Lab Open ended program/problem/experiment						
	Write-up & execution (1 open ended expt)- (20 marks write-up +	50 marks					
	20 marks algorithm/flowchart + 10 marks execution)						

	Project	evaluation							
	a.	Initial write up stating the objectives, methodology and the outcome	10 marks						
2.	b.	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes	30 marks	100 marks					
	C.	related to a section of the project. Viva-voce	10 marks						
3.	3. Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of								
	CIE + SEE should be $\geq$ 40%.								
4.	SEE will be conducted in project batches by Internal & External examiners together.								

CO-PO Mapping (planned)								CO-PSO (planne	Mapping d)						
~~~	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		~	1		~								✓		
2		√	~		1								~		
3		<	~		~								~		
4									1	1					1

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up		
	after undergoing the course	Sectors & domains	after undergoing the course		
1	IoT application design skills	Telecommunication	Project manager		
2	Networking	Automobiles	Network Designer		

INTRODUCTION TO BIG DATA

Course Code	2215643	Course type	OEC	Credits L-T-P	3 - 0 - 0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 00 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	05 Hours			SEE Marks	100

Course Learning Objectives:

1.	To understand Big Data technology and its use in processing huge commercial data
2.	To recognize Hadoop components for data analytics
3.	To be able to analyze data with Spark
4.	To apply data transformation tools

Required Knowledge: Relational Database Management System and basics of Programming language.

Unit – I: Understanding Big Data	Contact Hours = 8 Hours
Introduction: Introduction to Big Data, Characteristics of Data and	Big Data, Evolution of Big Data,
Definition of Big Data, Challenges with big data, Why Big data?	Data Warehouse environment,
Traditional Business Intelligence versus Big Data. State of Practice in	Analytics, Key roles for New Big
Data Ecosystems, Examples of Big Data Analytics. (Text Book 1: Chap	1,2 & Text Book 2: Chap. 1)

Unit – II: All About Hadoop

Just the Facts: The History of Hadoop; Components of Hadoop: The Hadoop Distributed File System, The Basics of MapReduce, Hadoop Common Components; Getting Data into Hadoop: Basic Copy Data, Flume (Text Book 1: Chap.4)

Unit – III: MapReduce	Contact Hours = 8 Hours	
Data Format, Analyzing the Data with Hadoop, Scaling out, Hadoop Streaming;		
How MapReduce Works: Anatomy of a MapReduce Job Run, Failu	res, Job Scheduling, Shuffle and	
sort (Text Book 3: Chap. 2, 6)		

Unit-IV: Introduction to Data Analysis with Spark	Contact Hours = 8 Hours
What is Apache Spark?; A unified stack; Who uses Spark, and for	what?; Introduction to core spark
concepts; Standalone applications (Text book 4: Chap 1,2)	

Unit-V: Programming with RDDs

Contact Hours = 8 Hours

Contact Hours = 8 Hours

RDD Basics; Creating RDDs; RDD operations; Passing functions to Spark; Common Transformations and actions; Persistence(caching) (Text book 4: Chap 3,4)

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1	Introduction & Characteristics of NoSQL, Types of NoSQL Data Models
2	Introduction and classification of Big data analytics and Enterprise Class Hadoop
3	Task Execution in MapReduce

	Books
	Text Books:
1.	Paul C. Zikopoulos Chris Eaton Dirk deRoos Thomas Deutsch George Lapis- Understanding Big Data-Analytics for Enterprise Class & Hadoop and Streaming Data - McGraw-Hill Companies Copyright © 2018
2.	Seema Acharya, Subhashini Chellappan- Big Data & Analytics 2 nd Edition - Wiley Publishing Copyright ©2016
3.	Tom White- Hadoop: The Definitive Guide- 5 th Edition - O'Reilly Apr '23
4.	Andy Konwinski, Patrick Wendell, Holden Karau, Matei Zaharia-Learning Spark- Lightning-Fast Data Analysis- O'REILLY 2 nd Edition
	References:
1	Newton & Richard- Project management step by step: how to plan and manage a highly successful project: Willy's Publication 2020
	E-resources (NPTEL/SWAYAM Any Other)- mention links
1.	https://nptel.ac.in/courses/106/104/106104189/

Course delivery methods			Assessment methods
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Cou	Course Outcome (COs)					
Lea	Learning Levels: 1- Remember; 2- Understand; 3- Apply; 4 - Analysis; 5 - Evaluate; 6- Create					
At the end of the course, the student will be able to: Learning Level PO(s) PSO			PSO(s)			
1.	Explain Big Data and describe Characteristics useful in different fields of computations.	Re	1,12	1,2,3		

2.	Interpret significance of Big Data as NoSQL non-tabular databases by learning Hadoop components and HDFS	Un	2,4,5	1,2, 3
3.	Make use of MapReduce component in Big data Processing	Ар	4, 5	1,2,3
4.	Analyze the real world dataset using Spark tool	An	1,2,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks	
Marks	30+30 = 60	10+10 =20	20 mark (with report & presentation)	100	
-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. -Lack of minimum score in IA test will make the student Not Eligible for SEE -Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.					

Scł	Scheme of Semester End Examination (SEE):		
1.	It will be conducted for 100 marks of 3 hours duration.		
2.	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of CIE +		
	SEE should be > 40%.		
3.	Question paper contains three parts A,B and C. Students have to answer		

	CO-PO Mapping (planned)				CO-PSO Mapping (planned)										
C O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	РО 7	PO 8	PO 9	Р О 10	Р О 11	Р О 12	PSO 1	PSO 2	PSO 3
1	٧											٧	٧	٧	٧
2		٧		٧	V								٧	٧	٧
3				٧	V								٧	٧	٧
4	٧	٧										٧	٧	٧	٧

SI	Skill & competence	Applicable Industry Sectors	Job roles students can takeup
No	enhanced after undergoing	& domains	after undergoing the
	the course		Course
	Big data management & its	Telecommunications,	Data Scientists
1	associated applications in	Advertising and marketing,	Analytics
	intelligent business and	transportation	Managers/Directors
	scientific computing		
	Acquire fundamental data	Banking and Financial	Business Analysts Big
2	analytical techniques using	Services, Government,	Data Architects
	Hadoop, Map Reduce, NoSQL	Media and Entertainment	
	Interpret business models,	Meteorology, Healthcare	NoSQL DBAs
3	apply software tools to big	Cyber security, Education	Hadoop Experts
	data analytics.		

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	2215644	Course type	OEC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	nt 05 Hours		SEE Marks	100	

Cours	Course learning objectives			
1.	To understand the fundamental concepts and principles of Artificial Intelligence and Machine			
	Learning.			
2.	Explore various supervised and unsupervised learning algorithms and their usage in solving			
	problems related to the current scenario.			
3.	To learn designing, training, and evaluating deep learning models.			

Pre-requisites: NIL

Unit – I	Contact Hours = 8 Hours
Introduction to AI. What is AI, Foundations of AI, Early history of AI	, Future of AI, Intelligence of AI. Brain
size and performance, sensing and movement, Comparative Intelli	igence.

Unit – II	Contact Hours = 8 Hours			
Introduction to Machine Learning, What and why ?, Types of	Machine Learning, Supervised and			
Unsupervised, Reinforcement Learning, Theory of learning, Feasibility of learning, error and noise,				
Training versus testing.				

Unit – III	Contact Hours = 8 Hours
Supervised Learning- Linear and non linear examples, Linear regre	ession ,Naïve Bayes classifier, decision
Trees, KNN classifier, Support Vector Machines. Clustering basics	s, K-means Clustering, self-organizing
maps.	

Unit – IV	Contact Hours = 8 Hours
Fundamentals of Neural Networks - neuron, activation functions,	oss functions, Introduction to
Image Processing.	

Unit	– V
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Contact Hours = 8 Hours

Deep Learning CNN - CNN fundamentals, CNN layers, building CNN from scratch, transfer learning. Deep Learning RNN - RNN fundamentals, RNN layers.

Flipped Classroom Details:

Unit No.	I	II	111	IV	V
No. for Flipped	2	2	2	2	2
Classroom Sessions					

Unit No.	Self-Study Topics
	Linear Algebra, Principle Component Analysis.
IV	Back propagation.

Books	5
	Text Books:
1.	Kevin Warwick, "Artificial Intelligence the basics", Typeset in Bembo by Wearset Ltd,
	Boldon, Tyne and Wear, Library of Congress Cataloging in Publication Data Warwick,K. ISBN: 978-0-415-56482-3 (hbk).
2.	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3.	Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Pearson, Third Edition,
	2014.
4.	"Deep Learning" by Ian Goodfellow, Yoshua Bengio and Aaron Courville
	Reference Books:
1.	Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense
	of Data", Cambridge University Press, 2012.
	E-resources
1.	https://www.udemy.com/artificial-intelligence
2.	https://www.edx.org/course/artificial-intelligence-ai-columbiax-csmm-101x-4
3.	https://in.mathworks.com/
4.	https://www.classcentral.com/course/independent-practical-deep-learning-for-coders-
	7887

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1. IA tests		
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification	
4.	Online classes	4.	Course Project	
		5.	Semester End Examination	

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create At the end of the course, the student will be able Learning PO(s) PSO(s) to: Level Explain and apply AI and ML algorithms to address 1,2,3 1 1. Un, Ap various requirements of real-world problems. Use modern tools to create AI and ML solutions and 1,2,3,5 1,2 2. Ap ,An Analyze the results. Ар Develop practical AI solutions for real world problems to 1,2 3,4,5,9,10,12 demonstrate effective teamwork , communication and 3. problem solving skills in AI Project.

Scheme of Continuous Internal Evaluation (CIE):								
Components	Addition of two IA tests	Two Aassignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks				
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100				

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	Scheme of Semester End Examination (SEE):					
1.	It will be conducted for 100 marks of 3 hours duration.					
2.	Minimum marks required in SEE to pass: Score should be \geq 35%, however overall score of CIE + SEE should be \geq 40%.					
3.	Question paper contains three parts A,B and C. Students have to answer					
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.					
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each					
	Question Carries 10 Marks.					
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.					

CO-PO Mapping (Planned)									CO-PS (Planr	iO Mapp ned)	oing				
С	РО	РО	РО	РО	PO	PO	PO	РО	РО	PO	PO	PO	PSO	PSO	PSO
0	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	\checkmark	\checkmark	\checkmark										√		
2	\checkmark	~	\checkmark										√	~	
3			\checkmark	\checkmark	\checkmark				✓	✓		~			
5															

SI No	Skill & competence enhancedApplicableafter undergoing the courseIndustry Sectors &domainsIndustry Sectors &		Job roles students can take up after undergoing the course
1	A good understanding of what AI and ML is, its applications, and its use cases	Healthcare, Education, Manufacturing, Marketing, Retail	Al Engineer, Al Data Analyst

LINEAR ALGEBRA

Course Code	22MAT661	Course type	OEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; $T = 0$ Hrs; $P = 0$ Hrs			CIE Marks	100
Flipped Classes content	10 Hours	urs SEE Marks		100	

Course learning objectives

This co	ourse will enable students to:
1.	Basics in Abstract Algebra.
2.	Find the solution of the system of linear equations using matrix operations.
3.	Identify vector spaces and subspaces
4.	Transform a vector space of one dimension into another
5	Factorize a given matrix using different methods

Pre-requisites: Basic algebra. Matrix theory

Unit – I	Contact Hours = 8 Hours

Basic Abstract Algebra: Groups, Permutation Groups, Isomorphism, Fields, finite fields and examples.

Unit – II	Contact Hours = 8 Hours				
Vector Spaces: Vector spaces; subspaces; bases and dimension; coordinates; summary of row-					
equivalence; computations concerning subspaces.					

Unit – III	Contact Hours = 8 Hours				
Linear Transformations: Linear transformations; algebra of linear transformations; isomorphism;					
representation of transformations by matrices; linear functional; I	nverse of a linear transformation.				

Unit – IV	Contact Hours = 8 Ho	urs
Inner Product Spaces: Inner products; inner product spaces; ortho	gonal sets and	projections;
Gram-Schmidt process; QR-factorization.		

Unit – V	Contact Hours = 8 Ho	urs			
Symmetric Matrices and Quadratic Forms: Diagonalization; quadra	atic forms;	constrained			
optimization; Singular value decomposition.					

Flipped Classroom Details

Unit No.	I	II		IV	V
No. of Flipped	2	2	2	2	2
Classroom Sessions					

Unit No.	Self-Study Topics
1	Fields and Rings with examples
2	Rank, nullity, Column space, Row space
3	Kernel of transformation, Inverse linear transformation
4	Applications of orthogonal vectors.
5	Least square solution of linear system of equations.

Books	5
	Text Books:
1.	John B. Fraleigh, "A First Course in Abstract Algebra," Narosa Publication 3rd edition onwards.
2.	David C. Lay, "Linear Algebra and its Applications," Pearson Education (Asia) Pte. Ltd, 2005 3rd
	edition onwards.
3.	Kenneth Hoffman and Ray Kunze, "Linear Algebra," Pearson Education (Asia) Pte. Ltd/2004
	2nd edition onwards.
	Reference Books:
1.	Bernard Kolman and David R. Hill, "Introductory Linear Algebra with Applications", Pearson
	Education (Asia) Pte. Ltd, 7th edition 2003 onwards.
2.	Gilbert Strang, "Linear Algebra and its Applications", Thomson Learning Asia, 2003 3rd edition
	onwards.
	E-resources:
1.	https://onlinecourses.nptel.ac.in/noc24_ee138/preview
2.	https://onlinecourses.nptel.ac.in/noc24_ma69/preview

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification	
3.	Flipped Classes	3.	Course Project	
4.	Online classes	4.	Semester End Examination	

Cou	Course Outcome (COs)										
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create											
At t	At the end of the course, the student will be able to:										
		Level	10(3)	1 30(3)							
1.	Understand of algebraic structures.	Un	1	1							
2.	Find bases and dimension of vector spaces.	Ар	1	1							
3.	Understand the matrix theory in Linear transformation and applications	Un	1	1							
4.	Apply techniques of constrained optimization and singular value decomposition for problems arising in power/control system analysis, signals and systems.	Ар	1	1							

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments– (Open/Industry/Certificatio n etc)	Course project(CP)/ Case study etc	Total Marks						
