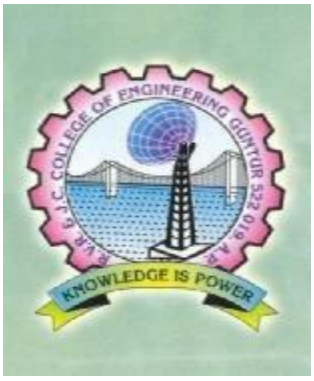
(R-20)

R.V.R. & J.C.COLLEGE OF ENGINEERING

(Autonomous)

Regulations (R-20)
Scheme of Instruction, Examinations and Syllabi
for
Four year B.Tech. Degree Programme

(W.e.f. 2020-2021)



Computer Science &Engineering

R.V.R. & J.C.COLLEGE OF ENGINEERING

Accredited by NBA and NAAC with "A" Grade
Chowdavaram, Guntur- 522019

RVR & JC College of Engineering

Department of Computer Science & Engineering

R20 Regulations B.Tech.(CSE)

Semester - I (First Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	CS/IT111	Mathematics – I	3	0	30	70	3	BS
2	CS/IT112	Engineering Physics	3	0	30	70	3	BS
3	CS/IT113	Basic Electrical & Electronics Engineering	3	0	30	70	3	ES
4	CS/IT114	Programming for Problem Solving	3	0	30	70	3	ES
5	CS/IT151	Engineering Physics Lab	0	3	30	70	1.5	BS
6	CS/IT152	Basic Electrical & Electronics Engineering Lab	0	3	30	70	1.5	ES
7	CS/IT153	Engineering Graphics and Design Lab	1	4	30	70	3	ES
8	CS/IT154	Programming for Problem Solving Lab	0	3	30	70	1.5	ES
9	CS/IT MC1	Constitution of India	2	0	100	-	-	MC
10		Three-weeks orientation program	-	-	-	-	-	
		TOTAL	**15**	**13**	**340**	**560**	**19.5**	

Category	CREDITS
Basic Science Courses	7.5
Engineering Science Courses	12
TOTAL CREDITS	**19.5**

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Semester - II (First Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	CS/IT121	Mathematics – II	3	0	30	70	3	BS
2	CS/IT122	Engineering Chemistry	3	0	30	70	3	BS
3	CS/IT123	Digital Electronics	3	0	30	70	3	ES
4	CS/IT124	English for Communication Skills	3	0	30	70	3	HS
5	CS/IT125	Programming in Python	2	0	30	70	2	ES
6	CS/IT161	Engineering Chemistry Lab	0	3	30	70	1.5	BS
7	CS/IT162	Programming in Python Lab	0	2	30	70	1	ES
8	CS/IT163	Computer Engineering Workshop	0	3	30	70	1.5	ES
9	CS/IT164	English Language Communication Skills Lab	0	3	30	70	1.5	HS
10	CS/IT MC2	Environmental Science	2	0	100	-	-	MC
		TOTAL	**16**	**11**	**370**	**630**	**19.5**	

Category	CREDITS
Basic Science Courses	7.5
Engineering Science Courses	7.5
Humanities and Social Science Courses	4.5
TOTAL CREDITS	**19.5**

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Semester - III (Second Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	CS/IT211	Probability and Statistics	3	0	30	70	3	BS
2	CS/IT212	Discrete Mathematics	3	0	30	70	3	PC
3	CS/IT213	Computer Organization	3	0	30	70	3	PC
4	CS/IT214	Data Structures	3	0	30	70	3	PC
5	CS/IT215	Object Oriented Programming	3	0	30	70	3	PC
6	CS/IT251	Probability and Statistics Lab	0	3	30	70	1.5	PC
7	CS/IT252	Data Structures Lab	0	3	30	70	1.5	PC
8	CS/IT253	Object Oriented Programming Lab	0	3	30	70	1.5	PC
9	CSSL1	Skill Oriented Course-1	1	2	100	-	2	SC
10	CS/IT MC3	Design Thinking & Product Innovation	2	0	100	-	-	MC
		TOTAL	**18**	**11**	**440**	**560**	**21.5**	

Category	CREDITS
Basic Science Course	3
Professional Core Courses	16.5
Skill Oriented Basic Course	2
TOTAL CREDITS	**21.5**

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Semester - IV (Second Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	CS/IT221	Computational Statistics	3	0	30	70	3	BS
2	CS/IT222	Database Management Systems	3	0	30	70	3	PC
3	CS/IT223	Operating Systems	3	0	30	70	3	PC
4	CS/IT224	Software Engineering	3	0	30	70	3	PC
5	CS/IT225	Web Technologies	3	0	30	70	3	PC
6	CS/IT261	Computational Statistics Lab	0	3	30	70	1.5	PC
7	CS/IT262	Database Management Systems Lab	0	3	30	70	1.5	PC
8	CS/IT263	Web Technologies Lab	0	3	30	70	1.5	PC
9	CSSL2	Skill Oriented Course-2	1	2	100	-	2	SC
10	CS/IT MC4	Ethics & Human Values	2	0	100	-	-	MC
		TOTAL	**18**	**11**	**440**	**560**	**21.5**	
Internship of Minimum 6 Weeks is mandatory during Summer Vacation (Will be evaluated in fifth Semester)								
Registration for Honors/Minor degree permitted in this semester (Maximum Two additional courses per semester are permitted for Honors/Minor								

Category	CREDITS
Basic Science Course	3
Professional Core Courses	16.5
Skill Oriented Basic Course	2
TOTAL CREDITS	**21.5**

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Semester- V (Third Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	CS/IT311	Automata Theory & Formal Languages	3	0	30	70	3	PC
2	CS/IT312	Computer Networks	3	0	30	70	3	PC
3	CS/IT313	Design & Analysis of Algorithms	3	0	30	70	3	PC
4	CS314	Professional Elective - I	3	0	30	70	3	PE
5	CS315	Open / Job-oriented Elective - I	3	0	30	70	3	OE
6	CS/IT351	Design & Analysis of Algorithms Lab	0	3	30	70	1.5	PC
7	CS/IT352	Data Analysis Lab	0	3	30	70	1.5	PC
8	CS/IT353	Summer Internship	-	-	100	-	1.5	PR
9	CSSL3	Skill Oriented Course – III	1	2	100	-	2	SC
		TOTAL	**16**	**8**	**410**	**490**	**21.5**	

Category	CREDITS
Professional Core Courses	12
Professional Elective Courses	3
Open Elective Course/Job Oriented Elective	3
Soft Skills- Skill Oriented Course*	2
Summer Internship	1.5
TOTAL CREDITS	**21.5**

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Semester- VI (Third Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	CS/IT321	Artificial Intelligence	3	0	30	70	3	PC
2	CS/IT322	Cryptography & Network Security	3	0	30	70	3	PC
3	CS/IT323	Machine Learning	3	0	30	70	3	PC
4	CS324	Professional Elective -II	3	0	30	70	3	PE
5	CS325	Open / Job Oriented Elective - II	3	0	30	70	3	OE
6	CS/IT361	Artificial Intelligence lab	0	3	30	70	1.5	PC
7	CS362	Machine Learning Lab	0	3	30	70	1.5	PC
8	CS/IT363	Term Paper	0	3	100	-	1.5	PR
9	CSSL4	Skill Oriented Course – IV	1	2	100	-	2	SC
		TOTAL	**16**	**11**	**410**	**490**	**21.5**	
Internship minimum of 6 weeks is mandatory during summer vacation. (Will be evaluated in Seventh Semester)								

Category	CREDITS
Professional Core Courses	12
Professional Elective Courses	3
Open Elective Course/Job Oriented Elective	3
Skill Advanced Course	2
Project/Term Paper	1.5
TOTAL CREDITS	**21.5**

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Semester -VII (Fourth Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	CS411	Humanities and Social Sciences (Elective)	3	0	30	70	3	HS
2	CS412	Professional Elective - III	3	0	30	70	3	PE
3	CS413	Professional Elective - IV	3	0	30	70	3	PE
4	CS414	Professional Elective – V (**MOOCS**)	0	0	-	100	3	PE
5	CS415	Open / Job Oriented Elective - III	3	0	30	70	3	OE
6	CS416	Open / Job Oriented Elective – IV (**MOOCS**)	0	0	-	100	3	HS
7	CS451	Internship / Professional Certification	-	-	100	-	3	PR
8	CSSL5	Skill Oriented Course – V	1	2	100	-	2	SC
TOTAL			**13**	**2**	**320**	**480**	**23**	

Category	CREDITS
Professional Elective Courses	9
Open Elective Course/Job Oriented Elective	3
Humanities And Social Science Elective	6
Skill Advanced Course	2
Industrial/Research Internship	3
TOTAL CREDITS	**23**

Semester - VIII (Fourth Year)

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category Code
			L	P	Internal Marks	SEE marks	Credits	
1	CS/IT461	Project Work (Project Work, Seminar and internship)	0	12	30	70	12	PR
TOTAL			**0**	**12**	**30**	**70**	**12**	

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Professional Elective Courses				
S.NO	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**CR**
III/IV B.Tech. (Vth Sem)				
CS314				
1.	CSEL01	Digital Image Processing	3-0-0	3
2.	CSEL02	Information Retrieval	3-0-0	3
3.	CSEL03	Data Engineering	3-0-0	3
III/IV B.Tech. (VIth Sem)				
CS324				
4.	CSEL04	Compiler Design	3-0-0	3
5.	CSEL05	Distributed Systems	3-0-0	3
6.	CSEL06	Principles of Cloud Computing	3-0-0	3
7.	*CSEL07	Industry Recommended Course(IRC)*	3-0-0	3
IV/IV B.Tech. (VIIth Sem)				
CS412				
1.	CSEL08	Devops (LBD)	3-0-0	3
2.	CSEL09	Cyber Security(LBD)	3-0-0	3
3.	CSEL10	Web and Micro Services(LBD)	3-0-0	3
IV/IV B.Tech. (VIIIth Sem)				
CS413				
4.	CSEL11	Internet of Things(LBD)	3-0-0	3
5.	CSEL12	Visual Programming(LBD)	3-0-0	3
6.	CSEL13	Natural Language Processing(LBD)	3-0-0	3
7.	*CSEL14	Industry Recommended Course(IRC)*	3-0-0	3

Open Elective courses offered by CSE				
S.NO	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**CR**
1.	CSOL01	Programming with Java	3-0-0	3
2.	CSOL02	Relational Database Management System	3-0-0	3

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Skill Oriented Courses			
S.NO	**COURSE NAME**	**L-T-P**	**CR**
Basic Skill Oriented Courses			
CSSL1 Skill Oriented Course - I			
a.	2D-Computer Animation	1-0-2	2
b.	Programming with C++	1-0-2	2
c.	PHP Programming	1-0-2	2
CSSL2 Skill Oriented Course - II			
a.	3D-Computer Animation	1-0-2	2
b.	Linux Programming	1-0-2	2
c.	Mobile Application Development	1-0-2	2
CSSL3	**Skill Oriented Course - III Soft Skills**	1-0-2	2
Skill oriented advanced Courses			
CSSL4 Skill Oriented Course - IV			
a.	Automation Testing	1-0-2	2
b.	Object Oriented Modeling and Design	1-0-2	2
c.	Socket Programming	1-0-2	2
CSSL5 Skill Oriented Course - IV			
a.	AWS cloud	1-0-2	2
b.	User Interface Design with ReactJS	1-0-2	2
c.	OpenMP & MPI	1-0-2	2
d.	Industry Recommended Course (IRC)*	1-0-2	2

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B.Tech. (Hons.) CSE Courses				
S.NO.	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**CR**
		POOL1		
1	CSH11	Advanced Data Structures	3-1-0	4
2	CSH12	Functional Programming	3-1-0	4
3	CSH13	Fuzzy Logic	3-1-0	4
4	CSH14	Computer Graphics	3-1-0	4
		POOL2		
1	CSH21	Advanced Databases	4-0-0	4
2	CSH22	Concurrent Programming	3-1-0	4
3	CSH23	Game Theory	3-1-0	4
4	CSH24	ARM system architecture	4-0-0	4
		POOL3		
1	CSH31	GPU Architectures and Programming	3-1-0	4
2	CSH32	Search Engine Internals	4-0-0	4
3	CSH33	Wireless Sensor Networks	4-0-0	4
4	CSH34	Parallel Algorithms	3-1-0	4
		POOL4		
1	CSH41	Semantic Web Technologies	4-0-0	4
2	CSH42	Deep Learning	3-1-0	4
3	CSH43	Social Network Analysis	4-0-0	4
4	CSH44	Augmented and Virtual Reality	3-1-0	4
		MOOCS		

2 MOOC courses to be done with the acceptance of CSE BoS.

Any of the following two can be opted:

- Knowledge Graphs / Ethical hacking / Digital Forensics / BlockChain Technology.
- Courses from Honors Pools not opted by the concerned student & offered by NPTEL

Humanities & Social Sciences Elective for CSE		
S.No	**COURSE CODE**	**COURSE NAME**
1	HSEL1	Industrial Management And Entrepreneurship
2	HSEL2	Economics for Engineers
3	HSEL3	Introduction to Industrial Management
4	HSEL4	Project Management & Entrepreneurship
5	HSEL5	Human Resources and Organizational Behavior

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Open Elective Courses (Offered by other Departments for CSE)

COURSE CODE	COURSE NAME	COURSE CODE	COURSE NAME
CEOL1	Basic Surveying	CEOL2	Building Materials And Construction
CEOL1	Energy Engineering	CHOL2	Biofuels
EEOL1	Renewable Energy Sources	EEOL2	Utilization Of Electrical Energy
MEOL1	Operations Research	MEOL2	Applied Mechanics & Mechanical Engineering
ECOL1	Applied Electronics	ECOL2	Microprocessors and Interfacing
ECOL3	Linear ECs and Applications		

Job Oriented Elective Courses (All branches)

COURSE CODE	COURSE NAME	Dept	COURSE CODE	COURSE NAME	Dept
JOEL01	Big data Processing	CSE	JOEL02	Full Stack Development	CSE
JOEL03	JavaScript Technologies	IT	JOEL04	Cloud Computing using AWS / Azure	IT
JOEL05	DevOps	CSB	JOEL06	Enterprise Programming	CSB
JOEL07	Tableau Software	CSD	JOEL08	Python for Data science	CSD
JOEL09	Interface and programming with IoT Gateway	CSO	JOEL10	IoT Cloud and Data Analytics	CSO
JOEL11	Geospatial Technology	CE	JOEL12	Building Planning	CE
JOEL13	Quantity Estimation	CE	JOEL14	Bio Fuels	ChE
JOEL15	Environmental Engineering	CE	JOEL16	Safety Management	ChE
JOEL17	Non-Conventional Energy engineering	ChE	JOEL18	Biopharmaceutics and Drug design	ChE
JOEL19	Embedded Systems-1	ECE	JOEL20	Embedded Systems-2	ECE
JOEL21	Open Source Systems	CSM	JOEL22	Machine Learning	CSM

Courses offered for Minor in Computer Science & Engineering

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	CSMR1	Fundamentals of Data Structures	4-0-0	4
2.	CSMR2	Computer Organization and Architecture	4-0-0	4
3.	CSMR3	Operating System Concepts	4-0-0	4
4.	CSMR4	Relational DataBase Management System	4-0-0	4
5.	CSMR5	Programming with JAVA	4-0-0	4
6.	CSMR6	Introduction to Algorithms	4-0-0	4
7.	CSMR7	Principles of Software Engineering	4-0-0	4
8.	CSMR8	Computer Networking Concepts	4-0-0	4
• 2 courses to be done through MOOCs with the acceptance of CSE BoS				

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Minor Programs offered by other Departments

- **Minor in Civil Engineering**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	CEMR1	Geomatics (Survey, GIS & GPS)	3-1-0	4
2.	CEMR2	Construction Engineering & Management	3-1-0	4
3.	CEMR3	Fundamentals of Structural Engineering	3-1-0	4
4.	CEMR4	Water Resource Engineering	3-1-0	4
5.	CEMR5	Environmental Engineering	3-1-0	4
6.	CEMR6	Geotechnical Engineering	3-1-0	4
7.	CEMR7	Transportation Engineering	3-1-0	4

- **Minor in Chemical Engineering**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	CHMR1	Unit Operations	3-1-0	4
2.	CHMR2	Principles of Chemical process calculations	3-1-0	4
3.	CHMR3	Transfer operations	3-1-0	4
4.	CHMR4	Reaction Engineering	3-1-0	4
5.	CHMR5	Industrial Pollution Controll Engineering	4-0-0	4
6.	CHMR6	Principles of Safety Management	4-0-0	4

- **Minor in Mechanical Engineering**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	MEMR1	Engineering Mechanics	3-1-0	4
2.	MEMR2	Strength of materials and Fluid mechanics	3-1-0	4
3.	MEMR3	Manufacturing Processes	4-0-0	4
4.	MEMR4	Concepts of Thermal Engineering	3-1-0	4
5.	MEMR5	Concepts of Mechanical Design	3-1-0	4
6.	MEMR6	Computer Aided Design & Manufacturing	4-0-0	4
7.	MEMR7	Additive Manufacturing	4-0-0	4

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- **Minor in Electronics & Communication Engineering**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	ECMR1	Electronics Devices & Circuits	3-1-0	4
2.	ECMR2	Digital Logic Design	3-1-0	4
3.	ECMR3	Network Analysis	3-1-0	4
4.	ECMR4	Electronic Circuit Analysis	3-1-0	4
5.	ECMR5	Signals and Systems	3-1-0	4
6.	ECMR6	Microprocessors & Interfacing	3-1-0	4

- **Minor in Electrical & Electronics Engineering**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	EEMR1	Electrical Machines Theory & Performance	3-1-0	4
2.	EEMR2	Electrical Power Generation & Utilization	4-0-0	4
3.	EEMR3	Power Systems Engineering	3-1-0	4
4.	EEMR4	Power Converters & Applications	3-1-0	4
5.	EEMR5	Electrical Measurements & Instrumentation	3-1-0	4
6.	EEMR6	Electric Vehicles	4-0-0	4

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Minor Programs offered under Industrial Tracks