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)							
Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by										
BOS) can be considered as a Course activity and awarded maximum of 10 marks. -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.										

Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scł	neme of Semester End Examination (SEE)
1	It will be conducted for 100 marks of 3 hours duration.
2	Minimum marks required in SEE to pass: Score should be \geq 35%, however overall score of CIE + SEE
	should be <u>></u> 40%.
3	Question paper contains three parts A,B and C. Students have to answer
	1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.

CO-PO Manning (Planned)							CO-PS	0 М	apping						
								(Plann	ied)						
0	PO	PO	PO	РО	РО	PO	PSO	PSO	PSO						
0	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	~												~		
2	~												~		
3	~												~		
4	~												~		
APPLIED STATISTICS

Course Code	22MAT662	Course type	OEC	Credits L-T-P	3-0-0
Hours/week: L - T- P		Total credits	3		
Total Contact Hours	L = 40 Hrs; T = 0	Hrs; P = 0 Hrs	CIE Marks	100	
	10tal = 40 Hrs				
Flipped Classes content	10 Hours			SEE Marks	100

Cour	Course learning objectives						
1.	Understand different terminology in statistics						
2.	Get knowledge about various Dispersion parameters moments skewness						
3.	Get familiar with Multiple Correlation and Regression						
4.	Get acquainted with various Analysis of Variance (ANOVA) designs .One way and two way .						
	Understand Non Parametric Tests processes.						

Pre-requisites : : Basic statistics, Basic probability

Unit – IContact Hours = 8 HoursDescriptive Statistics: Discrete and continuous data, Simple descriptive statistics - Mean, Median,
Quantiles, percentiles, and quartiles, Variance, and standard deviation, Standard errors of estimates,
Inter quartile range. Graphical statistics - Histogram, frequency polygon, and ogives, Stem-and-leaf
plot, Box plot, Scatter plots, and time plots.

Unit – II

Contact Hours = 8 Hours

Moments, Skewness and Kurtosis:

Introduction to moments, Moments about the mean, Skewness, Negative Skewness, Positive Skewness, Kurtosis, Mesokurtic, Leptokurtic, Platykurtic -Practical, engineering related examples

Unit – III	Contact Hours = 8 Hours
Multiple Correlation and Regression, Curve fitting: Multiple co	prrelation and regression. Bivariate,
Trivariate. Probable error of correlation coefficient. Spearman's ra	nk correlation coefficient.
Curvilinear regression. Standard error of estimate or residual var	iance. Least square Curve fitting and
related error computation. Engineering related examples	

Unit – IV	Contact Hours = 8 Hours
Analysis of Variance (ANOVA): The Purpose of Analysis of Variance	e. One_ Way Classification. Variation
within treatments. Variation between treatments. Total Variation.	Expected values of the variation.
Distribution of variations' ANOVA Tables. Two-way classification	Variations for two-way classification.
Experiments with replication. Experimental Design	

Unit – V

Contact Hours = 8 Hours

Non Parametric Tests: Introduction The Sign Test. The Mann-Whitney U Test. The Kruskal- Wallis H Test corrected for Ties. The run test for randomness. Further Applications of the Run test. Spear man's Rank Correlation

Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped	2	2	2	2	2
Classroom Sessions					

Unit No.	Self-Study Topics
1	Percentile ranks, quartile ranks.
2	Skewness and Kurtosis in Data Science.
3	Multiple regression in Machine Learning.
4	Calculate ANOVA using MS excel.
5	Wilcoxon's signed rank test, Kolmorogov-Smirnov test, Jonckheer test

Books	5
	Text Books:
1.	B. S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42 nd Edition, 2012
	and onwards.
2.	Fundamentals of Mathematical Statistics by S.C.Gupta and V.K.Kapoor., Sultan Chand and Sons,
	2009 and onwards.
	Reference Books:
1.	Probability and statistics Schaum series second edition TAT Mc Graw Hill publication
2.	R Ganeshan -Research Mehtodology MJP Publishers
	E-resources:
1.	https://archive.nptel.ac.in/courses/111/102/111102111/ (Prob and Stochastic)
2.	https://archive.nptel.ac.in/courses/111/104/111104147/(Sampling and Linear regression)

Course delivery methods		Assessment methods				
1.	Chalk and Talk	1.	IA tests			
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)			
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification			
4.	Online classes	4.	Course Project			
		5.	Semester End Examination			

Co ι	urse Outcome (COs)								
Learning Levels: Re - Remember; Un - Understand; Ap - Apply;An - Analysis; Ev - Evaluate; Cr - Create									
At t	the end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)					
1.	To Understand different measures of Statistics	Un	1	1					
2.	To Understand the concept Moments, Skewness and Kurtosis	Un	1	1					
3.	To Apply methods of Multiple Correlation & Regression, Curve fitting and Analysis of Variance(ANOVA) for tabular data.	Ар	1	1					
4.	To Understand the Non Parametric Tests	Un	1	1					

Components	Addition of two IA tests	IA tests Certification of two IA tests Certification of two tests tests Certification tests test		Total Marks		
Marks	30+30 = 60	10 + 10 = 20	20 marks 100 (with report & presentation)			
-Certification e by BOS) can be	arned by passing the considered as a Cour	standard Online MOOCs or se activity and awarded r	course (1 course of at least 8 ho maximum of 10 marks.	urs defined		

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scł	neme of Semester End Examination (SEE)
1	It will be conducted for 100 marks of 3 hours duration.
2	Minimum marks required in SEE to pass: Score should be \geq 35%, however overall score of CIE + SEE
	should be \geq 40%.
3	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.

CO-P	CO-PO Mapping (Planned)								CO-PSO (Plannec	Mapping I)					
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	~												\checkmark		
2	\checkmark												\checkmark		
3	\checkmark												\checkmark		
4	\checkmark												\checkmark		

NANOSCIENCE AND NANOTECHNOLOGY

Course Code	22CH641	Course type	OEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0	Total credits	3		
Total Contact Hours	L = 40 Hrs; T = 0 H	CIF Marks	100		
	Total = 40 Hrs		100		
Flipped Classes content	10 Hours			SEE Marks	100

Course	Course learning objectives							
1.	To provide a comprehensive overview of synthesis and characterization of nanoparticles,							
	nanocomposites and hierarchical materials with nanoscale features.							
2.	To provide the engineering students with necessary background for understanding various							
	nanomaterials characterization techniques							
3.	To develop an understanding of the basis of the choice of material for device applications							
4.	To give an insight into complete systems where nanotechnology can be used to improve our							
	everyday life							

Pre-requisites: NIL

Unit – I	Contact Hours = 8 Hours						
Nanotechnology, Frontier of future-an overview, Length Scales, Variation of physical properties from							
bulk to thin films to nanomaterials, Confinement of electron in OD,	1D, 2D and 3D systems						
Synthesis of Nanomaterials: Bottom-Up approach: Chemical Route	s for Synthesis of nanomaterials-						
Sol-gel, Precipitation, Solution Combustion synthesis, SILAR Techni	que, Hydrothermal method.						
LABORATORY ACTIVITIES PLANNED							
1) Preparation of silver nanoparticles and characterization of	particle size by optical spectroscopy						
2) Preparation of ZnO nanoparticles by combustion technique	e						
3) Preparation of Al2O3 nanoparticles by precipitation metho	od						
4) Preparation of Silica nanoparticles by sol-gel method							
5) Hydrothermal synthesis of metal oxide nanoparticles							

Unit – II	Contact Hours = 8 Hours
Basic principles and instrumentations of Electron Micros	scopy –Transmission Electron Microscope,
Scanning Electron Microscope, Scanning Probes- Scann	ing Tunneling microscope, Atomic Force
Microscope –different imaging modes, comparison of SEN	1 and TEM, AFM and STM, AFM and SEM,
Porosity (BET method), Zeta potential	
Basic principles of working of X-ray diffraction, derivation	of Debye-Scherrer equation, numericals on
Debye Scherrer equation,	

Unit – III

Contact Hours = 8 Hours

Electronic and optoelectronic properties: Explanation of Ballistic transport-comparison with superconductor, Coulomb blockade-property-in quantum dot circuit/single electron transistor, Diffusive transport Dielectric Properties: Polarization, Ferroelectric Behaviour

Optical Properties: Photoconductivity, Optical absorption and transmission, Plasmons and Excitons, Luminescence- Phosphorescence and Fluorescence.

Unit – IV

Contact Hours = 8 Hours

Solar cells: First generation, Second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells.

Batteries: Lithium ion battery- working, Requirements of anodic and cathodic materials, classification based on ion storage mechanisms, limitations of graphite anodes, Advances in Cathodic materials, Anodic materials, Separators

Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes

Unit – V

Contact Hours = 8 Hours

Switching glasses, Semiconductor devices including LEDs and Photonic crystals (1D, 2D and 3D) and their applications, Display devices

TiO2 and ZnO based photo catalysts, Photocatalysis Mechanism, Nano filtration membranes-Dead end filtration method, Super hydrophobic materials-Lotus effect

Flipped Classroom Details:

Unit No.	I	II	III	IV	v
No. for Flipped Classroom Sessions	2	2	2	2	2

Unit No.	Self-Study Topics
1.	Top-Down approach- Ball milling technique, Sputtering, Laser Ablation.
2.	Optical Spectroscopy-Instrumentation and application of IR, UV/VIS (Band gap
	measurement)
3.	Magnetic properties: Nanomagnetism, Magnetoresistance, Super Para Magnetism-Neel
	Relaxation time, blocking temperature etc.
	Mechanical Properties of nanomaterials
4.	Super capacitors: Introduction, construction and working of supercapacitor
5.	Nanosensors: Electrochemical sensors, Temperature Sensors, Chemical and gas Sensors,
	Light and radiation sensors.

Books	
	Text Books:
1.	Nano Materials – A.K. Bandyopadhyay/ New Age Publishers
2.	Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U.
	Kulkarni, Springer Series in Materials Science
3.	Nano Essentials- T. Pradeep/TMH

	Reference Books:
1.	Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
2.	Understanding Nanotechnology, Scientific American 2002
3.	Nanotechnology, M. Ratner and D. Ratner, Prentice Hall 2003
4.	Nanotechnology, M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, CRC Press
	Boca Raton 2002

	Course delivery methods	Assessment methods			
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification		
3.	Flipped Classes	3.	Course Project		
4.	Online classes	4.	Semester End Examination		

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create At the end of the course, the student will be able to: Learning PO(s) PSO(s)

At the	end of the course, the student will be able to:	Learning	PO(c)	PSO(c)
		Level	PO(3)	P30(3)
1.	Demonstrate the synthesis of nanoparticles by various techniques.	[L2]	1	1
2.	Explain working of basic instruments used in characterization of nanoparticles.	[L2]	1	1
3.	Discuss the application of nanotechnology to mechanical and civil domains	[L2]	1,4	1
4.	Classify the nanomaterials based on the dimensions.	[L3]	1	1
5.	Assess the suitability of nanomaterials for various device applications.	[L4]	1,6,12	1

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments (Open/Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):

- 1. It will be conducted for 100 marks of 3 hours duration.
- 2. Minimum marks required in SEE to pass: Score should be \geq 35%, however overall score of CIE + SEE should be \geq 40%.

3. Question paper contains three parts **A,B and C**. Students have to answer

1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.

2. From Part B answer 5 out of 10 questions choosingany one full question from each unit, each Question Carries 10 Marks.

3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.

	CO-PO Mapping (Planned)								CO-P	SO Map Planned	oping I)				
0	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	\checkmark														
2	\checkmark														
3	\checkmark			\checkmark											
4	\checkmark														
5	\checkmark					\checkmark						\checkmark			

MARKETING MANAGEMENT

Course Code	22INT61	Course type	OEC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	Classes content 10 Hours		SEE Marks	100	

Cours	Course learning objectives		
1.	To make students understand the fundamental concepts of marketing and environment in which		
	marketing system operates.		
2.	To gain knowledge on consumer buying behavior and influencing factors		
3.	To describe major bases for segment marketing, target marketing, and market positioning.		
4.	To develop a Conceptual framework, covering basic elements of the marketing mix.		
5.	To understand fundamental premise underlying market driven strategies and hands on practical		
	approach.		

Pre-requisites: The student should have basic awareness of market, products, services, buying-selling transaction and promotional activities

Unit – I	Contact Hours = 8 Hours
Introduction to Marketing: Importance of marketing, Definition	ns of market and marketing, Types of
Needs, Elements of Marketing Concept, Functions of Marketing, N	1arketing V/s Selling, 4P's of
Marketing, 7P's of service marketing, Marketing Environment.	

Unit – IIContact Hours = 8 HoursAnalyzing Consumer Behavior: Meaning and Characteristics, Importance of consumer behavior, Factors
influencing Consumer Behavior, buying behavior, personal factors, psychological factors and cultural
factors. Consumer Buying Decision Process, Buying Roles, Buying Motives, The black box model of
consumer behavior. Characteristics of generation Z consumers

Unit – III	Contact Hours = 8 Hours
Product Management, Pricing and Branding: product levels,	product hierarchy, classification of
products, Managing Product Life Cycle, New Product Development	t, Packing as a marketing tool, Role of
labeling in packaging. Types of Pricing Strategies	
Concept of Branding, Brand Equity, branding strategies	

Unit – IV	Contact Hours = 8 Hours
Distribution and Promotion: Roles and purpose of Marketing	Channels, Factors Affecting Channel
Choice, Integrated Marketing Communications (IMC)-Tools-Adv	vantages, Disadvantages, Advertising
Objectives, Advertising Budget, Advertising Copy, AIDA model,	

Unit – VContact Hours = 8 HoursMarket Segmentation, Targeting and Brand Positioning:Concept of Market Segmentation, Benefits,
Requisites of Effective Segmentation, Bases for Segmenting Consumer Markets, Market Segmentation
Strategies. Types of Segmentation. Targeting - Bases for identifying target Customer target Marketing
strategies, Positioning - Meaning, Tasks involved in Positioning.

Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Unit No.	Self-Study Topics
1	Elements of Digital and social media Marketing, Green Marketing, Neuro Marketing, Sensory
	Marketing and societal marketing concept
2	Study the buying pattern based on demographics of consumers
3	Take any FMCG product and study the PLC, branding equity and pricing of that product.
4	Draft advertising copy

Books	
	Text Books:
1.	Kotler, P., Keller, K. L., Ang, S. H., Tan, C. T., & Leong, S. M. Marketing management: an Asian
	Perspective. Pearson Publication, (2018).
2.	Kotler, P., Kartajaya, H., & Setiawan, I. Marketing 4.0: Moving from traditional to digital. John Wiley
	& Sons, (2016).
3.	Ramaswamy, Namakumari, Marketing Management: Global Perspective, McGraw-Hill, (2019
	Reference Books:
1.	Dhruv Grewal, Michael Levy, Marketing Management, McGraw-Hill, (2018)
2.	Baines, P., Fill, C, Page, K. and Sinha, P.K, Marketing, Asian edition, Oxford University Press, New
	Delhi (2013)
	E-resources:
1.	https://youtu.be/5fdx5Laavkc
2.	https://youtu.be/ob5KWs3I3aY?t=131

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification	
3.	Flipped Classes	3.	Course Project	
4.	Online classes	4.	Semester End Examination	

Cour	se Outcome (COs)				
Lear	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create.)				
At th	At the end of the course, the student will be able to : Learning PO(s) PSO(s) Level				
1.	Understand the basics concepts for Marketing and business environment	2	1	1	
2.	Demonstrate the application of the knowledge with respect to strategic and tactical use of the primary decision-making areas of marketing	2	2	1	
3.	Demonstrate and Apply the critical thinking ability needed to ensure Product and Brand sustainability	3	1	2	
4.	Evaluate the needed strategies for distribution and promotion of products and services	4	6	3	

Components	Addition of two IA tests	Two Assignments (Open/Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sch	neme of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be \geq 35%, however overall score of
	CIE + SEE should be \geq 40%.
3.	Question paper contains three parts A,B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)							CO-PSO Mapping (Planned)								
со	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	✓												√		
2		\checkmark											\checkmark		
3	\checkmark													\checkmark	
4						\checkmark									\checkmark

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Strategic decision making	Retail, Service	Product Managers
2	Branding knowledge	Retail, Service	Brand Managers
3	Business Communication	Retail, Service, Branding	Advertising Consultants

EMPLOYABILITY SKILLS II

Course Code	22AESIS66 Course type AEC		AEC	Credits L-T-P	1-0-0
Hours/week: L - T- P	Total credits	1			
Total Contact Hours	L = 30 Hrs; T = 0 Hrs	CIF Marks	100		
	Total = 30 Hrs		100		

Course	Course learning objectives				
1.	Skill development is/are personal attributes that influence how well an individual works or				
	interacts with others.				
2.	These skills make it easier to form relationships with people, create trust and dependability,				
	and lead teams.				
3.	In essence, they are essential for individual success in the workplace, their company's success,				
	and their personal life also				

Pre-requisites: NA

Unit – I	Contact Hours = 4 Hours				
Quantitative Aptitude: Ratios, Proportions and Variations (2 Hours), Partnership (1 Hour), Time and					
Work (2 Hours)					
Logical Reasoning: Seating Arrangement (1 Hour)					

Unit – II	Contact Hours = 4 Hours				
Quantitative Aptitude: Time, Speed and Distance (2 Hours), Trains, Boats and Streams (2 Hours)					
Verbal Ability: Reading Comprehension (2 Hours)					

Unit – III	Contact Hours = 4 Hours			
Quantitative Aptitude: Permutation and Combination (2 Hours), Ages (1 Hour)				
Logical Reasoning: Data Arrangement (1 Hour)				
Soft Skills: Interview Skills (1 Hour), Resume Building (1 Hour).				

Unit – IV	Contact Hours = 4 Hours			
Quantitative Aptitude: Probability (2 Hours)				
Logical Reasoning: Clocks and Calendars (2 Hours), Syllogisms (2 Hours)				

Unit – V	Contact Hours = 4 Hours			
Quantitative Aptitude: Data Interpretation (2 Hours)				
<i>Logical Reasoning:</i> Data Sufficiency (2 Hours)				
Verbal Ability: Ordering of Sentences (1 Hour), Critical Reasoning	(1 Hour)			

Books					
	Text Books:				
	Name of the author(s), Title of the Book, Publisher, Edition/Yearand onwards				
1.	The Aptitude Triad , BIZOTIC				
2.	How to prepare for Quantitative Aptitude for CAT & other Management Examinations, Arun				
	Sharma, McGraw Hill Education(India) Private Limited, 4 th Edition, 2018.				
3.	How to prepare for Logical Reasoning for CAT & other Management Examinations, Arun Sharma,				
	McGraw Hill Education(India) Private Limited, 8 th Edition, 2018.				
4.	How to prepare for Verbal Ability and Reading Comprehension for CAT & other Management				
	Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 8 th Edition, 2018.				
5.	How to prepare for Data Interpretation for CAT & other Management Examinations, Arun				
	Sharma, McGraw Hill Education(India) Private Limited, 5 th Edition, 2018.				

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes	
		3.	Assignments	
		4.	Seminar	

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply;An - Analysis; Ev - Evaluate; Cr - Create					
At th	e end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)	
1.	Clear the Aptitude round of recruiters during placements	L2	10,12	1	
2.	Perform confidently during the Interview process	L2	10,12	1	
3.	Develop resumes that are grammatically correct and written in Business English	L2	10,12	1	
4.	Develop behaviors that are appropriate for a professional	L2	10,12	1	

Components	Addition of two IA tests	Online Quiz	Addition of two Assignments	Total Marks							
Marks	30+30 = 60	20	10+10 =20	100							
- Writing 2 IA tests are compulsory											

	CO-PO Mapping (Planned)										CO-P	SO Map Planneo	oping I)		
6	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PO	PSO	PSO	PSO
0	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1										\checkmark		<			
2										\checkmark		\checkmark			
3										\checkmark		\checkmark			
4										\checkmark		\checkmark			

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up			
	after undergoing the course	Sectors & domains	after undergoing the course			
1	Logical Thinking	IT Industry	Software Engineer			
2	Problem Solving	Automotive	Developer			
3	Communication Skills	Education Sector	Project Manager			

ROBOTIC PROCESS AUTOMATION LAB

Course Code	22ISL68	Course type	PCCL	Credits L-T-P	0-0-1
Hours/week: L - T- P	0 - 0 - 2		Total credits	1	
Total Contact Hours	L = 0 Hrs; T = 0 Hrs	s; P = 20 Hrs	CIF Marks	50	
	Total = 20 Hrs				
Flipped Classes content	-			SEE Marks	50

	Course learning objectives									
1.	To understand importance and need of automation in view point with RPA.									
2.	To discuss the different types of variables, Control Flow and data manipulation techniques									
3.	To Understand Image, Text, Data Tables, Recording and Email automation using RPA tool									
4.	To build and develop real time automation scenarios using RPA tool									

Required Knowledge of : any programming language

Lab Experiment – I	Contact Hours = 2 Hours
Managing Variables	
Lab Experiment – 2	Contact Hours = 2 Hours
Using Arguments and Importing New Namespaces	
Lab Experiment – 3	Contact Hours = 2 Hours
If Else Statements, The Switch Activity – control statements	
Lab Experiment – 4	Contact Hours = 2 Hours
Do While Activity, For activity - loops	
Lab Experiment – 5	Contact Hours = 2 Hours
Data Manipulation - Scalar variables, collections	
Lab Experiment – 6	Contact Hours = 2 Hours
Data Manipulation - collections and Tables	
Lab Experiment – 7	Contact Hours = 2 Hours
Basic and Desktop Recording	
Lab Experiment – 8	Contact Hours = 2 Hours
Web Recording - Input/output Methods - Screen Scraping - Data S	Scraping
Lab Experiment – 9	Contact Hours = 2 Hours
Exception Handling	
Lab Experiment – 10	Contact Hours = 2 Hours
Email Automation	

Books	
	Text Books:
1.	Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing
	Release Date: March 2018ISBN: 9781788470940
2.	Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate
	Repetitive Tasks & Become An RPA Consultant
	E-resources:
1.	https://www.uipath.com/rpa/robotic-process-automation

	Course delivery methods	Assessment methods			
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments		
2.	Virtual Labs (if present)	2.	Journal writing		
3.	Chalk and Talk	3.	Lab project/ Open ended experiment		
4.		4.	Lab Test		
5.		5.	Semester End Examination		

Cours	Course Outcome (COs)											
Learn	ing Levels:Re - Remember; Un - Understand; Ap - Apply; An - A	Analysis; Ev -	Evaluate; Cr - (Create								
At th	ne end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)								
1.	Understand the Basic Programming concepts and the underlying logic/structure and applications of RPA in automation.	Un	1,2	1								
2.	Understand variables, control flow and data manipulation technique used in RPA tool.	Un	1,5	1,2								
3.	Apply the RPA recording and advanced automation techniques and exception handling to given applications.	Ap, Cr	3,4,5	1,2,3								
4.	Apply the RPA concepts to develop solutions for a real time programs/applications .	Ap, Cr	1,2,3,4,5,6, 8,9,10,12	1,2,3								

Conduction of experiments & viva-voce	Journal	Lab project/ Open ended expt	Lab Test	Total							
20 marks	5 marks	10 marks	50 marks								
Conduct of Lab: 1. Conduction of the experime 2. Calculations, results, graph, 3. Lab project/ Open ended ex 3. Lab Test: 15 marks	Conduct of Lab: 1. Conduction of the experiment: 15 marks + Viva voce: 5 marks 2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks 3. Lab project/ Open ended expt: 10 marks 3. Lab Test: 15 marks										
Eligibility for SEE:											
1. 40% and above (20 marks ar	nd above)										
2. Lab test is COMPULSORY											

Sch	Scheme of Semester End Examination (SEE):									
1.	It will be conducted for 50 marks of 2/3 hours duration.									
2.	Minimum marks required in SEE to pass: Score should be ≥35%, however overall score of CIE+SEE									
	should be ≥40%.									
2.	One or Two experiments to be conducted.									
3.	Minimum marks required in SEE to pass: 20 out of 50									
	Initial write up	10 marks								
4	Conduct of experiments, results and conclusion	20 marks	EQ months							
4.	One mark question	10 marks	SUMARKS							
	Viva- voce 10 marks									
5.	Viva-voce shall be conducted for individual student	and not in a group.								

CO-PO Mapping (planned)										CO-	PSO Map (planned)	ping				
~	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	DSO1	BSO2		
	1	2	3	4	5	6	7	8	9	10	11	12	P301	P301	F302	F303
1	√	\checkmark											\checkmark			
2	~				\checkmark								\checkmark	~		
3			\checkmark	√	\checkmark								\checkmark	\checkmark	\checkmark	
4	√	\checkmark	\checkmark	√	\checkmark	√		√	√	\checkmark		\checkmark	\checkmark	√	√	

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up after
	after undergoing the course	Sectors & domains	undergoing the course
1	Process Automation Skills	Software/ IT	RPA developer
2	AI and Process Management	Software/ IT	Automation Expert
	skills		

DATA SCIENCE AND VISUALIZATION

Course Code	221571	Course type	IPCC	Credits L-T-P	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2		Total credits	4	
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs			CIE Marks	100
	Total = 60 Hrs				100
Flipped Classes content	05 Hours		SEE Marks	100	

Course Learning Objectives	
1.	To provide an overview of data science, analytics and visualization.
2.	To introduce concepts of data science.
3.	To demonstrate fundamentals techniques and principles of data analytics and visualization.

Required Knowledge of: Basics of linear algebra and statistics

Unit – I	Contact Hours = 8 Hours
Introduction: Big data overview, State of the practice in Analy	rtics, Key role for the new big data
ecosystem, Examples of big data analytics, the five steps of data science, data science life cycle	

Unit – II	Contact Hours = 8 Hours
Classification: Decision Trees, Naïve Bayes, Diagnostics of Classifie	rs, Additional Classification Methods

Unit – III	Contact Hours = 8 Hours
Clustering: Overview of clustering, K means, additional algorithms,	Linear regression, Logistic regression,
Reasons to choose and cautions, Addition regression models	

Unit – IV	Contact Hours = 8 Hours
Time Series Analysis: Overview of time series analysis, ARIMA model, Text analysis steps, A text analysis	
example, collecting raw text, representing text, Term frequency, d	etermining sentiments

Unit – V	Contact Hours = 8 Hours	
Big Data Visualization: Introduction to Data visualization, Cha	allenges to Big data visualization,	
Conventional data visualization tools, Techniques for visual data	ata representations, Types of data	
visualization, Visualizing Big Data, Tools used in data visualization, Analytical techniques used in Big		
data visualization.		

Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
2	1	Decision Tree
3	3	K-means, Logistic Regression, Linear Regression
5	1	Visualizing big data

Unit No.	Self-Study Topics
	NIL

Books	
	Text Books:
1.	David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education
	services, Wiley publications, 2012, ISBN0-07-120413-X 2.
2.	Ashutosh Nandeshwar, "Tableau Data Visualization Codebook", Packt Publishing, ISBN 978-1-
	84968-978-6
	Reference Books:
1.	Maheshwari Anil, Rakshit, Acharya, "Data Analytics", McGraw Hill.
	E-resources:
1.	https://www.edx.org/course/data-analytics-and-learning
2.	https://www.udemy.com/course/business-analytics-complete-course
3.	https://swayam.gov.in/nd1_noc20_cs46/

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1. IA tests		
2	PPT and Videos		Open Assignment (OA)/ Lab Project/ Industry	
2.		۷.	assignment/Certification/ Course project	
3.	Flipped Classes	3.	Lab Test	
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination	
5.	Virtual Labs (if present)			

Course Outcome (COs)								
Learning Levels: Re - Remember; Un - Understand; Ap - Apply;An - Analysis; Ev - Evaluate; Cr - Create								
Δt th	be end of the course, the student will be able to	Learning	PO(s)	PSO(s)				
		Level	10(3)	1 30(3)				
1	Apply and demonstrate applications of real-world data sets	lin An	2, 3,5,10	1				
1.	using data science models and visualization tools.	оп, др						