- **Minor in Automation & Robotics**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	ARMR1	Robotic Engineering	4-0-0	4
2.	ARMR2	Mechatronics and Microcontrollers	3-1-0	4
3.	ARMR3	Industrial Automation	4-0-0	4
4.	ARMR4	Computer integrated Manufacturing	3-0-0	3
5.	ARMR5	Fluidics and Control Systems	3-1-0	4
6.	ARMR6	Mechanics of Robots	3-1-0	4
7.	ARMR7	3D Printing	4-0-0	4

- **Minor in Cloud Computing**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	CCMR1	Principles of Cloud Computing	3-1-0	4
2.	CCMR2	Cloud Virtualization	3-1-0	4
3.	CCMR3	Cloud Application Development	3-1-0	4
4.	CCMR4	Cloud Security	3-1-0	4
5.	CCMR5	Edge Computing	3-1-0	4
6.	CCMR6	Block Chain Security	3-1-0	4
7.	CCMR7	High Performance Computing	3-1-0	4
8.	CCMR8	Cloud Computing and Distribution Systems (MOOCs)		
9.	CCMR9	Cloud Computing (MOOCs)		

- **Minor in Full Stack Development**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	FSMR1	User Interface Design	3-1-0	4
2.	FSMR2	Client Side Scripting	3-1-0	4
3.	FSMR3	React JS	3-1-0	4
4.	FSMR4	MEAN Stack(Mongo DB, Express, JS, Node JS	3-1-0	4
5.	FSMR5	C# (..Net Framework)	3-1-0	4
6.	FSMR6	Web Application Development using ASP	3-1-0	4
7.	FSMR7	J2ME	3-1-0	4
8.	FSMR8	Modern Application Development (MOOCs)		
9.	FSMR9	Advanced Python Programming (MOOCs)		

- **Minor in Electric Vehicles**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	EVMR1	Energy systems and Electrical Machines	3-1-0	4
2.	EVMR2	Hybrid Electric Vehicles	3-1-0	4
3.	EVMR3	Plug – in Electric Vehicles	3-1-0	4
4.	EVMR4	Electric vehicle power train	3-1-0	4
5.	EVMR5	Autotronics	3-1-0	4
6.	EVMR6	BMS & Charging stations	3-1-0	4

- **Minor in VLSI**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	VLMR1	HDL Programming	3-1-0	4
2.	VLMR2	System Venlog and UVM	3-1-0	4
3.	VLMR3	Synthasis and Formal Verification	3-1-0	4
4.	VLMR4	Design for Testability	3-1-0	4
5.	VLMR5	Physical Design Fundamentals	3-1-0	4
6.	VLMR6	Advanced Physical Design	3-1-0	4

- **Minor in Safety Engineering**

S.NO	COURSE CODE	COURSE NAME	L-T-P	CR
1.	SEMR1	Safety Management	4-0-0	4
2.	SEMR2	Chemical Process Safety	4-0-0	4
3.	SEMR3	Hazard Identification and Risk Assessment	4-0-0	4
4.	SEMR4	Fire Technology	4-0-0	4
5.	SEMR5	Environmental Safety	4-0-0	4
6.	SEMR6	Safety in Petroleum and Petrochemical Industries	4-0-0	4

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Semester I (First year)

CS/IT111	Mathematics-I	L	P	C
		3	0	3

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more a level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:
After successful completion of the course, students will be able to:

1. Evaluate certain improper integrals apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. Apply Role's theorem which is fundamental application of analysis to Engineering problems.
3. Solve problems related to linear algebra including linear transformations in a Comprehensive manner
4. Find Matrix Eigen values and know diagonalization and orthogonalization.

Course Content:

UNIT I **Text Book-1** **15 Periods**

Evolutes and Involutes, Evaluation of improper integrals: Integrals without infinite limits of integration, Beta function, Gamma function, Relation between beta and gammafunctions (without proof) Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT II **Text Book-1** **15 Periods**

Rolle's theorem (without proof), Lagrange's mean value theorem (without proof), Taylor's and Maclaurin series, Sequences, Series, Series of positive terms, Convergence tests: Comparison test (limit form) D'Alembert's ratio test, Raabe's test for convergence.

UNITIII **Text Book-2** **15 Periods**

Vectors: addition and scalar multiplication, linear dependence and independence of vectors.
Vector space, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

UNIT IV **Text Book-2** **15 Periods**

Characteristic equation, Eigen values and eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, Eigen basis, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Learning Resources:

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd edition.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 2002.
2. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
3. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

CS/IT112	Engineering Physics	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are to:

1. Introducing the concept of electron motion in periodic potentials and classification of solids, band formation by learning the prerequisite quantum physics.
2. Explaining the diode equation and formation of P-N junction from the basics of semiconductors.
3. Understanding the interaction of radiation with bulk semiconductors and the relevant Optoelectronic devices with energy band diagrams.
4. Exploring the applications of devices in low dimensional materials by understanding the density of states and experimental techniques to be used for measurement of transport properties.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Demonstrate the necessity of periodical potentials and conditions for explaining the properties and band formation with the help of quantum physics.
2. Understand the theory of P-N junction diode from the basics of semiconductor concepts.
3. Know the theory and application of Optoelectronic devices.
4. Describe measuring techniques employed in transport phenomena and variation of properties in low dimensions.

Course Content:

UNIT I **CO1** **15 Periods**

Principles of Quantum Mechanics:Wave nature of particles, de Broglie's hypothesis, Davisson and Germer's experiment, Time dependent and Time independent Schrodinger wave equations, Physical significance of wave function, Uncertainty principle, single slit experiment. Particle in a box and extension to 3D box (qualitative treatment only).

Electron Theory of Metals: Salient features of Free electron theory, Fermi - Dirac distribution function, Fermi level, Density of States, Bloch wave function, Kronig-Penney model, E-k curves, Brillouin zones, Effective mass, Degrees of freedom, Distinction of metals, semiconductors and insulators. Concept of hole, Energy band formation insolids.

UNIT II **CO2** **15 Periods**

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, drift and diffusion equations, Einstein's relation, P-N junction formation, diode equation, Hall effect and applications.

UNIT III **CO3** **15 Periods**

Lasers and Optoelectronic Devices: Direct and Indirect band gap semiconductors, Light-semiconductor interaction: Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission, Optical loss and gain; Density of states for photons, Semiconducting laser, Homo and Hetero structure lasers with band diagrams, characteristics of laser and LED,PIN diode, Solar cell , working principle andcharacteristics.

UNIT IV **CO4** **15 Periods**

Low Dimensional Structures and Measuring Techniques: Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots. Four-point probe and Van der Pauw measurements for carrier density, resistivity and Hall mobility, Hot-point probe measurement, capacitance-voltage measurements, Parameter extraction from Diode I-V characteristics.

Learning Resources:

Text Book:

1. M.N. Avadhanulu, P.G. Kshirasagar - A Text book of Engineering Physics, S. Chand & Company Ltd., 2018.

Reference Book(s):

1. Donald A.Neeman - Semiconductor Physics and Device : Basic Principle (Fourth edition), TMH, 2012.
2. J.Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
3. B.E.A.Saleh and M.C.Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
4. S.M.Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
5. A.Yariv and P.Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
6. P.Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).

Web Resources:

1. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL.
2. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL.

CS/IT113	Basic Electrical & Electronics Engineering	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are :

1. To introduce fundamental laws, basic electrical elements, sources and their characteristics.
2. To develop the ability to apply circuit analysis to AC circuits.
3. To know the principle of operation and characteristics of Diode and transistors.
4. To acquire knowledge on feedback topologies and oscillators.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Analyse concepts of basic electrical circuits and batteries.
2. Solve problems on AC circuits.
3. Describe the principle of operation and characteristics of Diode and transistors.
4. Summarize feedback topologies and oscillators.

Course Content:

UNIT I **Text Books – 1&2** **CO1** **16 Periods**

DC Circuits: Batteries: Lead-acid, Nickel-iron, Nickel-Cadmium batteries (Operation only). Elementary calculations for energy consumption. DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT II **Text Books – 1&2** **CO2** **16 Periods**

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), real power, reactive power, apparent power, power factor. Three phase balanced circuits, voltage and current relations in star and delta connections (balanced loads only).

UNIT III **Text Book - 2** **CO3** **16 Periods**

Semiconductor Diodes: Semiconductor diode, Zener diode, Half-Wave Rectifier, Full-Wave rectifier, Clippers and Clampers.
Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitter configuration, Common collector configuration.

UNIT IV **Text Book – 2, Reference Book-4** **CO4** **16 Periods**

Amplifiers: Need of biasing, Thermal runaway, Types of biasing-fixed bias, collector base bias, self-bias. Feedback and Oscillator Circuits: Feedback concepts, feedback connection types, Barkhausen criteria, Phase-Shift oscillator, Wien bridge oscillator, Hartley oscillator, Colpitts oscillator.

Learning Resources:

Text Books:

1. Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 5th Edition, TMH, 2017.
2. M.S. Sukhija, T.K. Nagasarkar, "Basic Electrical & Electronics Engineering", Oxford press, 2012.

Reference Books:

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand, 2010.
2. Mahmood Nahvi and Joseph Edminister, Electric Circuits, 5th Edition, Schaum's outline series, TMH, 2017.
3. S. Salivahanan, A. Vallavaraj, "Electronic Devices and Circuits", TMH, 2011.
4. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson, 2010.

CS/IT114	Programming for Problem Solving	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are to:

1. Basic problem solving process using Flow Charts and algorithms.
2. Basic concepts of control structures in C.
3. Concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. Concepts of structures, unions, files and command line arguments in C.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Develop algorithms and flow charts for simple problems.
2. Use suitable control structures for developing code in C.
3. Design modular programs using the concepts of functions and pointers.
4. Develop code for complex applications using structures and file handling features.

Course Content:

UNIT I **15 Periods**

Introductory Concepts: Block Diagram of Computer, Computer Characteristics, Hardware vs Software, how to Develop a Program, Software Development Life Cycle, Structured Programming, Types of Programming Languages, Introduction to C program, Program Characteristics.
Introduction to C Programming: Character set, Identifiers and Keywords, Data types, Constants, type qualifiers, Declaration and Initialization of variables.
Operators & Expressions: Arithmetic Operators, Unary Operators, Relational and Logical Operators, Assignment Operators, Conditional Operator, Input/ Output functions.

UNIT II **15 Periods**

Control Statements: Branching, Looping, Nested Control Structures, Switch Statement, Break Statement, continue Statement, and Goto Statement
Arrays: Defining an Array, Processing an Array, Multidimensional Arrays & Strings.

15 Periods

UNIT III

Functions: Defining a Function, Accessing a Function, Function prototypes, Passing Arguments to a Function, Passing Arrays to Functions, Recursion, Storage Classes
Pointers: Fundamentals, Pointer Declarations, Passing Pointers to a Function, Pointers and Arrays, Dynamic memory allocation, Operations on Pointers, Arrays of Pointers.

15 Periods

UNIT IV

Structures and Unions: Defining a Structure, Processing a Structure, User-Defined Data Types, Structures and Pointers, Passing Structures to Functions, Self-Referential Structures, Unions.
Files Handling: Opening and Closing a Data File, Reading and Writing a Data File, Processing a Data File, Unformatted Data Files, Accessing the File Randomly.
Command line arguments, C-preprocessor directives.

Learning Resources:

Text Book:

1. Programming with C (Schaum's Outlines) by Byron Gottfried, Third Edition, Tata McGraw-Hill.

Reference Books:

1. Programming in C by Stephen G. Kochan, Fourth Edition, Pearson
2. C Complete Reference, Herbert Sheildt, TMH., 2000.
3. Programming with C by K R Venugopal&Sudeep R Prasad, TMH., 1997.
4. The C Programming Language by Brian W. Kernighan & Dennis M. Ritchie, Second Edition, Prentice Hall.
5. A Structured Programming Approach Using C by Behrouz A. Forouzan, Richard F. Gilberg, Third Edition, Cengage 2007.

Web References:

1. http://cprogramminglanguage.net/
2. http://lectures-c.blogspot.com/
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

CS/IT151	Engineering Physics Lab	L	P	C
		0	3	1.5

Course Objectives:

The aim and objective of the Lab course on Physics is to introduce the students of B.Tech. class to the formal structure of Physics so that they can use these in Engineering as per their requirement.

1. To familiarize the students with electronic measuring instruments.
2. To measure various parameters of the optical components.
3. Design/problem solving skills, practical experience are developed through laboratory assignments which provide opportunities for developing team in multidisciplinary environments.
4. To understand the general, scientific concepts and a wide idea on various components &instruments required for technology.

Course Outcomes:

At the end of the course, the student will be to draw:

1. Use CRO, Function generator, Spectrometer for making measurements.
2. Test the optical instruments using principles of interference and diffraction.
3. Carrying out precise measurements and handling sensitive equipment.
4. Draw conclusions from data and develop skills in experimental design.

List of Experiments:

1. Measurements using Vernier Calipers, Screw Gauge and Spherometer.
2. Newton's rings - Measurement of radius of curvature of plano-convex lens.
3. Determination of Energy band gap of a Semiconductor.
4. Optical fibers – Determination of Numerical Aperture.
5. Diffraction grating - Measurement of wavelengths using Spectrometer.
6. Magnetic field in Helmholtz coil.
7. PhotoVoltaic Cell – Determination of fill factor.
8. Series LCR resonance circuit –Determination of Q – factor.
9. Four probe method apparatus for measurements of resistivity and conductivity
10. Determination of wavelengths using diffraction grating
11. Variation of magnetic field along the axis of a circular current carrying coil
12. Carey Foster's bridge – Determination of Specific Resistance

Reference Book:

Physics Lab Manual: RVR & JCCE, Guntur

Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CS/IT152	Basic Electrical & Electronics Engineering Lab	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this lab course are to:

1. To conduct experiments on electrical circuits.
2. To design experimental setups for theorems.
3. To learn Diode characteristics, and basic diode applications as rectifiers and regulators.
4. To learn BJT characteristics and Oscillators.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Use common electrical measuring instruments.
4. Verify the network theorems.
5. Design Zener voltage regulator to meet the specifications.
6. Verify popular BJT applications experimentally.

List of experiments/demonstrations:

1. Familiarization of Electrical Installations and Electrical Testing Equipment: Miniature circuit breakers (MCBs), Moulded Case Circuit Breakers (MCCBs), Earth-leakage circuit breakers (ELCBs), Fuses, Types of Wires, Wire Gauges, continuity test, megger, Cables and Earthing.
2. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, oscilloscope, measurement of basic parameters.
3. Verification of KVL and KCL.
4. Verification of Superposition Theorem.
5. Verification of Thevenin's Theorem.
6. Verification of Norton's Theorem.
7. Determination of choke coil parameters.
8. Characteristics of Silicon, Germanium diodes.
9. Characteristics of Zener diode.
10. Half Wave Rectifier and Full Wave Rectifier.
11. Transistor Characteristics in CE configuration.
12. Characteristics of FET.
13. Self-Bias circuit.
14. Wein Bridge Oscillator.
15. Colpitt's Oscillator.

Note: A minimum of 10(Ten) experiments have to be Performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CS/IT153	Engineering Graphics & Design Lab	L	P	C
		1	4	3

Course Objectives:

The main objectives of this course are to:

1. Expose the students to standards and conventions followed in preparation of engineering drawings.
2. Make them understand the concepts of orthographic and isometric projections
3. Develop the ability of conveying the engineering information through drawings.
4. Make them understand the relevance of engineering drawing to different engineering domains.
5. Develop the ability of producing engineering drawings using drawing instruments.
6. Enable them to use computer aided drafting packages for the generation of drawings.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Prepare engineering drawings as per BIS conventions mentioned in the relevant codes.
2. Produce computer generated drawings using CAD software.
3. Use the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings.
4. Develop isometric drawings of simple objects reading the orthographic projections of those objects.
5. Convert pictorial and isometric views of simple objects to orthographic views.

Course Content:

(**UNIT I to IV** shall be taught in conventional drawing method and Unit V shall be taught with the aid of computer)

UNIT I

General: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering.
Conic sections: Construction of Ellipse, Parabola, Hyperbola and Rectangular Hyperbola. (General method only)
Curves: Cycloid, Epicycloid, Hypocycloid and Involute; and Scales

UNIT II

Method of Projections: Principles of projection - First angle and third angle projection of points, Projection of straight lines inclined to both planes. Traces of lines.
Projections of planes: Projections of planes inclined to both the planes, projections on auxiliary planes.

UNIT III

Projections of Regular Solids: Projections of solids (Prism, Pyramid, Cylinder and Cone) with varying positions.

Sections of Solids: Sections of Prisms, Pyramids, cylinders and Cones. True shapes of sections. (Limited to the cutting plane perpendicular to one of the principal plane).

Development of surfaces: Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT IV

Isometric Projections: Principles of Isometric Projection-Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids.
Orthographic Projections: Conversion of pictorial views into Orthographic views and Vice-versa. (Treatment is limited to simple castings).
Perspective Projections: Introduction to Perspective Projection.

UNIT V

Over view of Computer Aided drafting (AutoCAD): Introduction, starting and customizing AutoCAD screen, usage of different menus, toolbars (drawing, editing, dimension, text, object properties.etc), tabs (Object, snap, grid, polar, ortho, otrack.etc.) and command prompt. Setting units, limits, layers and viewports (Isometric, Top, Front, back, etc.). 2D drawings of various mechanical and structural components, electrical and electronic circuits. Orthographic and Isometric views of mechanical castings and simple structures.

Learning Resources:

Text Book:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.

Reference Books:

1. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
4. (Corresponding set of) CAD Software Theory and User Manuals

CS/IT154	Programming for Problem Solving Lab	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this course are to:

1. Basic problem solving process using Flow Charts and algorithms.
2. Basic concepts of control structures in C.
3. Concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. Concepts of structures, unions, files and command line arguments in C.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Develop algorithms and flow charts for simple problems.
2. Use suitable control structures for developing code in C.
3. Design modular programs using the concepts of functions and recursion.
4. Develop code for complex applications using structures, pointers and file handling features.

List of Exercises / Activities:

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Lab1 Simple computational problems using arithmetic expressions.
Lab2 Problems involving if-then-else & switch.
Lab3 Iterative problems.
Lab4 1D Array manipulation.
Lab5 Problems on 2D arrays and Strings.
Lab6 Function calling mechanisms (Call by value).
Lab7 Function calling mechanisms (Call by reference).
Lab8 Recursive functions.
Lab9 Dynamic memory allocation.
Lab10 Structures and unions.
Lab11 File operations.
Lab12 Command line arguments.