2.	Analyse and Interpret the result of different ML algorithms.	Un, An	1, 2,10	1				
3.	Analyse the results of different data science models.	Un, An	3, 4,5,10	1, 2				
4.	Apply the learnings through a course activity.	Ар	9,10	1				

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

Total	(40 marks)	LAB	THEORY (60 marks)				
Total	Lab test	Conduction Lab test		IA test 1			
100 marks	30 marks	10 marks	30 marks	30 marks			

IA Test:

1. No objective part in IA question paper

2. All questions descriptive

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks

2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester

- 2. Timetable, Batch details and examiners will be declared by Exam section
- 3. Conducting the experiment and writing report: 5 marks
- 4. Calculations, results, graph and conclusion: 15 marks

5. Viva voce: 10 marks

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score

in IA test will make the student Not Eligible for SEE

2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.

3. Lab test is COMPULSORY

4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Sche	Scheme of Semester End Examination (SEE):					
1.	It will be conducted for 100 marks of 3 hours' duration.					
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE					
	should be ≥40%.					
3.	Question paper contains three parts A, B and C. Students have to answer					
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.					
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each					
	Question Carries 10 Marks.					
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.					

CO-PO Mapping (planned)								CO-	PSO Ma (planned	oping d)					
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO	PO	PSO1	PSO2	PSO3
										10	11	12			
1		1	1		1					1			1		
2	~	1								1			1		
3			1	1	1					1			1	1	
4									1	1			1		

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up
	after undergoing the course	Sectors & domains	after undergoing the course
1	Hands on experience on data	Healthcare, business,	Data scientist, Data analyst
	science projects	food, IT	

CYBER SECURITY

Course Code	221572	Course type	IPCC	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2		Total credits	4	
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs			CIF Marks	100
	Total = 60 Hrs				100
Flipped Classes content	bed Classes content 5 Hours			SEE Marks	100

Cours	Course Learning Objectives			
1.	To understand the basics of cybersecurity.			
2.	To learn about security threats and countermeasures			
3.	To learn about firewalls and security analysis protocols			
4.	To explore different cybersecurity tools			

Pre-requisites: Basic understanding of internet, Computer Networks

Unit – I	Contact Hours = 8 Hours
Cybersecurity System Fundamentals	

Introduction to Digital data, its types and information; Introduction to management information systems (MIS) and its functions. Introduction to Data Centre and its infrastructure;

Case study: Green Data Centre

Introduction to Cyber Security

Introduction to Information Security and its policies; CIA Triad-3 pillars of information security architecture;; Cyber security threats and best practices; Access controls and its types; ; Types of Reconnaissance; Types of Cyber Attack; Vulnerability Assessment and its features; Concept and types of Scanning Methodology;

Unit – II	Contact Hours = 8 Hours			
Network Security: Threats and countermeasures, Network Securit	y Devices, Types of Network Securities,			
Network Access Control, Characteristics of Network Access Control, Application Security, IDS vs. IPS; IDS,				
IPS and their Types; Introduction to Web Application Vulnerabilities;				
Basic Practices of Web Application Security: Wireless Network Th	reats, Wireless Security Measures,			
Mahila Davica Sacurity Sacurity Threats Mahila Davica Sacurity S	tratogy			

Mobile Device Security: Security Threats, Mobile Device Security Strategy.

Unit – III	Contact Hours = 8 Hours
Firewalls and Other Jawa	

Firewalls and Cyber laws

Types of Firewalls and its benefits, Packet Filtering Firewall, Stateful Inspection Firewall, Application Gateways, Circuit Gateways, Mac Layer Firewalls, Hybrid Firewalls, DNS and DHCP, VPN and how it protects your IP address and privacy.

Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offences, Organizations dealing with Cyber-crime and Cyber security in India.

Unit – IV	Contact Hours = 8 Hours
Cryptography and Social Media Security	
Introduction to cryptography, Overview of cryptography, Crypt cryptography, Symmetric encryption, Asymmetric encryption, Has certificates and signatures, Introduction to cryptographic atta	tography and Cryptanalysis, Types of th Cryptography, Understanding digital tecks, Types of cryptographic attacks,
Traditional cryptographic attacks, Counter measures to cryptograp	phic attacks.
social media, Flagging and reporting of inappropriate content.	oring, security issues related to

Unit – V	Contact Hours = 8 Hours
Web Server & Application Security Concept and overview of 3 tie	r Architecture; Web Application Basics;
Full Stack Development with M.E.R.N stack; Working of DNS	(Domain Name System); Web Server
Vulnerabilities; Web Application Security; Technology Stack for	Web Development; Web Application
Attacks; Importance of Web Security; Web Application Framew	ork; Working of HTTP;; HTTP Request
Methods; HTTP Status Messages; HTTP – Responses.	
Cyber Security Tools: CMSeek, Splunk	

Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

List of Experiments:

Linit No	No. of	Tonic(s) related to Experiment	
onic No.	Experiments		
1	1	File Integrity	
2	1	Wi-Fi Network Analyzer	
3	3	Firewall Implementation, Password Generator, Port Scanner	
4	2	Encryption/Decryption, SQL Injection Vulnerability Tester:	
5	1	Phishing Website Detector	

Unit No.	Self-Study Topics
5	Nmap and its features

Books	
	Text Books:
1.	William Stallings, Cryptography and Network Security, Pearson 6th edition.
2.	Michael E. and Herbart J.: Principles of Information Security, 2nd Edition 2005
3.	Ric Messier, CEH v10 Certified Ethical Hacker Study Guide, Sybex, 2019

	Reference Books:
1	James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition,
	Pearson,2017 .
2	Security in the Digital Age: Social Media Security Threats and Vulnerabilities by
	Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th
	November, 2001)
3	Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant
	Publishers.
	E-resources:
1.	https://nptel.ac.in/courses/106106248

Course delivery methods			sment methods
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)							
Lear	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; Learning						
An -	Analysis; Ev - Evaluate; Cr - Create	Level	10(3)	1 30(3)			
1	Explain the need of cybersecurity in various web applications.	Un	1	2			
2	Analyze the various types of threats and attacks and evaluate	1,2	2,3				
	the performance of various counter measure tools.	All					
3	Apply the various cryptographic techniques to provide security	۸n	1,2	1,3			
against web application threats and Social Media							
4	Apply the learning through course activity	Ар	10	1			

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

	THEC	ORY (60 marks)	LAB (40 r				
IA test 1	IA test 2	Assignment (OA/Lab Project/ Industry assignment /Certification)/	Conduction	Lab test	Total		
		Course project					
25 marks	25 marks	10 marks	10 marks	30 marks	100 marks		
IA Test:	IA Test:						
1. No objective part in IA question paper							
2. All ques	tions descript	tive					

-Certification earned by passing the standard Online MOOCs course (of atleast 8 hours defined by BOS) can be considered as a Course activity/Assignment and awarded maximum of 10 marks.

Conduct of Lab:

- 1. Conducting the experiment and journal: 5 marks
- 2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batchwise with 15 students/batch)

- 1. Test will be conducted at the end of the semester
- 2. Timetable, Batch details and examiners will be declared by Exam section
- 3. Conducting the experiment and writing report: 5 marks
- 4. Calculations, results, graph and conclusion: 15 marks

5. Viva voce: 10 marks

Eligibility for SEE:

- 1. 40% and above (24 marks and above) in theory component (No change)
- 2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Total.
- 3. Lab test is COMPULSORY

4. Not eligible in any one of the two components will make the student Not Eligible for SEE

Scheme of Semester End Examination (SEE):

- 1. It will be conducted for 100 marks of 3 hours' duration.
- Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
- 3. Question paper contains three parts **A**, **B** and **C**. Students have to answer
 - 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
 - 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.
 - 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)								CO-PSO Mapping							
	0 1110	PP8	(1.16111	icaj									(Plan	ned)	
<u> </u>	DO1	002	0.02	DO4	DOF	DOG	DO7		DOD	DO 10	DO11	DO12	PSO	PSO	PSO
0	POI	PUZ	PU5	P04	P05	PUO	P07	PU6	P09	PO 10	POII	PUIZ	1	2	3
1	~									~				~	
2	~	~								~				~	~
3	~	~								~			~		~
4										\checkmark			~		

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up		
	after undergoing the course	Sectors & domains	after undergoing the course		
1	Networking and System	Software Engineer	Cyber security Analyst		
	Administration				
2	Cloud Security	Software Developer	IT auditor		

SOFTWARE TESTING

Course Code	22IS73 Course typ		IPCC	Credits L-T-P	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2		Total credits	4	
Total Contact Hours	L = 40 Hrs; T = 0 H	rs; P = 20 Hrs	CIF Marks	100	
	Total = 60 Hrs			100	
Flipped Classes content	lasses content 05 Hours			SEE Marks	100

Course Learning Objectives		
1.	To introduce the concept of Software Testing.	
2.	To understand the various methods of Software Testing.	
3.	To understand the process of Software Quality Assurance.	

Required Knowledge of: Software Engineering

Unit – I	Contact Hours = 8 Hours
Δ Perspective on Testing	

Perspective on Testing:

Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing.

Unit – II	Contact Hours = 8 Hours
The SATM (Simple Automatic Teller Machine) problem, The currenc	y converter, Saturn windshield wiper.
Boundary value analysis, Decision Table-Based Testing: Boundary	y value analysis, Robustness testing,
Worst-case testing, Special value testing.	

Unit – III	Contact Hours = 8 Hours

Equivalence Class Testing:

What is equivalence class in testing? What is equivalence partitioning testing with an example?, Equivalence partitioning testing with an example.

Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

Unit – IV	Contact Hours = 8 Hours		
Path Testing, Data Flow Testing:			
paths, Test coverage metrics, Basis path testing, guidelines and	d observations. Definition-Use		
testing. Slice-based testing, Guidelines and observations.			

Unit – V	Contact Hours = 8 Hours

Software Quality & Software Quality Assurance:

Software Quality, Software Testing, Quality and Testing, Verification and Validation, Static and Dynamic V&V Activities, V-Model, Goal of Quality Assurance, QA Technique Classification, Dealing with Pre-Release and Post Release Defects, Defect Prevention, Defect Reduction, Issues with Testing, Risk, Testing Sweet Spot, Defect Containment.

Flipped Classroom Details:

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

List of Experiments:

Unit No.	No. of	Topic(s) related to Experiment				
	Experiments					
2	4	Boundary value analysis, Decision Table-Based Testing				
3	2	Equivalence Class Testing				
4	4	Path Testing, Data Flow Testing				

Unit No.	Self-Study Topics
1	Levels of testing
2	Special value testing
3	Equivalence Class Testing Guidelines and observations.
4	Path Testing Test coverage metrics
5	Defect Prevention, Defect Reduction, Issues with Testing

Books	5
	Text Books:
1.	Name of the author(s), Title of the Book, Publisher, Edition/Yearand onwards
	Paul C. Jorgensen, Software Testing A Craftsman's Approach, Fourth Edition, CRC Press
2.	https://www.se.rit.edu/~se456/slides/SoftwareQuality.pdf
	Reference Books:
1.	Ian Sommerville, SOFTWARE ENGINEERING, Addison-Wesley, Ninth Edition / 2011
	E-resources:
1.	https://youtu.be/OGImfxO2TEU
2.	https://onlinecourses.nptel.ac.in/noc22_cs61/preview

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Open Assignment (OA)/ Lab Project/ Industry	
			assignment/Certification/ Course project	

3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Cour	se Outcome (COs)			
Lear	ning Levels:			
Re -	Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;	Cr - Create		
Λ+ + b	e and of the course, the student will be able to	Learning	PO(s)	PSO(c)
ALL	e end of the course, the student will be able to	Level	FO(S)	1 30(3)
1.	Illustrate test cases for different applications.	Un	1,2,5	1
2	Apply different software testing methods for development of	lin An	2,5	2
۷.	applications.	01, др		
з	Analyse the requirements and design test cases to verify and	Δn	2,5	2
5.	validate an application.			
4.	Apply the learnings through a course activity.	Ар	9,10	1

Scheme of Continuous Internal Evaluation (CIE):							
For integrated cou	rses, a lab test also v	will be conducted at the	e end of the semester. The	lab test			
(COMPULSORY) w	(COMPULSORY) will be part of the CIE. No SEE for Lab.						
THEORY (60 marks) LAB (40 marks)							
IA test 1	IA test 2	Conduction	Lab test	TOLAI			
30 marks	30 marks	10 marks	30 marks	100 mark			

IA Test:

1. No objective part in IA question paper

2. All questions descriptive

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks

2. Calculations, results, graph, conclusion and Outcome: 5 marks

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester

2. Timetable, Batch details and examiners will be declared by Exam section

3. Conducting the experiment and writing report: 5 marks

4. Calculations, results, graph and conclusion: 15 marks

5. Viva voce: 10 marks

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE

2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of

40 marks (i.e. 16 marks) in Lab component.

3. Lab test is COMPULSORY

4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Sche	me of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of
	CIE+SEE should be \geq 40%.
3.	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,
	each Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

co-	CO-PO Mapping (planned)							CO-P (plan	SO Map ned)	ping					
~~~	DO1	000	000	DO 4	DOF	DOC	0.07	<b>D</b> O0	<b>D</b> O0	DO10	DO11	0013	PSO	PSO	PSO
0	P01	P02	PO3	P04	P05	P06	P07	P08	P09	PO10	POII	P012	1	2	3
1	1	1			1								1		
2		1			1									1	
3		1			1									1	
4									1	1			1		