Note: A minimum of 10(Ten) experiments have to be Performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CS/IT MC1	Constitution of India	L	P	C
		2	0	0

Course Objective:

To provide basic information about Indian Constitution.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Understand the significance of many provisions of the Constitution as well as to gain insight into their back ground. They will also understand number of fundamental rights subject to limitations in the light of leading cases.
2. Study guidelines for the State as well as for the Citizens to be followed by the State in the matter of administration as well as in making the laws. It also includes fundamental duties of the Indian Citizens in Part IV A (Article 51A).
3. Understand administration of a State, the doctrine of Separation of Powers.
4. Know how the State is administered at the State level and also the powers and functions of High Court.
5. Understand special provisions relating to Women empowerment and also children. For the stability and security of the Nation, Emergency Provision are Justified.
6. Understand election commission as an independent body with enormous powers and functions to be followed both at the Union and State level. Amendments are necessary, only major few amendments have been included.

Course Content:

UNIT I **10 Periods**

Preamble to the Constitution of India Domicile and Citizenship. Fundamental rights under Part III,Leading Cases. Relevance of Directive Principles of State Policy under Part-IV, IV-A Fundamental duties.

UNIT II **10 Periods**

Union Executive - President, Vice-President, Prime Minister, Union Legislature - Parliament and Union Judiciary - Supreme Court of India. State Executive - Governors, Chief Minister, State Legislature and High Court.

UNIT III **10 Periods**

Special Constitutional Provisions for Scheduled Casters and Tribes, Women and Children and Backward Classes, Emergency Provisions.

UNIT IV **10 Periods**

Electoral process, Centre State Relations (Amendment Procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments).

Learning Resources:

Text Book:

1. Durga Das Basu, Introduction to the Constitution of India" (student edition) Prentice - Hall EEE,19th/20th Edition, 2001.

Reference Books:

1. M.V. Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI, Learning Pvt.Ltd., New Delhi,2011.

Semester II (First year)

CS/IT121	Mathematics-II	L	P	C
		3	0	3

Course Objectives:

The objective of this course is to extend concepts developed in Calculus to functions of several variables of multivariable calculus and ordinary differential equations and to develop student understanding and skills in the topic necessary for its applications to science and engineering.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Optimize functions of several variables essential in many engineering problems'.
2. Evaluate double and triple integrals and find areas and volumes.
3. Concepts like divergence, curl in integration of vector functions.
4. Solve differential equations which model physical processes.

Course Content:

UNIT I **15 Periods**

Multivariable Calculus: Limit, continuity and partial derivatives, total derivative
Maxima, minima and saddle points of two variables, Method of Lagrange multipliers

UNIT II **15 Periods**

Multiple Integrals: Double integrals (Cartesian and polar), change of order of integration, change of variables (Cartesian to polar), area by double integration, triple integrals, volume by triple integrals.

UNIT III **15 Periods**

Scalar and vector point functions, Gradient, directional derivative, divergence and curl, del applied twice to point and product of point functions (without proofs) Vector integration: line integral, surface and volume integrals, Green's theorem (without proof), Stoke'stheorem (without proof), Gauss divergence theorem (without proof)

UNIT IV **15 Periods**

First order ordinary differential equations: Linear, Bernoulli and exact equations Second order ordinary linear equations: Solution by method of variation of parameters,Cauchy's equation, Power series solutions; Legendre polynomials, Besselfunctions of the first kind and their properties

Learning Resources:

Text Book:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd edition.

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2010.
2. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

CS/IT122	Engineering Chemistry	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are to:

1. To develop concepts involved in molecular structure, intermolecular forces and make them understand the chemistry behind electrochemical energy systems.
2. To acquire knowledge on the chemical concepts involved in Water treatment and Corrosion.
3. Student shall know about the major organic reactions and end products like conducting polymers.
4. Learn analytical methods useful in characterization of compounds.

Course outcomes:

After successful completion of the course, students will be able to:

1. Identify stable complexes and suitable electrochemical energy systems for end usage.
2. Apply his knowledge for effective water treatment and corrosion prevention.
3. Identify chemical reactions that are used in the synthesis of molecules and polymers
4. Distinguish the ranges of the electromagnetic spectrum and characterize a given compound using analytical techniques.

Course Content:

UNIT I CO1 15 Periods

Molecular structure, Intermolecular forces and Energy systems:
Crystal field theory-salient features, energy level diagrams-tetrahedral and octahedral complexes, crystal field stabilization energies and magnetic properties.

Ionic, dipolar, Vander Waal's interaction and Hydrogen bonding, critical Phenomena-Andrew's isotherms of CO_2, derivation of critical constants from Vander Waal's equation.

Electrode potential, electrochemical series, Nernst equation and its applications. Batteries-Primary (Dry cell) and secondary (Lead acid), Lithium battery (Li-MnO_2)- advantages, Fuel cell (H_2-O_2 cell).

UNIT II CO2 15 Periods

Water Chemistry and Corrosion:
Water Chemistry-WHO standards, Municipal water Treatment-Removal of suspended Impurities-Sedimentation, Co-agulation and Filtration-Disinfection of water by chlorine, Break point chlorination, DE chlorination, Purification by ion-exchange method and reverse osmosis.

Corrosion-Introduction, Electrochemical theory of corrosion, galvanic corrosion, differential aeration corrosion, Factors-temperature, pH, overvoltage. Cathodicprotection by sacrificial

anodic method and impressed current method. Electroplating (Cu), Electrolessplating (Ni).

UNIT III CO3 15 Periods

Organic Reactions and Polymers:
Types of organic Reactions-Substitution (SN_1 and SN_2), Elimination (E_1 and E_2), Addition-Markownikoff's rule and anti-Markownikoff's rule, Cyclisation (Diel's Alder reaction), Synthesis of aspirin.

Polymers-Functionality, Degree of Polymerization, Tacticity-Addition and condensation polymerization, Relationship between Structure and Properties of polymers (Strength, Crystallinity, Elasticity, Plastic Deformation, Glass transition temperature (T_o)), Factors affecting T_o.

Conducting polymers: Introduction, Examples, General applications, Mechanism of conduction in polyacetylene.

UNIT IV CO4 15 Periods

Spectroscopic techniques and its applications:
Beer-Lambert's law, limitations, colorimetric determination of Fe(III)
UV-VIS spectroscopy – electronic transitions, shifts-blue and red, Block diagram - brief introduction of components, Applications – purity and differentiation of conjugated and non-conjugated dienes.

IR Spectroscopy–condition to be IR active, vibrational modes of–AB_2, Block diagram-brief introduction of components, IR spectrum of CO_2 and H_2O molecules, General applications. Fluorescence and its applications in medicine.

Learning Resources:

Text Books:

1. Engineering chemistry, P.C. Jain and Monica Jain, 16th edition, Dhanpat Rai Publishing Company.
2. Wiley Engineering chemistry, 2nd edition, Wiley India Private Limited.

Reference Books:
1. University Chemistry, Bruce H. Mahan, 3rd edition, Narosa Publishing House.
2. A text book of Engineering chemistry, Shashi Chawla, 3rd edition, Dhanpat Rai Publishing Company.

Web References:
1. Engineering Chemistry (NPTEL Web Book by B.L. Tembe, Kamaluddin&M.S. Krishnan).
2. http://www.powerstream.com/BatteryFAQ.html#lec.
3. http://freevideolectures.com/Course/3029/Modern-Instrumental-Methods-ofAnalysis.

CS/IT 123	Digital Electronics	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are to:

1. Know the concepts of different number systems, conversions and functionality of logic gates.
2. To analyse and design combinational logic circuits.
3. To analyse and design sequential logic circuits.
4. Understand programmable logic devices.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Demonstrate the knowledge in number systems, Boolean algebra, Combinational, sequential circuits, Programmable logic devices and Logic families.
2. Analyse and Design various combinational Circuits.
3. Analyse and Design various sequential Circuits.
4. Implement combinational circuit functionality with Programmable logic devices.

Course Content:

UNIT I **CO1, CO2, CO3, CO4** **12 Periods**

Digital Systems: Digital Systems, Binary Numbers, Number-Base Conversions, Octal and Hexadecimal Numbers, complements, signed binary Numbers.
Codes:BCD, excess – 3, Gray.
Boolean Algebra & Logic Gates: Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic theorems and Properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms, Digital Logic gates.
Gate-Level Minimization: The Map Method, Four-Variable K-Map, Five-Variable K-Map, Product of sums simplification, Don't-Care conditions, NAND and NOR implementation.

UNIT II **CO1, CO2, CO3** **12 Periods**

Combinational Logic: Combinational Circuits, Analysis Procedure, Design procedure, Half adder, Full adder, Half subtractor, Full subtractor, Carry look ahead adder, Magnitude comparator, Encoders, Decoders, Multiplexers, Demultiplexers.

UNIT III **CO1, CO2, CO3** **12 Periods**

Synchronous and sequential Logic: Sequential circuits, Latches, Flip-Fops, Analysis of clocked Sequential circuits, State Reduction and Assignment, Design Procedure.