SI.	Skill & competence enhanced	Applicable Industry	Job roles students can take up
No.	after undergoing the course	Sectors & domains	after undergoing the course
1	Testing Techniques	Software Testing	Software Tester
2	Test Planning and Strategy	Quality and Assurance	Quality Control Manager

#### MOBILE COMPUTING AND APPLICATIONS

Course Code	22IS741	Course type	PEC	Credits L-T-P	3 - 0 - 0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40 Hrs; T =	0 Hrs; P = 0 Hrs	CIF Marks	100	
	Total = 40 Hrs			100	
Flipped Classes content	05 Hours			SEE Marks	100

Cours	Course Learning Objectives			
1.	To introduce the fundamental concepts of Mobile computing.			
2.	To introduce the fundamental concepts of wireless networks - GSM, GPRS.			
3.	To understand client-server architecture and programming.			
4.	To understand client programming using J2ME programming.			

**Pre-requisites :** Basics of Java Programming , Fundamentals of Computer Networks, Fundamentals of Wireless Networks.

Unit – I

**Contact Hours = 8 Hours** 

**Introduction to Mobile Computing**: Mobile Computing, Dialogue control, Networks, Architecture for Mobile Computing, Three tier architecture, Design considerations for mobile computing.

Unit – IIContact Hours = 8 HoursWireless Networks-1: GSM and SMS: Global system for Mobile Communication (GSM) and Short<br/>service Messages SMS):Architecture, Entities, Call routing in GSM, PLMN interface, GSM Addresses and<br/>Identities, Network Aspects in GSM, Mobility management, GSM frequency allocation, Introduction to<br/>SMS ,SMS architecture .

Unit – III	Contact Hours = 8 Hours			
Wireless Networks -2: GPRS: GPRS and Packet Data Network, GPR	S Network Architecture, GPRS			
Network Operations, data services in GPRS, Applications for GPRS, Billing and Charging in GPRS.				
Wireless Networks -3: CDMA ,3G and WiMAX: Spread Spectrum technology, IS 95, CDMA versus				
GSM, Wireless Data, Third Generation Networks, Introduction To V	NIMAX.			

Unit – IV	Contact Hours = 8 Hours			
Building Smart Client Applications: Smart client architecture-the client and the server. Smart client				
development Process-Needs analysis phase and the design p	hase. Thin client wireless internet			
applications-Client overview (client and middleware), Processing a	a wireless request, WAP model, WAP			
components, Wireless Application Environment.				

Unit – V	Contact Hours = 8 Hours		
Client Programming using J2ME : Introduction, CDC, CLDC, MIDP, Programming for CLDC, MIDlet model			
MIDlet life-cycle, Creating new application, MIDlet event hand	dling, GUI in MIDP, Low level GUI		

components, UI Design issues.

# Flipped Classroom Details:

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
2	SM MT and SM MO.
3	Applications on 3G
5	Multimedia API Communication in MIDP and Security.

Books	5
	Text Books:
1.	Asoke Talukder, Roopa Yavagal-Mobile Computing-Technlogy, Applications and Service
	Creation, Tata McGraw Hill Publishers-2 nd Edition onwards
2.	Martyn Mallick-Mobile and Wireless Design Essentials, Wiley Publications-2016 print
	onwards
3.	William Stallings," Wireless Communication and Networks",2 nd edition, Pearson
	Education 2007.
	Reference Books:
1.	Martyn Mallick, Mobile and Wireless Design Essentials, Wiley Publications- 2016 print
	and onwards
2.	Jochen Schiller- Mobile communications, Pearson Education Publications, 2 nd Edition
	onwards
	E-resources:
1.	

Cours	e delivery methods	Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification	
4.	Online classes	4.	Course Project	
		5.	Semester End Examination	

## Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At t	he end of the course, the student will be able to:	Learning	PO(s)	PSO(s)
		Level		
1.	Explain the architecture of mobile computing.	Un	1,10	2
2	Explain the concepts and architectures of wireless netork1	Lin	1,10	2
Ζ.	and wireless netork2.	On		
3.	Describe concepts of smart client applications.	Un	1,10	2
4.	<b>Develop</b> modules in client programming using J2ME.	Un ,Ap	1,2,10	2,3
5	Apply the learning through a course activity.	Ар	9,10	1

Scheme of Continuous Internal Evaluation (CIE):						
Components	Addition of two IA tests	Two Assignments – (Open/Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks		
Marks	30+30 = 60	10 + 10 = 20	20 mark (with report & presentation)	100		

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scł	Scheme of Semester End Examination (SEE):						
1	It will be conducted for 100 marks of 3 hours' duration.						
2	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of						
	CIE + SEE should be $\geq$ 40%.						
3	Question paper contains three parts A, B and C. Students have to answer						
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.						
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,						
	each Question Carries 10 Marks.						
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.						

CO-P	CO-PO Mapping (Planned)									CO-PSC (Planne	) Mappin ed)	g			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	~									$\checkmark$				$\checkmark$	
2	√									√				$\checkmark$	
3	$\checkmark$									√				√	
4	~	√								~				~	$\checkmark$
5										$\checkmark$	$\checkmark$			$\checkmark$	

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Architecture of Mobile	Telecommunication	Network Administrator
	Computing	industry	
2	GSM,CDMA,GPRS,Wimax	Telecommunication	Network Administrator
		industry	
3	Client programming	Telecommunication	Network programmer.
		industry	

#### SYSTEM SIMULATION & MODELING

Course Code	2215742	Course type	PEC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0	Hrs; P = 0 Hrs	CIE Marks	100	
	Total = 40 Hrs			100	
Flipped Classes content	lipped Classes content 5 Hours			SEE Marks	100

Cours	e Learning Objectives
1.	To explain the importance of simulation components in engineering problems.
2.	To introduce mathematical and statistical models in continuous and discrete distributions.
3.	To present random number generation methods and tests for random number.
4.	To realize the importance of analysis of simulation data and validation of simulation models.

Pre-requisites: Engineering Mathematics, Discrete mathematics

Unit – I	Contact Hours = 8 Hours				
<b>Introduction:</b> When simulation is the appropriate tool and when it is not appropriate, Advantages and					
disadvantages of Simulation, Systems and system environment; Co	omponents of a system; Discrete and				
continuous systems; Model of a system; Types of Models; Discrete- Event System Simulation; General					
Principles, Simulation Software: Concepts in Discrete-Event simulation: The event-					
scheduling / time-advance algorithm.					

Unit – II	Contact Hours = 8 Hours
Statistical Models in Simulation: Review of terminology and c	oncepts; Useful statistical models;
Discrete distributions: Binomial distribution, Poisson distribution	; Continuous distributions: Uniform
distribution, Exponential distribution,	

Unit – III	Contact Hours = 8 Hours				
Random-Number Generation: Properties of random numbers; Generation of pseudo-random					
numbers; Techniques for generating random numbers; Tests for Random Numbers: frequency tests;					
Random-Variate Generation: Inverse transform technique: Exponential distribution, Uniform					
distribution,					

Unit – IV	Contact Hours = 8 Hours				
Input Modeling: Data Collection; Identifying the distribution with data; Parameter estimation;					
Goodness of Fit Tests; Selecting input models without data.					

Unit – V	Contact Hours = 8 Hours
Verification, Calibration, Validation and Optimization	

Model building, verification and validation; Verification of simulation models; Calibration and validation of models,

## **Flipped Classroom Details**

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Unit No.	Self-Study Topics
1	Simulation examples: Simulation of queuing systems (single server and two server), Simulation of (M,N) inventory system.
2	Triangular distribution.
5	input-output validation using historical input data.

Books	5
	Text Books:
1.	Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System
	Simulation, 4th Edition onwards, Pearson Education, 2010 onwards.
	Reference Books:
1.	Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson
	Education, 2006.
2.	Averill M. Law: Simulation Modeling and Analysis, 4th Edition, TataMcGraw-Hill, 2007.
	E-resources:
1.	https://nptel.ac.in/courses/112107220
2.	https://onlinecourses.nptel.ac.in/noc21_me25/preview

Course delivery methods			Assessment methods		
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)		
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification		
4.	Online classes	4.	Course Project		
		5.	Semester End Examination		

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An- Analysis; Ev - Evaluate; Cr - Create						
At th	ne end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)		
1.	<b>Illustrate</b> the use of simulation software and Statistical models to simulate the new systems.	Un	1,2,10	1,2		

2	Examine the techniques for building a model representing the	An	1,2,10	1,2
2.	existing systems.			
2	Identify the distribution and verification of the data to model a	Ар	1,2,10	1,2
5.	system, calibrate and validate the same.			
Λ	Model the use of System simulation and modeling considering	Ар	1,2,10	1,2
4.	real world problem.			

Scheme of Continuous Internal Evaluation (CIE):								
Components	Addition of two IA tests	Two Assignments– (Open/Industry/ Certification etc.)	Course project (CP)/ Case study etc.	Total Marks				
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100				

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Sche	Scheme of Semester End Examination (SEE):						
1.	It will be conducted for 100 marks of 3 hours' duration.						
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE +						
	SEE						
	should be $\geq$ 40%.						
3.	Question paper contains three parts A, B and C. Students have to answer						
	1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.						
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit,						
	each Question Carries 10 Marks.						
	3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.						

CO-P	CO-PO Mapping (planned)								CO-PSC (planne	D Mappin ed)	g				
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	~	~								~			~	~	
2	~	~								~			~	~	
3	~	~								~			~	~	
4	~	~								~			~	~	

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up after
	after undergoing the course	Sectors & domains	undergoing the course
1	Communication, Design skills, usage of Tools	Computer modeling sectors, manufacturing companies, Tools operations	Design Architect, Evaluator.
#### **BIG DATA MANAGEMENT**

Course Code	2215743	Course type	PEC	Credits L-T-P	3 - 0 - 0
Hours/week: L - T- P	3 - 0 - 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 00 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	05 Hours			SEE Marks	100

#### **Course Learning Objectives**

1.	To understand Big Data technology and its use in processing huge commercial data
2.	To recognize Hadoop components for data analytics
3.	To be able to analyze data with Spark
4.	To apply data transformation tools

**Required Knowledge:** Relational Database Management System and basics of Programming language.

Unit – I: Understanding Big Data	Contact Hours = 8 Hours			
Introduction : Introduction to Big Data, Characteristics of Data and Big Data, Evolution of Big Data,				
Definition of Big Data, Challenges with big data, Why Big data? Data Warehouse environment,				
Traditional Business Intelligence versus Big Data. State of Practice in Analytics, Key roles for New				
Big Data Ecosystems, Examples of Big Data Analytics.				
(Text Book 1: Chap 1,2 & Text Book 2: Chap. 1)				

# Unit – II: All About HadoopContact Hours = 8 HoursJust the Facts: The History of Hadoop; Components of Hadoop: The Hadoop Distributed File System,<br/>The Basics of MapReduce, Hadoop Common Components; Application Development in Hadoop: Pig<br/>and PigLatin, Hive, Jaql; Getting Data into Hadoop: Basic Copy Data, Flume<br/>(Text Book 1: Chap.4)

Unit – III: MapReduce	Contact Hours = 8 Hours
Data Format, Analyzing the Data with Hadoop, Scaling out, Hadoop Works: Anatomy of a MapReduce Job Run, Failures, Job Scheduling (Text Book 3: Chap. 2, 6)	o Streaming; How MapReduce g, Shuffle and sort

Unit-IV: Introduction to Data Analysis with Spark	Contact Hours = 8 Hours			
What is Apache Spark? A unified stack; Who uses Spark, and for what? Introduction to core spark				
concepts; Standalone applications				
(Text book 4: Chap 1,2)				

Unit-V: Programming with RDDs	Contact Hours = 8 Hours			
RDD Basics; Creating RDDs; RDD operations; Passing functions to Spark; Common Transformation				
and actions; Persistence(caching)				
Working with key/value pairs: Creating pair RDDs; Transformations on pair RDDs; Actions available				
on pair RDDs; Data partitioning(advanced)				
(Text book 4: Chap 3,4)				

# Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1	Introduction & Characteristics of NoSQL, Types of NoSQL Data Models
2	Introduction and classification of Big data analytics and Enterprise Class Hadoop
3	Task Execution in MapReduce

Во	ooks
	Text Books:
	Paul C. Zikopoulos Chris Eaton Dirk deRoos Thomas Deutsch George Lapis- Understanding Big
1.	Data-Analytics for Enterprise Class & Hadoop and Streaming Data - McGraw-Hill Companies Copyright © 2018
2.	Seema Acharya, Subhashini Chellappan- Big Data & Analytics 2 nd Edition - Wiley Publishing
	Copyright ©2016
3.	Tom White- Hadoop: The Definitive Guide- 5 th Edition - O'Reilly Apr '23
4.	Andy Konwinski, Patrick Wendell, Holden Karau, Matei Zaharia-Learning Spark- Lightning-Fast
	Data Analysis- O'REILLY 2 nd Edition
	References:
1.	Newton & Richard- Project management step by step: how to plan and manage a highly
	successful project: Willy's Publication 2020

	E-resources:
1.	https://nptel.ac.in/courses/106/104/106104189/

Course delivery methods			Assessment methods		
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project		
3.	Flipped Classes	3.	Lab Test		
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination		
5.	Virtual Labs ( if present)				

Co	Course Outcome (COs)						
Le	Learning Levels: 1- Remember; 2- Understand; 3- Apply; 4 - Analysis; 5 - Evaluate; 6- Create						
At	the end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)			
1.	<b>Explain</b> Big Data and describe Characteristics useful in different fields of computations.	Re	1,12	1,2,3			
2.	Interpret significance of Big-Data as NoSQL non- tabular databases by learning Hadoop components and HDFS	Un	2,4,5	1,2, 3			
3.	Make use of MapReduce component in Big data Processing	Ар	4, 5	1,2,3			
4.	Analyze the real world dataset using Spark tool	An	1,2,12	1,2,3			

Scheme of Continuous Internal Evaluation (CIE):				
Component s	Addition of two IA tests	Two Assignments – (Open/Industry/Certifi cation etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

r						
Scł	Scheme of Semester End Examination (SEE):					
1	It will be conducted for 100 marks of 3 bours' duration					
1.	it will be conducted for 100 marks of 5 hours duration.					
2	Minimum marks required in SEE to pass. Score should be 225% however overall score of CIE					
Ζ.	winimum marks required in see to pass. Score should be 2 55%, nowever overall score of CE +					
	SEE should be $> 40\%$ .					

3. Question paper contains three parts **A**, **B** and **C**. Students have to answer

1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.

2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.

3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

				CO-PO	Mappi	ng (pla	inned)						r (1	CO-PSC Mappin planneo	) g J)
с о	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	v											٧	٧	v	٧
2		٧		V	V								٧	V	V
3				V	٧								٧	٧	٧
4	V	V										٧	٧	V	٧

SI	Skill & competence enhanced	Applicable Industry Sectors &	Job roles students can takeup
No	after undergoing the course	domains	after undergoing the Course
	Big-data management & its	Telecommunications,	Data Scientists Analytics
1	associated applications in	Advertising and marketing,	Managers/Directors
	intelligent business and	transportation	
	scientific computing		
	Acquire fundamental data	Banking and Financial	Business Analysts Big
2	analytical techniques using	Services, Government,	Data Architects
	Hadoop, Map Reduce, NoSQL	Media and Entertainment	
	Interpret business	Meteorology, Healthcare	NoSQL DBAs
3	models, apply	Cyber security, Education	Hadoop Experts
	software tools to big		
	data analytics.		

#### INTRODUCTION TO PROMPT ENGINEERING

Course Code	2215744	Course type	PEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours		SEE Marks	100	

Cours	e Learning Objectives
1.	To define the concept of prompt engineering and distinguish it from traditional engineering
	problem-solving methodologies.
2.	To trace the historical evolution of prompts in engineering and understand their various types and
	applications across different fields.
3.	To explore the role of prompts in enhancing engineering education and develop strategies to
	integrate prompt-based learning in academic settings.
4.	To apply prompt engineering principles to design and innovation processes and evaluate the
	effectiveness of prompts in real-world engineering projects.

#### Pre-requisites: NIL

Unit – I	Contact Hours = 8 Hours
Introduction Understanding Dromat Engineering Importance of	Promoto in Engineering.

Introduction -Understanding Prompt Engineering, Importance of Prompts in Engineering;

**Foundations of Prompt Engineering** - History and Evolution of Prompts in Engineering, Cognitive Science and Prompt Design;

**The Role of Prompts in Engineering** - Enhancing Learning with Prompts , Using Prompts in Problem Solving , Case Studies on Prompt-Based Learning Approaches

Unit – II	Contact Hours = 8 Hours	
Applying Prompt Engineering in Design and Innovation - Integrat	ing Prompts in the Design Process with	
case studies, Prompts for Creativity and Ideation with case studies, Prompt-Driven Innovation in		
Engineering with case studies,		

Unit – III	Contact Hours = 8 Hours			
Human-Computer Interaction and Prompt Design - Designing User Interfaces with Prompts with case				
studies, Adaptive Prompt Systems with case studies,				
Prompts in Engineering Systems and Automation - Smart Systems and Prompt Integration with case				
studies, Artificial Intelligence and Prompt Engineering, Application	s of AI and Prompt Engineering, Ethical			
Considerations in AI-Powered Prompt Engineering				

Unit – IV			

**Contact Hours = 8 Hours** 

**Evaluating Prompt Effectiveness**- Metrics for Assessing Prompt Performance, User Studies and Feedback Analysis, User Studies in Prompt Engineering, Feedback Analysis in Prompt Engineering, Importance of User Studies and Feedback Analysis in Prompt Engineering with case studies

# Unit – V Contact Hours = 8 Hours Data Analysis and Interpretation for Prompt Evaluation Emerging Technologies and Prompt Applications, The Role of Machine Learning in Prompt Generation, Prompts for Addressing Global Engineering Challenges, Prompt design guidelines and best practices

#### Flipped Classroom Details:

Unit No.	I	II		IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit	Self-Study Topics
No.	
2	Prompts in Engineering Systems and Automation
3	NLP
4	LLM
5	Working of Chatgpt and Bard

Books	5
	Text Books:
1.	Sudhindra B Deshpande, Kiran Tangod , Applied Prompt Engineering , SIPH Publications, 2022
	Reference Books:
1.	The Art of Prompt Engineering with Chatgpt: A Hands-On Guide: 3 (Learn AI Tools the Fun Way!
	2023, by Nathan Hunter
	E-resources:
1.	https://www.coursera.org/specializations/prompt-engineering
2.	https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/
3.	https://onlinecourses.swayam2.ac.in/imb24_mg116/preview (Generative AI and Large Language
	Models )

Cours	e delivery methods	Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification	
4.	Online classes	4.	Course Project	
		5.	Semester End Examination	

Cou	rse Outcome (COs)			
At tl	he end of the course, the student will be able to (Highlight the	action verb	representing the	
lear	ning level.)			
Lear	ning Levels: Re - Remember; Un - Understand; Ap - Apply;	Learning	PO(s)	PSO(s)
An -	Analysis; Ev - Evaluate; Cr - Create	Level	10(3)	1 30(3)
1	Understand how cognitive principles in prompt engineering	1,2,10	1	
1.	differ from traditional engineering problem-solving methods.	011		
2	Understand the history and types of prompts to use them	lln	1,2,10	2,3
2.	effectively in various engineering disciplines.			
2	Build prompt-based learning strategies in engineering to	۸n	2,3,5,10	2,3
э.	boost creative thinking and problem-solving skills.	γÞ		
	Build and assess user-centric prompt systems in human-		2,3,5,10	2,3
4.	computer interactions to enhance usability and	Ар		
	functionality in engineering.			
5.	Apply the learnings through a course activity.	٨٥	1,2,3,5,9,10,12	1,2,3
		Ар		

#### Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

Schen	ne of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of CIE + SEE
	should be <u>&gt;</u> 40%.
3.	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)										CO-PS (Planr	iO Map ned)	ping			
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
1	~	~								~			~		
2	~	~								~				~	~
3		~	~		~					~				~	~
4		~	~		~					~				~	~
5	~	~	~		~				~	~		~	~	~	~

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up
	after undergoing the course	Sectors & domains	after undergoing the course
1	Prompt Writing Skills	IT	Prompt Engineer

#### INTRODUCTION TO DATABASE APPLICATION DESIGNING

Course Code	22IS751	Course type	OEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T =	0 Hrs; P = 0 Hrs	CIE Marks	100	
	Total = 40 Hrs				
Flipped Classes content	05 Hours			SEE Marks	100

Cours	Course Learning Objectives					
1.	To gain a foundational understanding of database systems and their importance in various					
	fields.					
2.	To learn the principles of database design and normalization.					
3.	To develop proficiency in SQL programming for data manipulation and retrieval.					
4.	To acquire practical skills in developing database-driven applications.					

**Pre-requisites :** Familiarity with fundamental programming concepts , Programming languages such as Python, Java, or C# for application development.

Unit – I	Contact Hours = 8 Hours			
Introduction to Databases: Overview of Database Systems, Importance of Databases in Engineering				
Fields, Types of Databases (Relational, NoSQL), Database Management Systems (DBMS).				

Unit – II	Contact Hours = 8 Hours			
Relational Database Design: Entity-Relationship Model (ER Model), Relational Schema Design,				
Normalization Techniques, Entity-Relationship Diagrams (ERDs)				

Unit – III	Contact Hours = 8 Hours			
SQL Fundamentals : Introduction to SQL (Structured Query Language), Data Definition Language				
(DDL), Data Manipulation Language (DML), Querying Relational Date	tabases			

Unit – IV	Contact Hours = 8 Hours
Advanced SQL Programming : Joins and Subqueries, Aggregation I	Functions and Grouping, Views and
Indexes, Transaction Management	

Unit – V	Contact Hours = 8 Hours
Database Application Development: Introduction to Application I	Development, Database
Connectivity, Using SQL within Programming Languages (e.g., Pyth	ion, Java).

Unit No.	I	II	III	IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Book	5
	Text Books:
1.	Coronel, Carlos, and Steven Morris: Database Systems: Design, Implementation, and
	Management, 9th edition and above.
	Reference Books:
1.	Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 6th edition and
	above.
2.	Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, McGraw-Hill,
	2nd edition and above.
	E-resources:
1.	https://onlinecourses.nptel.ac.in/noc22_cs51/preview
2.	https://www.udemy.com/topic/database-management/

Course delivery methods			Assessment methods		
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)		
3.	Flipped Classes	3.	Open Book Tests (OBT)		
4.	Online classes	4.	Course Seminar		
		5.	Semester End Examination		

#### Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Lear App	ning Levels: Re - Remember; Un - Understand; Ap - ly; An - Analysis; Ev - Evaluate; Cr - Create	Learning Level	PO(s)	PSO(s)
1.	<b>Understand</b> the fundamentals of database Systems.	Un	1	1
2.	<b>Analyze</b> and <b>Develop</b> database design using the ER model and normalization techniques.	Ap, An	1,2,3	1,2
3.	<b>Demonstrate</b> proficiency in SQL fundamentals to write DDL, DML and other complex queries.	Ар	1,2,3	1.2
4.	<b>Understand</b> the basics of developing applications that interact with databases.	Un	1	1,2
5.	<b>Apply</b> the learnings inculcated through a course activity.	Ар	1,2,3,5,9,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):				
Components	Addition of two IA tests	Two Assignments (Open/Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

Schen	ne of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of
	CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 guestions, each Question Carries 20 Marks.