UNIT IV **CO1, CO4** **12Periods**

Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters.
Programmable Logic Devices: Programmable Read-Only Memory, Programmable Logic Array, Programmable Array Logic.

Learning Resources:

Text Book:

1. M. Morris Mano, Digital Design, 3rdEdition, Pearson Education, 2009

Reference Books:

1. Z. Kohavi - Switching and Finite Automata Theory,2nd Edition Tata McGraw Hill.
2. R.P. Jain - Modern digital electronics, 4thEdition, McGraw Hill.

WEB RESOURCES:

1. http://nptel.ac.in/courses/117105080/3
2. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-111-introductory

CS/IT124 **English for Communication Skills** **L P C**

3 0 3

Course Objectives:

The main objectives of this course are to:

1. To enable students, improve their lexical and communicative competence and to equip Students with oral and written communication skills.
2. To help students understand and learn the correct usage and application of Grammar Principles.
3. To get them acquainted with the features of successful professional communication.
4. To enable students, acquire various specific features of effective written communication.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Use vocabulary contextually.
2. Compose effectively the various forms of professional communication.
3. Apply grammar rules efficiently in spoken and written forms.
4. Improve clarity to locate and learn the required information.

Course Content:

No. of Units	Name of the Topic	COs
UNIT I	**Vocabulary Building:**	
1.1	Root words from foreign languages and their use in English	CO 1
1.2	Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives	CO 1
1.3	Synonyms, Antonyms, and Standard abbreviations.	CO 1
1.4	One word substitutes	CO 1
UNIT II	**Writing Skills**	
2.1	Proposal writing	CO 1,CO 2,CO 3
2.2	Letter-writing	CO 1,CO 2,CO 3
2.3	Techniques for writing precisely (Précis writing)	CO 1,CO 2,CO 3
2.4	E-mail writing	CO1,CO 2,CO 3
UNIT III	**Identifying Common Errors in Writing**	
3.1	Subject-verb agreement	CO 3
3.2	Noun-pronoun agreement	CO 3
3.3	Articles	CO 3

3.4	Prepositions	CO 3
3.5	Tenses	CO 3
3.6	Redundancies	CO 3
UNIT IV	**Nature and Style of sensible writing**	
4.1	Description & Narration. (Paragraph writing)	CO 1,CO2,CO 3
4.2	Essay Writing. (Expository Essay)	CO1,CO 2,CO 3
4.3	Note-Making and Note-Taking	CO1,CO 2, CO 4
4.4	Methods of preparing notes.	CO1,CO 2, CO 4

Learning Resources:

Text Book:

1.Communication Skills, Sanjay Kumar and PushpaLata, Oxford University Press.

Reference Book(S):

1. Remedial English Grammar. F.T. Wood, macmillan,2007
2. On WritingWell, William Zinsser, Harper Resource Book, 2001
3. Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press, 2006
4. Practical English Usage, Michael Swan, OUP, 1995 Press.

CS/IT125	Programming in Python	L	P	C
		2	0	2

Course Objectives:

The main objectives of this course are to:

1. Introduce the fundamentals of Python Programming language.
2. Teach students processing of files, mutable and immutable data types.
3. Impart knowledge of Object – Oriented Programming using Python

Course Outcomes:

After successful completion of the course, students will be able to:

1. Explain the fundamentals of Python programming language.
2. Create user defined functions to solve problems
3. Manipulate the data structures lists, tuples, sets and dictionaries
4. Use Exception handling and Object – Oriented programming features of Python in solving real world problems

Course Content:

UNIT I

The way of the program: What is a program? Running Python, The first program, Arithmetic operators, Values and types

Variables, expressions and statements: Assignment statements, Variable names, Expressions and statements, Script mode, Order of operations, String operations.

Functions: Function calls, Math functions, Composition, Adding new functions, Definitions and uses, Flow of execution, Parameters and arguments, Variables and parameters are local, Stack diagrams, Fruitful functions and void functions, Why functions.

Conditionals and recursion: Floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Stack diagrams for recursive functions, Infinite recursion, Keyboard input.

UNIT II

Fruitful functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Checking types.

Iteration: Reassignment, Updating variables, The while statement, break, Square roots.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and counting, String methods, The in operator, String comparison.

Files: Persistence, Reading and writing, Format operator, Filenames and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules,.

UNIT III

Lists: A list is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map, filter and reduce, Deleting elements, Lists and strings, Objects and values, Aliasing, List arguments.
Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters. Looping and dictionaries, Reverse lookup, Dictionaries and lists, Memos, Global variables.
Tuples: Tuples are immutable, Tuple assignment, Tuples as return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples.

UNIT IV

Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying.
Classes and methods: Object-Oriented features, Printing objects, The init method, The __str__ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation.
Inheritance: Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Data encapsulation.

Learning Resources:

Text Book:

1. Think Python: How to Think Like a Computer Scientist, Allen Downey, Green Tea Press, Version 2.0.17

Reference Books:

1. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus by Dierbach, Wiley
2. Fundamentals of Python Programming : Richard L. Halterman by Southern Adventist University

CS/IT161	Engineering Chemistry Lab	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this course are to:

1. To know the methods of determining hardness and chloride ion content of water sample.
2. To learn the redox methods to determine Fe2+ ions present in solution.
3. To know principles and methods involved in using instruments like conductivity bridge and potentiometer.
4. To know the molecular properties like surface tension, viscosity.
5. To know synthetic methods for preparation of drugs and polymer.

Course outcomes:
After successful completion of the course, students will be able to:

1. Estimate the Fe(II) content of a given solution and chloride/hardness content of water.
2. Measure conductance of solutions, redox potentials of a cell.
3. Synthesize a small drug molecule and polymer.
4. Measure molecular properties such as surface tension, viscosity and determine physical parameters like saponification value, partition co-efficient and Rf value.

List of Experiments:

1.	Estimation of Mohr's salt using KMnO4.	CO1
2.	Estimation of Mohr's salt using K2Cr2O7.	CO1
3.	Determination of chloride ion content of water.	CO1
4.	Determination of Hardness of water using EDTA method.	CO1
5.	Determination of Fe(II) strength using K2Cr2O7 potentiometrically.	CO1& CO2
6.	Determination on strength of NaOH using HCI conduct metrically.	CO2
7.	Preparation of p-bromo acetanilide.	CO3
8.	Preparation of Phenol Formaldehyde resin.	CO3
9.	Determination of surface tension.	CO4
10.	Determination of Viscosity.	CO4
11.	Determination of Saponification / acid value of oil.	CO4
12.	Determination of partition co-efficient of I2 in water.	CO4
13.	Determination of Rf value using TLC.	CO4
14.	Verification of Freundlich isotherm using adsorption of acetic acid on activated charcoal.	CO4

CS/IT162	Programming in Python Lab	L	P	C
		0	2	1

Course Objectives:

The main objectives of this course are to:

1. To introduce the fundamentals of Python Programming language.
2. To make the students process files, mutable and immutable data.
3. To impart knowledge of Object – Oriented Programming using Python

Course Outcomes:

After successful completion of the course, students will be able to:

1. Illustrate the fundamentals of Python programming language.
2. Create user defined functions to solve problems
3. Write programs to manipulate the data structures lists, tuples, sets and dictionaries
4. Use Exception handling and Object – Oriented programming features of Python in solving real-world problems.

List of Exercises / Activities:

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Lab1	Simple Programs to demonstrate Input - Output operations.
Lab2	Programs to demonstrate the behavior and use of various operators.
Lab3	Programs to emphasize the usage of Conditional Control Statements.
Lab4	Programs to emphasize the usage of Iterative control statements.
Lab5	Programs on the usage of Built-in functions.
Lab6	Programs to demonstrate the creation and usage of User Defined Functions.
Lab7	Programs to demonstrate Recursion.
Lab8	Programs on creation and importing of modules.
Lab9	Programs on Lists and its operations
Lab10	Programs on List Processing. (Sortings, Searchings, Permutations...)
Lab11	Programs to demonstrate Exception Handling.
Lab12	Programs to demonstrate OOP concepts.

Note: A minimum of 10(Ten) experiments have to be Performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CS/IT163	**Computer Engineering Workshop**	**L**	**P**	**C**
		0	**3**	**1.5**

Course Objectives:

The main objectives of this course are to:

1. To make the students aware of the basic hardware components of a computer and installation of operating system.
2. To introduce Raptor Tool for flowchart creation.
3. To get awareness of cyber hygiene to protect the personal computer from getting infected with the viruses, worms and other cyber-attacks.
4. To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Apply knowledge for computer assembling and software installation.
2. Draw flowcharts for the given problems
3. Troubleshoot hardware and software level problems.
4. Prepare professional word documents using the Microsoft office.

Apply the tools for preparation of PPT, and budget sheet etc.

TASK 1: PC Hardware: PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition, hardware and software level troubleshooting process, tips and tricks would be covered.

Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

TASK 2: Software Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

TASK 3: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

TASK 4: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate how to access the websites and email.

TASK 5: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

TASK 6: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

TASK 7: Drawing flowcharts (Raptor Tool): Students should draw flowcharts for the problems

validating an email id entered by user, printing first fifty numbers and preparing electricity bill.

TASK 8: Productivity tool: Microsoft (MS) office: Importance of MS office, Details of the three tasks and features that should be covered in each, MS word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter. Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Using MS Word to create project certificate: Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date and Time option in Word.