CO-I	РО Марј	oing (Pl	anned)										CO-PSC (Planne	D Mappin ed)	g
60	DO 1	000	000	DO 4	DOF	DOC	007	000	000	0010	DO11	0012	PSO	PSO	PSO
0	PU 1	P02	PU3	P04	P05	P06	PU7	PU8	P09	P010	POII	P012	1	2	3
1	√												$\checkmark$		
2	√	✓	√										√	$\checkmark$	
3	~	√	√										√	√	
4	~												√	√	
5	~	✓	√		√				$\checkmark$	√		√	√	√	~

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Database Design	In today's data-driven world, databases are indispensable across	Database designer
2	SQL	various domains, serving as pivotal tools for managing large and complex datasets. Their applications span diverse fields	Database developer/ programmer

#### INTRODUCTION TO DATA SCIENCE AND ANALYTICS

Course Code	22IS752 Course type OE		22IS752 Course type OEC		OEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0			Total credits	3		
Total Contact Hours	L = 40 Hrs; T =	= 0 Hrs; P = 0 Hrs	CIF Marks	100			
	Total = 40 Hrs	5		100			
Flipped Classes content	05 Hours			SEE Marks	100		

Cours	Course Learning Objectives			
1	To introduce concepts of data science and analytics.			
2	To demonstrate the fundamentals of data analytics.			
3	To implement data analytical techniques to the real-world problems.			

Pre-requisites: Basics of linear algebra and statistics

Unit – I	Contact Hours = 8 Hours
Introduction: Big data overview, State of the practice in Anal	lytics, Key role for the new big data
ecosystem, Examples of big data analytics, the five steps of data so	cience, data science life cycle

Unit – II	Contact Hours = 8 Hours
Classification: Decision Trees: Overview, General algorithm, ID3 al	gorithm, Evaluating decision tree;
Naïve Bayes: Overview, Bayes Theorem, Naïve Bayes classifier	algorithm; Diagnostics of Classifiers,
Additional Classification Methods	

Unit – III	Contact Hours = 8 Hours
Regression: Linear regression: Overview, Model description, Di	iagnostics; Logistic regression: Model
description, Diagnostics; Reasons to choose and cautions, Addition	n regression models

Unit – IV	Contact Hours = 8 Hours
Clustering: Oerview of clustering, What is Cluster Analysis?, App	plications of Cluster Analysis, Types of
Clustering, K-means algorithm, Diagnostics	

Unit – V	Contact Hours = 8 Hours
Time Series Analysis: Overview of time series analysis, ARIMA mod	del, Text analysis steps, A text analysis
example, collecting raw text, representing text, Term frequency, d	etermining sentiments

# Flipped Classroom Details:

Unit No.	I	II		IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Unit No.	Self-Study Topics
1	GINA case study

Books	\$
	Text Books:
1.	David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education
	services, Wiley publications, 2012, ISBN0-07-120413-X 2.
	Reference Books:
1.	
	E-resources
1.	https://www.edx.org/course/data-analytics-and-learning
2.	https://www.udemy.com/course/business-analytics-complete-course
3.	https://swayam.gov.in/nd1_noc20_cs46/

Course delivery methods Assessment methods		sment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Cour At ti lear	rse Outcome (COs) ne end of the course, the student will be able to (Highlight the action ning level.)	n verb repre	esenting t	he
Lear	ning Levels: Re - Remember; Un - Understand; Ap - Apply; An -	Learning	PO(s)	PSO(s)
Analysis; Ev - Evaluate; Cr - Create		Level		
1.	To make use of data science models for real world problems.	Ар	2	2
2.	To develop model using concepts of data analytics.	Ар	3	2
3.	To analyze the results of data analytics.	An	4	3
4.	Apply the learnings through a course activity.	Ар	9,10	1

Scheme of Continuous Internal Evaluation (CIE):				
Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100
-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by				
BOS) can be considered as a Course activity and awarded maximum of 10 marks.				
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.				

-Lack of minimum score in IA test will make the student Not Eligible for SEE

Sch	Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 100 marks of 3 hours' duration.			
2.	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of CIE + SEE			
	should be $\geq$ 40%.			
3.	Question paper contains three parts A, B and C. Students have to answer			
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.			
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each			
	Question Carries 10 Marks.			
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.			

CO-PO Mapping (Planned)						CO-PS (Plann	O Mapp ed)	ing							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1		1												1	
2			1											✓	
3				1											1

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Deep understanding of data science concepts	Healthcare, business, food, IT	Data scientist, Data analyst

#### **INTRODUCTION TO CYBER SECURITY**

Course Code	2215753	Course type	OEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0 H	CIE Marks	100		
	Total = 40 Hrs			100	
Flipped Classes content	5 Hours			SEE Marks	100

Cours	Course Learning Objectives				
1.	To understand the basics of cybersecurity.				
2.	To learn about security threats and countermeasures.				
3.	To expose students to responsible use of online social media networks				
4.	To explore different cybersecurity tools				

Pre-requisites : Basic understanding of internet, Computer Networks

Unit – I	Contact Hours = 8 Hours				
Introduction to Cyber Security					
Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace,					
Communication and web technology, Internet, World wide web, Advent of internet, Internet					
infrastructure for data transfer and governance, Internet society, Regulation of cyberspace,					
Concept of cyber security, Issues and challenges of cybersecurit	ty.				

Unit – II	Contact Hours = 8 Hours

#### Cybercrime and Cyber law

Classification of cybercrimes, Common cybercrimes- cybercrime targeting computers and mobiles, cybercrime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offences, Organization's dealing with Cyber-crime and Cyber security in India, Case studies.

Unit – III	Contact Hours = 8 Hours			
Social Media Overview and Security				
Introduction to Social networks. Types of Social media, Social media platforms, Social media				
monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges,				
opportunities and pitfalls in online social network, Security issues related to social media, Flagging				
and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best				
practices for the use of Social media, Case studies.				

Unit – IV	Contact Hours = 8 Hours			
E - Commerce and Digital Payments				
Definition of E- Commerce, Main components of E-Commerce,	Elements of E-Commerce security, E-			
Commerce threats, E-Commerce security best practices,	Introduction to digital payments,			
Components of digital payment and stake holders, Modes of digital payments- Banking Cards,				
Unified Payment Interface (UPI),e-Wallets, Unstructured Supplementary				
Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and				
preventive measures. RBI guidelines on digital payments and customer protection in unauthorized				
banking transactions. Relevant provisions of Payment Settleme	ent Act,2007			

Unit – V	Contact Hours = 8 Hours
Digital Devices Security, Tools and Technologies for Cyber Sec	urity

End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.

#### Flipped Classroom Details:

Unit No.	I	II	III	IV	V
No. for Flipped	1	1	1	1	1
Classroom Sessions					

Books	5
	Text Books:
1.	Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010
2.	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by
	Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3.	Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A.
	Oliver, Create Space Independent Publishing Platform. (Pearson , 13 th November, 2001)
	Reference Books:
1.	Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
2	Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant
	Publishers.
3.	Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition,
	Wiley India Pvt. Ltd.
	E-resources:
1.	https://nptel.ac.in/courses/106106248

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification	
4.	Online classes	4.	Course Project	
		5.	Semester End Examination	

# Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr -Create

At tl	ne end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)
1	Explain the need of cybersecurity in various web applications	Un	1	2
2	Analyze the various types of threats and attacks and its impact on social media	An	1,2	2,3
3	Apply the various security tools and techniques, cyber laws for ensuring security in Ecommerce and other applications	Ар	1,2	1,3
4	Apply the learning through course activity	Ар	10	1

Scheme of Continuous Internal Evaluation (CIE):										
Components	Addition of two IA tests	Two Assignments – (Open	Course project (CP)/ Case study etc.	Total Marks						
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100						

-Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for  $\ensuremath{\mathsf{SEE}}$ 

Sch	cheme of Semester End Examination (SEE):							
1.	It will be conducted for 100 marks of 3 hours' duration.							
2	Minimum marks required in SEE to pass: Score should be $> 25\%$ however overall score of							
Ζ.	winning marks required in sec to pass. Score should be 2 55%, however overall score of							
	CIE + SEE should be $\geq$ 40%.							

CO-PO Mapping (Planned)											CO-PSO Mapping (Planned)				
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	~									~				~	
2	~	~								~				~	~
3	~	~			~					~			~		~
4										~			~		

SI No	Skill & compet	ence en	hanced	Applicable Industry	Job roles students can take up				
after undergoing the course				Sectors & domains	after undergoing the course				
1	Networking	and	System	Software Engineer	Cyber security Analyst				
	Administration	)							
2	Cloud Security			Software Developer	IT auditor				

#### **OPTIMIZATION TECHNIQUES**

Course Code	22MAT761 Course type OEC		Credits L-T-P	3-0-0	
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0	Hrs; P = 0 Hrs		CIF Marks	100
	Total = 40 Hrs			100	
Flipped Classes content	10 Hours		SEE Marks	100	

Cours	e Learning Objectives
1.	To understand the methodology of OR problem solving and formulate linear programming
	problem. Solve linear programming problems using simplex method
2.	Develop formulation skills in transportation models and finding solutions. Understand the
	basics of Assignment Problems.
3.	Analyze dynamic games and understand queuing theory models and applications.
4.	To know how project management techniques help in planning and scheduling a project.

Pre-requisites: Basic algebra, Matrix theory, Probability

Unit – I : Introduction to OR and Linear Programming Problem	Contact Hours = 8 Hours
Evolution of OR, definition of OR, steps (phases) in OR study, character	eristics and
limitations of OP models used in OP Linear Programming Proble	m Convertiviand Basic Eessible

limitations of OR, models used in OR,Linear Programming Problem, Convexity and Basic Feasible Solutions. Formulation and examples, Graphical Solution, Convex and polyhedral sets, Extreme points, Basic solutions, Basic feasible solutions, Correspondence between basic feasible solutions and extreme points.

Unit – II : Simplex method and Duality	Contact Hours = 8 Hours					
Simplex method, Canonical and Standard form of LP problem, Optir	mality criterion, slack and surplus					
variables, Solutions to LPP by Simplex method . Formulation of the dual problem, Unbounded and infeasible solutions in the primal, Solving the primal problem using duality theory.						

Unit – III : Transportation and Assignment Problem	Contact Hours = 8 Hours						
Formulation of transportation problems, Methods of finding initia	l basic feasible solutions: North- west						
corner rule, Least-cost method, Vogel approximation method, Algorithm for obtaining optimal							
solution using MODI method. Formulation of assignment problems, Hungarian method.							
Unit – IV : Game Theory and Queuing Theory Contact Hours = 8 Hours							
Formulation of two-person zero-sum games, Games with mixed strategies, Graphical method for							

solving matrix game, Dominance principle, Solution of game problem.

Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), Kendall & Lee's notation of Queuing, empirical queuing models –Numerical on M/M/1 and M/M/C Queuing models.

Unit – V : Network Analysis						Con	tac	: Hou	urs =	8 Hours				
													1	

Network Scheduling by CPM-PERT: Rules of Network construction, Numbering of events (Fulkerson's rule), Construction of network, Time analysis: Forward Pass computation, Backward Pass computation, Determination of Floats and Slack times, Critical Path Method (CPM), Program Evaluation Review Technique (PERT). Cost analysis in networks - Problem

#### Flipped Classroom Details

Unit No.	I	II		IV	V
No. for Flipped	2	2	2	2	2
Classroom Sessions					

Unit	Self-Study Topics
No.	
1	Scope of OR, application areas of OR
2	Solving LPP by Generalized simplex method, Degeneracy in LPP
3	Travelling sales man problem
4	Linear programming method to solve without saddle point
5	Crashing of networks

Books	
	Text Books:
1.	Operations Research, An Introduction, Seventh Edition, Hamdy A. Taha, PHI Private
	Limited, 2006.
2.	Operations Research, S D Sharma Kedarnath, Ramnath & Company.
3.	Operations Research, Theory and Applications, Sixth Edition, J K Sharma, Trinity Press, Laxmi
	Publications Pvt. Ltd. 2016
4.	Operations Research, Anand Sharma, Himalaya Publishing House.
	Reference Books:
1.	Introduction to Operations Research, Hillier and Lieberman, 8 th Ed., McGraw Hill.
2.	Hamdy A. Taha (2017). Operations Research: An Introduction to Linear
	Programming and Game Theory (3rd edition)
	E- resources:
1.	http://www.class-central.com/subject/math(MOOCs)
2.	http://academicearth.org/

Course delivery methods			Assessment methods		
1.	Chalk and Talk	1.	IA tests		
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification		
3.	Flipped Classes	3.	Course Project		
4.	Online classes	4.	Semester End Examination		

Cou	Course Outcome (COs)								
Lear	ning Levels: Re - Remember; Un - Understand; Ap - Apply; An - An	alysis; Ev - E	valuate;	Cr – Create					
At th	At the end of the course, the student will be able to: Level PO(s) PSO(s)								
	Understand linear programming problems using appropriate		1	1					
1.	techniques and optimization solvers, interpret the results	Un							
	obtained.								
	Analyse the transportation models' solutions and infer solutions		1	1					
2.	to the real-world problems recognize and solve assignment	An							
	problems.								
2	Apply theory of pure and mixed strategy games and queuing	٨٣	1	1					
э.	theory models.	Ар							
	Apply Network models for service and manufacturing systems,		1	1					
4.	and apply operations research techniques and algorithms to	Ар							
	solve these Network problems.								

# Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments– (Open/Industry/Certification etc)	Course project(CP)/ Case study etc	Total Marks			
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100			
-Certification e	arned by passing the	e standard Online MOOCs cours	e (1 course of at least 8 hours	defined			
by BOS) can be	considered as a Cou	rse activity and awarded maxir	num of 10 marks.				
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.							
-Lack of minimum score in IA test will make the student Not Eligible for SEE							
-Minimum sco	re in CIE to be eligible	e for SEE: 40 OUT OF 100.					

Sch	Scheme of Semester End Examination (SEE):						
1.	It will be conducted for 100 marks of 3 hours' duration.						
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of						
	CIE + SEE should be $\geq$ 40%.						
3.	Question paper contains three parts A, B and C. Students have to answer						
	1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.						
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each						
	Question Carries 10 Marks.						
	3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.						

CO-PO Mapping (Planned)								CO-P Map (Plan	SO ping ned)						
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	$\checkmark$												$\checkmark$		
2	$\checkmark$												$\checkmark$		
3	$\checkmark$												$\checkmark$		
4	$\checkmark$												$\checkmark$		

#### COMPLEX ANALYSIS AND SPECIAL FUNCTIONS

Course Code:	22MAT762	Course type:	OEC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 40 Hrs	= 0 Hrs; P = 0 Hr	CIE Marks	100	
Flipped Classes content	10 Hours		SEE Marks	100	

# **Course Learning Objectives**

1.	Understand complex valued functions.
2.	Apply conformal mapping to find the image of region.
3.	Apply various integral formulae for dealing with complex integration
4.	Understand the importance of special functions.

Prerequisites: Basic knowledge of complex numbers, algebra and series solution

Unit – I	Contact Hours = 8 Hours				
Complex Analysis-I Functions of complex variables, Analytic func-	ctions, CR equations- Cartesian and				
Polar form(with proof), Properties of analytic functions, Applications to flow problems-velocity					
potential, complex potential, stream functions and stream lines. H	armonic functions				

Unit – II	Contact Hours = 8 Hours			
Conformal Transformation, Condition for conformality, Mappings	$w = Z^{n} w = Z^{2}, w = e^{z}, w = z + (a^{2}/z).$			
Bilinear transformation. Cross ratio Fixed points. Numericals based on different regions.				

Unit – III	Contact Hours = 8 Hours				
Line integral in complex plane, Cauchy's theorem and consequences, Cauchy's integral formula and					
residue theorem, Singularities and residues. Laurent's series. Region of convergence. Numericals on					
all above.					

Unit – IV	Contact Hours = 8 Hours
Bessel function: Bessel equation and its origin, solution, Bessel fun	ction of first kind,Jo(x), J1 (x), J0.5 (x),
J-0.5 (x) Recurrence relations, More J values. Generating function, o	rthogonality. Numericals on above

Unit – V	Contact Hours = 8 Hours
Legendre function: Legendre equation and its origin, solution, Legendre equation, solution, Legendre equation, solution, solution, Legendre equation, solution, solution	endre polynomial, Rodrigues formula

# Recurrence relations, Generating function, orthogonality. Numericals on above

# Flipped Classroom Details

Unit No.		11		IV	V
No. for Flipped	2	2	2	2	2
Classroom Sessions					

Unit No.	Self-Study Topics
1	Proof of C R equations.
2	Trigonometric transformations: sin z, cos z, tan z.
3	Taylor's and Maclaurin's series.
4	Graphs of various Bessel function.
5	Rodrigues formula derivation.

Books	5
	Text Books:
1.	B.S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42 nd Edition, 2012.
2.	B. V. Ramana- Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd.
	Tenth reprint 2010 and onwards.
	Reference Books:
1.	P.N.Wartikar & J.N.Wartikar– Applied Mathematics (Volume I and II) Pune Vidyarthi Griha
	Prakashan, 7 th Edition 1994 onwards.
2.	Functions of One Complex Variable" by John B. Conway, 2004 edition onwards.
3.	Special Functions & Their Applications, by N.N.Lebedev, 2004 edition onwards.
	E-resources:
1.	https://www.shiksha.com/online-courses/numerical-methods-for-engineers-course-courl3484
2.	https://www.coursera.org/learn/complex-analysis

Course delivery methods			Assessment methods		
1.	Chalk and Talk	1.	IA tests		
2	2. PPT and Videos		Assignment-		
۷.			Open/Industry/Certification		
3.	Flipped Classes	3.	Course Project		
4.	Online classes	4.	Semester End Examination		

#### Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr -Create

At the	e end of the course, the student will be able to:	Learning Level	PO(s)	PSO(s)
1.	To Understand the complex function as generalisation.	Un	1	1
2.	To Apply conformal mapping for image processing.	Ар	1	1
3.	To Understand complex integration and its properties	Un	1	1
4.	To Understand the role of special functions in applications.	Un	1	1

# Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks		
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100		
-Certification	earned by passing the	e standard Online MOOCs co	ourse (1 course of at least 8 ho	urs defined		
by BOS) can be	considered as a Cours	se activity and awarded max	ximum of 10 marks.			
Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.						
-Lack of minimum score in IA test will make the student Not Eligible for SEE						
-Minimum sco	ore in CIE to be eligible	e for SEE: 40 OUT OF 100.				

Sche	eme of Semester End Examination (SEE):
1	It will be conducted for 100 marks of 3 hours' duration.
2	Minimum marks required in SEE to pass: Score should be > 35%, however overall score of
	CIE + SEE should be $\geq$ 40%.
3	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2questions, each Question Carries 20 Marks.

CO PO Manning (Planned)							CO-PSO Mapping								
0-1		phing	Flainin	euj									(Plann	ed)	
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	~												~		
2	~												~		
3	~												~		
4	~												~		

#### HUMAN RESOURCE MANAGEMENT FOR ENGINEERS

Course Code	22INT71 Course type OEC			Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0		Total credits	3	
Total Contact Hours	L = 40 Hrs; T = 0 H	rs; P = 0 Hrs	CIF Marks	100	
	Total = 40 Hrs			100	
Flipped Classes content	10 Hours		SEE Marks	100	

Cours	Course Learning Objectives			
1.	To understand and analyze human resource functions within organizations			
2.	To examine current issues, trends, practices, and processes in HRM			
3.	To contribute to employee performance management and organizational effectiveness			
4.	Problem-solve human resource challenges			

**Pre-requisites:** Students need to be aware of the basic HR terminologies

Unit – I	Contact Hours = 8 Hours
Introduction to Human Resource Management: Definition, The Ma	anager's Role in Strategic Human
Resource Management.	

Unit – II	Contact Hours = 8 Hours
Recruitment and Placement: Human Resource Planning and Recru	iting, Recent trends of Recruiting,
Employee Testing and Selection, Interviewing Candidates.	

Unit – III	Contact Hours = 8 Hours
Training and Development: Training and Developing Employees, P	erformance Management and
Appraisal	

Unit – IV	Contact Hours = 8 Hours
Compensation: Pay Structure, Pay for Performance and Financial	ncentives, Benefits and Services

Unit – V	Contact Hours = 8 Hours
Employee Relations: Justice, and Fair Treatment in HR Management	nt, Developing Employee Relations,
Disciplinary procedure and Grievance Redressal, Employee Health	and Safety,

#### Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped	2	2	2	2	2
Classroom Sessions					

Unit No.	Self-Study Topics
1	Evolution of HRM
2	Job Analysis
3	Strategic Pay Plans
4	POSH Act
5	Global HRM and its implications

Books	
	Text Books:
1.	Gary Dessler, Human Resource Management, Pearson Education
2.	Michael Armstrong, Stephen Taylor, Armstrong's Handbook of Human Resource Management
	Practice, Kogan Publication
3.	Robert Mathis and John Jackson, Human Resource Management, Cengage Learning, 14th, 2016
	Reference Books:
1.	Bohlander, S. S. (2012). Managing Human Resources. Newyork : Thomson Learning
2.	Cynthia Fisher, S. (2008). Human Resource Management (Fifth ed.). New Delhi: Wiley
	Dreamtech
	E-resources
1.	Edx- People Management / https://www.edx.org/course/people-management-2
2.	NPTEL, Human Resource Management – I/ https://nptel.ac.in/courses/122105020

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Coui Lear An -	rse Outcome (COs) ning Levels: Re - Remember; Un - Understand; Ap - Apply; · Analysis; Ev - Evaluate; Cr - Create.)			
At th	ne end of the course the student will be able to:	Learning Level	PO(s)	PSO(s)
1.	Students apply the models of human resource management	Ар	1,2	1
2.	Students analyze of methods of human resource management and practices in the organizations	An	1,2	2
3.	Students would be able to analyze & plan effective practices and policies of human resource management in the organizations	АР	2.4,6	2
4.	Students will be able to apply & evaluate good HR practices	An	2,4,6	3

#### Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA	Two Assignments – (Open	Course project (CP)/ Case	Total
	tests	/Industry/Certification	study etc	Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE

-	
Sch	neme of Semester End Examination (SEE):
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE + SEE
	should be $\geq$ 40%.
3.	Question paper contains three parts A, B and C. Students have to answer
	1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.
	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each
	Question Carries 10 Marks.
	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)				CO-PSO Mapping (Planned)			
СО	PO1	PO2	PO4	PO6	PSO1	PSO2	PSO3
1	√	√			√		
2	√	√				√	
3		√	√	√		√	
4		√	√	√			√

SI No	Skill & competence enhanced	Applicable Industry	Job roles students can take up	
	after undergoing the course	Sectors & domains	after undergoing the course	
1	Knowledge of HR Policies and	HRM Domain	HR, Executive, Talent	
	Practices		Acquisition, HR Recruiter, HR	
			Generalist	

#### INDIAN KNOWLEDGE SYSTEM

Course Code	22AECIS77	Course type	HSMS	Credits L-T-P	1-0-0
Hours/week: L – T - P 1 – 0 – 0			Total credits	1	
Total Contact Hours	L = 15Hrs; T = 0 Hrs; P =0 Hrs			CIE Marks	100
	Total = 15 Hrs				
Flipped Classes content	03 Hours			SEE Marks	

Course	learning objectives
1.	To understand the importance of ancient knowledge to a society and familiarize with vedas and
	vedangas
2.	To understand the concepts of science and technology in ancient India

#### Pre-requisites: Nil

Unit – I	Contact Hours = 5 Hours
Importance of ancient knowledge and IKS. IKS corpus – a classified	cation framework, history and unique
aspects of IKS. Introduction to vedas and vedangas, vedic	life. Indian philosophical systems –
development and unique features, vedic schools of philosophy. Pa	anchatantra – puranas and itihasa as a
source of wisdom.	

Unit – II	Contact Hours = 5 Hours	
Foundational concepts for science and technology – importance	& role of Sanskrit in Natural language	
processing, stages of speech in Sanskrit vocabulary, number system in India, salient features of numerical		
system- measurement for time, distance & weight.		

Unit – III	Contact Hours = 5 Hours	
Science, Engineering and Technology in IKS - unique aspects of	Indian Mathematics and astronomy,	
functions in Mathematics, historical development of astronomy, elements of Indian calendar.		
The rise and fall of great Indian technology, mining, metal working, alloys in India Irrigation practices and		
architecture in India		

# Flipped Classroom Details

Unit No.	I	II	III
No. for Flipped Classroom	1	1	1
Sessions	L L	1	Ĩ

Books	
	Text Books:
1.	B. Mahadevan, V. R. Bhat and R. N. Nagendra Pavana, "Introduction to Indian Knowledge system
	- Concepts and Applications", PHI, 2023

Course delivery methods		Assessment methods		
1.	Chalk and Talk	1.	IA tests	
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)	
3.	Flipped Classes	3.	Open Assignments (OA)	
4.	Online classes	4.		

# Course Outcomes (Cos)

Cours	Course Outcomes (Cos)					
arnin	arning Levels: Re – Remember; Un – Understand; Ap – Apply; An – Analysis; Ev – Evaluate; Cr – Create					
Λ+ +b	a and of the course, the student will be able to:	Learning				
At the end of the course, the student will be able to:		Level	PO(S)	P30(3)		
1.	Understand the importance of ancient knowledge to a society and	lln	67	1		
	familiarize with vedas and vedangas	011	0,7	1		
2.	2. Understand the fundamental concepts of science and technology in		67	1		
	ancient India	01	0,7	1		

# Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Addition of two Assignments	Case study/Activity	Total Marks			
Marks	30+30 = 60	10+10 =20	20	100			
- Writing 2 IA tests are compulsory.							
- Student should score n	ninimum 40% of 100 marks	to pass the course.					

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
СО	РО	PO	PO	РО	РО	РО	РО	РО	PO	PO	PO	РО	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1						$\checkmark$	$\checkmark$						$\checkmark$		
2						$\checkmark$	$\checkmark$						$\checkmark$		