TASK 9: Spread sheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: - Gridlines, Format Cells, Summation, auto fill, Formatting Text

TASK 10: Creating Power Point: Student should work on basic power point utilities and tools in Ms Office which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and Charts.

** Minimum 8 tasks should be done by the student to get eligibility to appear for the exam

** Tasks 1 to 7 are mandatory

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
3. Computer Fundamentals, l e, Anita Goel, Person Education.

Reference Books:

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

CS/IT164	Communication Skills Lab	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this course are to:

1. To identify speaker's purpose and tone; make inferences and predictions about spoken discourse, discuss and respond to content of a lecture or listening passage orally and/or in writing.
2. To acquaint the students with the Standard English pronunciation, i.e., Receive Pronunciation (RP), with the knowledge of stress and intonation.
3. To develop production and process of language useful for social and professional life.
4. To develop in them communication and social graces necessary for functioning. Improve the dynamics of professional presentations.
5. To develop critical reading and comprehension skills at different levels.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Comprehend relationships between ideas and make inferences and predictions about spoken discourse.
2. Speak English with a reasonable degree of accuracy in pronunciation.
3. Develop appropriate speech dynamics in professional situations.
4. Use effective strategies and social graces to enhance the value of communication.
5. Develop effective communication and presentation skills and using language effectively to face interviews with success.

List of Exercises / Activities:

1. Listening Comprehension.
2. Pronunciation, Intonation, Stress and Rhythm.
3. Common Everyday Situations: Conversations and Dialogues.
4. Interviews.
5. Formal Presentations.
6. Reading Comprehension.

Reference Book(S):

1. Communication Skills. Sanjay Kumar and PushpaLata. Oxford University Press.
2. Practical English Usage. Michael Swan. OUP. 1995 Press.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University.
4. Technical English M. Sambaiah, Wiley Publications, New Delhi.

CS/ITMC2	**Environmental Science**	**L**	**P**	**C**
		2	**0**	**-**

Course Objectives:

The main objectives of this course are to:

1. Understand that humans are an integral part of environment and hence their activities reflect on the environment.
2. Realize and appreciate the importance of ancient practices and their importance in the present times
3. Appreciate the contribution of individuals for the upkeep of environmental standards, in turn help the humans live better.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Evaluate the implications of human activities and thereby promote ecofriendly technologies.
2. Promote awareness among the members of the society for a sustainable environment.
3. Include and give priority to environmental protection in all developmental projects.

Course Content:

A. AWARENESS ACTIVITIES - SMALL GROUP MEETINGS

I. Source of water for human consumption/activities:

a. collection of information pertaining to water resources and consumption in Andhra Pradesh

b. Water resource on campus: General / Laboratory use and

c. Drinking water - understand the background and adopt judicious management.

d. Recycled water for Gardening - Particularly Lawns.

e. Cut down wastage of electricity in class rooms / labs / hostels etc. by avoiding misuse.

II. After the group meetings and exposure to the local issues and healthy practices, students motivated to make:

a. Posters

b. Slogans/One liners for promoting awareness

III. Lectures from Experts (at least 2 in the course duration)

IV. A walk in the neighborhood to promote a chosen theme on environmental consciousness.

B. ACTUAL ACTIVITIES

1. Plantation on Campus and on the sides of approach road.
2. Distribution of saplings to the local colony dwellers and encourage plantation.
3. Development of Kitchen garden on campus - Cultivation of at least leafy vegetables
4. and creepers like cucumber etc. for use in college canteen/hostels etc.
5. Adoption of "NO PLASTICS" on campus.
6. Field trip to gain knowledge of biodiversity, water shed, mining, pollution and other
7. local issues.
8. Preparation of working models for energy generation/transformation etc.

C. THEORY SYLLABUS FOR ASSESSMENT

Part-I

1. Introduction to Environmental Studies, Scope and Importance.
2. Natural resources Renewable and Non-Renewable; Definition and importance of the following resources in detail: a. Forest b. Water c. Land d. Energy
3. Sustainable development - Concept and Measures.
4. Biodiversity - Definition, Types of Biodiversity, Values and threats to Biodiversity, Conservation of biodiversity, IUCN classification: Endangered, Threatened, Vulnerable, Rare species; Endemic and Exotic species.
5. Climate change - Global warming, Ozone depletion and Acid rain.

Part-II

6. Water shed, water shed management in detail.
7. Solid wastes and Solid waste management.
8. Environmental Legislation, Environmental acts - Wild life protection act, Water act, Forest conservation act, Air act and Environmental protection act.
9. Case studies: Chernobyl nuclear disaster, Bhopal gas tragedy, Narmada bachaoandolan, Silent valley, Story of Tuvalu, Story of Ganga.
10.Earth summit and Kyoto protocol; Measures at individual level for conservation of natural resources and sustainable development.

Learning Resources:

Text Books:

1. Anubha Kaushik and C.P. Kaushik - Environmental Studies, 3rd Edition, New Age International Publishers, New Delhi., 2012.
2. R. Rajagopalan - Environmental studies from crisis to cure, 3rd Edition, Oxford University press, 2012.

Assessment

1. Two assessments each of 40 marks will be done in the semester. The split up of each assessment is as follows:
a. Two internal theory examinations will be conducted for 18 marks each.
b. Evaluation of the prepared activity sheets and working models will be done for 12M (continual evaluation) twice in the semester in line with the theory examination.
c. 5 Marks for attendance and 5 marks for oral test.

Semester - III (Second Year)

CS/IT211 **Probability and Statistics** **L P C**
2 0 3

Course Objectives:

The student who successfully completes this course will have:

1. The ability to understand the basic principles of various probability distributions.
2. The ability to know the sample distributions of the data
3. The basic concepts of testing of hypothesis and their applications for the data.
4. The skill to predict the future behaviour based on time series data.

Course Outcomes:

On completion of this course, students will be able to:

1. CO1: Apply various formulae to analyze and interpret the data.
2. CO2: Apply the knowledge of distribution theory to both software and hardware design problems.
3. CO3: Apply the basic concepts of testing of hypothesis and derive the conclusions for the data.
4. CO4: Forecast the behavior of the data by various models in time series.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	2	3	3

Course Content

UNIT I **14 periods**

Probability distributions: Random Variables, Binomial distribution, Poisson distribution, and Geometric distribution.

Probability densities: Continuous random variables, Normal distribution, Normal approximation to the Binomial distribution, Uniform distribution, Log-normal distribution, Gamma distribution, Beta distribution, Weibull distribution.

UNIT II **14 periods**

Sampling distribution: Population and samples, the sampling distribution of mean (σ known), the sampling distribution of mean (σ unknown), the sampling distribution of variance.

Testing of Hypotheses (Parametric Tests):
Inferences Concerning Means: Point estimation, Interval estimation, tests of hypothesis, null hypothesis and tests of hypothesis, hypothesis concerning one mean, inferences concerning two means

UNIT III **14 periods**

Testing of Hypotheses (Parametric Tests) (Contd…):
Inferences Concerning Variances*:* The estimation of variances, hypothesis concerning one variance, hypothesis concerning two variances.

Inferences Concerning Proportions:The estimation of proportions, hypothesis concerning one proportion, hypothesis concerning several proportions, The analysis of r×c tables, Goodness of fit.

UNIT IV **14 periods**

Testing of Hypotheses (Non-Parametric Tests): Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region.

Basics of Time Series Analysis & Forecasting: Stationary, ARIMA Models: Identification, Estimation and Forecasting.

Learning Resources:

Text Book:

1. Miller &Freund's Probability and Statistics for Engineers – Richard A. Johnson

Reference Books:

1. U. Dinesh Kumar, Business Analytics: The science of data- driven decision making.
2. S.M Ross, Introduction to Probability and Statistics for Engineers and Scientists.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley.
5. S.C. Gupta and V.K. Kapoor., Fundamentals of Mathematical Statistics, Sultan Chand &Co.

CS/IT212 **Discrete Mathematics** **L P C**
2 0 3

Course Objectives:

At the end of the course, the student will

1. Introduce the concepts of mathematical logic.
2. Understand the combinatorial problems using counting principles,
3. Create generating functions and solve recurrence relations.
4. Use Directed & Un-Directed Graphs concepts and its applications.

Course Outcomes:

At the end of the course, the student will be able to

1. Apply formal methods of proof and propositional & First order logic to validate the propositional statements.
2. Apply techniques for counting the occurrences of discrete events including permutations, combinations with or without repetitions.
3. solve generating function and recurrence relations.
4. Solve the real-world problems using directed and undirected graphs.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3		2
CO2	3		2
CO3	3		2
CO4	3		2

Course Content:

UNIT I **13 periods**

Foundations: Sets, Relations and Functions, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof, Rules of Inference for Quantified propositions, Mathematical Induction.

UNIT II **10 periods**

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Combinations and Permutations with Constrained Repetitions.

UNIT III **13 periods**

Recurrence Relations: Generating functions of sequences, Calculating Coefficients of Generating Functions, solving recurrence relations by Substitution and generating functions. The methods of characteristic roots, solutions of inhomogeneous recurrence relations.

UNIT IV **14 periods**

Relations & Digraphs: Properties & Equivalence relations, Operations on relation, Directed Graphs and Adjacency Matrices, Ordering relations, Lattices and Enumerations.

Graphs: Isomorphism's and Sub graphs, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

Learning Resources:

Text Book:

1. Joe L. Mott, Abraham Kandel& Theodore P.Baker, Discrete Mathematics for Computer Scientists & Mathematicians, PHI 2nd edition.

Reference Books:

1. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.
2. Discrete and Combinational Mathematics- An Applied Introduction-5th Edition– Ralph. P. Grimaldi.Pearson Education
3. Discrete Mathematical Structures with applications to computer science Trembly J.P. &Manohar. P, TMH
4. Discrete Mathematics and its Applications, Kenneth H. Rosen, FifthEdition.TMH.

CS/IT213 **Computer Organization** **L P C**
3 0 3

Course Objectives:

The objectives of the course are:
1. To introduce the functional units of computer system, architecture and its operations.
2. To discuss the basic processing unit and I/O devices.
3. To impart the knowledge on memory system.
4. To demonstrate the arithmetic operations in a computer system.
5. To instruct the instruction level parallelism

Course Outcomes:

At the end of the course the students will be able to:
1. Describe components, architecture of a computer system and its working.
2. Demonstrate instruction execution and control system.
3. Illustrate a pipeline system for the execution of instruction.
4. Explain various I/O handling mechanisms and its interfaces.
5. Discuss computer arithmetic algorithms.
6. compare various memory systems.

CO-PO Mapping

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

Course Content:

UNIT I **12 Periods**

Basic structure of computers: Computer types, Functional Units, Basic Operational Concepts, Number Representation and Arithmetic, Character Representation, Performance.

Instruction Set Architecture: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Stacks, Subroutines, Additional Instructions, Encoding of Machine Instructions.

UNIT II **14 Periods**

Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control.
Pipelining: Basic Concept-The Ideal Case, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Resource limitations.

UNIT III **10 Periods**

Basic Input/ Output: Accessing I/O Devices: I/O Device Interface, Program-Controlled I/O; Interrupts: Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling I/O Device Behavior, Processor Control Registers.

Input/output Organization: Bus Structure, Bus Operation: Synchronous Bus, Asynchronous Bus; Arbitration, Interface Circuits; PCI Bus, SCSI Bus.

UNIT IV **14 Periods**

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Cache Memories, Performance Considerations.

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Unsigned Numbers, Multiplication of Signed Numbers, Fast Multiplication-Bit-Pair recoding of Multipliers, Integer Division, Floating-Point Numbers and Operations.

Learning Resources:

Text Book(s):

1. Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books:

1. Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
2. Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, Pearson Education.

CS/IT214 **Data Structures** **L P C**
3 0 3

Course Objectives:

The objectives of this course are:

1. To illustrate operations of linear and non-linear data structure
2. To demonstrate computational problems using suitable data structures
3. To familiarize searching and sorting techniques

Course Outcomes:

After successful completion of the course, student will be able to:

1. Analyze computation complexity of algorithms
2. Implement searching, sorting and hashing techniques
3. Apply operations on linear and non-linear data structures
4. Develop solutions for computational problems using appropriate data structures

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I **10 Periods**

Introduction: Basic Concepts-Algorithm Specification, Data Abstraction, Performance Analysis-Time complexity, Space complexity, Asymptotic Notations

Searching and Sorting: Linear Search, Binary Search, insertion sort, selection sort.

UNIT II **14 Periods**

Lists: Pointers, Singly Linked Lists, Polynomials, Circular Linked Lists: Operations & their algorithms, Polynomials: Addition, Multiplication

Hashing: Static Hashing - Hash Tables, Hashing Functions, Overflow Handling

UNIT III **12 Periods**

Stacks and Queues: Stack ADT, Queue ADT, Evaluation of Expressions, Multiple Stacks and Queues, Dynamically Linked Stacks and Queues

UNIT IV **14 Periods**

Trees: Introduction, binary trees, Binary Tree Traversals, Binary Search Trees, AVL Trees, Heaps, Heap sort, B-Trees and B+ Trees

Graphs: The Graph Abstract Data Type, representations of graphs, Elementary Graph Operations - Depth First Search, Breadth First Search, Connected Components

Learning Resources:

Text Book:

1. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.

Reference Book(S):

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 1997.
2. Y. Langsam, M.J.Augeustein and A.M. Tenenbaum, Data Structures Using C, Pearson Education Asia, 2004.
3. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Jean Paul Trembly and P.G.Sorenson, An Introduction of Data Structures with Applications

CS/IT215 **Object Oriented Programming** **L P C**
3 0 3

Course Objectives:

The learning objectives of this course are:

1. To make the students understand Java fundamental concepts
2. To elucidate the fundamentals of object-oriented programming in Java
3. To create awareness on exception handling and multithreading
4. To familiarize students with the concepts of Event Handling, Generics and Collections

Course Outcomes:

By the end of the course, the students will be able to

1. Comprehend the concepts of OOP and fundamentals of Java Programming.
2. Develop reusable and efficient programs using Inheritance & Polymorphism.
3. Demonstrate the importance of packages and interfaces.
4. Use the concept of exception handling to create error free codes and avoid abnormal program terminations.
5. Design multi-tasking applications using Multithreading.
6. Develop Event Driven applications and generic programs

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1		2	
CO2		3	2
CO3		3	3
CO4		3	3
CO5		3	3
CO6		3	3

Course Content:

UNIT I **(CO1)** **12 Periods**

Introduction: The history and evolution of Java, Java Buzz words, object-oriented programming, Data Types, Variables and Arrays, Operators, Control Statements.

Classes and Objects: Concepts, methods, constructors, types of constructors, constructor overloading, usage of static, access control, this keyword, garbage collection, finalize()method, overloading, parameter passing mechanisms, final keyword, nested classes and inner classes.

Utility Classes: Date, Calendar, Scanner, Random

UNIT II **(CO2, CO3)** **12 Periods**

Inheritance: Basic concepts, access specifiers, usage of super key word, method overriding, using final with Inheritance, abstract classes, dynamic method dispatch, Object class.
Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.
Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.
Strings: Exploring the String class, String buffer class, Command-line arguments

UNIT III **(CO4, CO5)** **12 Periods**

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, multiple catch clauses, nested try, Built-in exceptions, creating own exception sub classes.
Multithreading: The Java Thread model, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, Inter Thread Communication, Deadlock.
Applets: Concepts of Applets, life cycle of an applet, creating applets
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

UNIT IV **(CO6)** **12 Periods**

AWT: AWT Components, , File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menu bar.

GUI with Swing– Swings introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons. Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables

Generics: Basics of Generic Methods, Generic Classes

Collections: Collection Interfaces, Collection Classes**,** Accessing a Collection via an Iterator

Learning Resources:

Text Book:

1. Java The Complete Reference - Herbert Schildt 11th Edition, Mc Graw Hill Education.

Reference Books:

1. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
3. Cay.S.Horstmann and Gary Cornell, Core Java 2, Vol 1, Fundamentals 7th Edition, Pearson Education.
4. H.M.Dietel and P.J.Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI.
5. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001.
6. Cay Horstmann, John Wiley and Sons ,Big Java 2nd Edition, ,Pearson Education.

CS/IT251	Probability & Statistics with R Lab	L	P	C
		0	3	1.5

Course Objectives:

The student who successfully completes this course will have:

1. The knowledge to use R for statistical programming, computation, modelling and graphics.
2. The skill to write functions and use R in an efficient way.
3. The ability to fit some basic types of statistical models using R.
4. The idea to expand the knowledge of R on their own.

Course Outcomes

On completion of this course, students will be able to:

1. Write the programs in R to solve the statistical problems.
2. Apply various built in functions in R to solve the computational and modelling problems.
3. Interpret the statistical data by various functions of graphical representation.
4. Understand- reading, writing, working and manipulating the data in various data frames.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	POS2	PSO3
CO1	3	3	1
CO2	2	2	3
CO3	3	3	2
CO4	3	2	2

Lab – Course Content:

Introduction to R

Functions

Control flow and Loops

Working with Vectors and Matrices

Reading in Data

Writing Data

Working with Data

Manipulating Data

Simulation

Linear model

Data Frame

Graphics in R

Pre – Requisites

CS/IT-151– C Programming.

Lab – Course Plan&Delivery:

LIST OF EXPERIMENTS	PERIODS
1. Graphical representation of data a) Bar plot b)Frequency polygon	**3**
2. Graphical representation of data a) Histogram b)Pie chart c) Scatter plot	**3**
3. Measures of central tendency a) Mean b)Median c)Mode	**3**
4. Measures of central tendency a)Geometric Mean e)Harmonic Mean	**3**
5. Measures of dispersion a)Range b)Quartile deviation	**3**
6. Measures of dispersion a)Mean deviation b)Standard deviation	**3**
7. Goodness of fit a) Binomial b)Poisson	**3**
8. Goodness of fit a)Normal b)Contingency table	**3**
9. Parametric tests a) t-test for one-mean b) t-test for two means	**3**
10.Parametric tests a) paired t-test b) F-test	**3**
11. Non-parametric tests a) Sign test b) Wilcoxon-Signed rank test	**3**
12. Non-parametric tests a) Mann-Whitney test b)Kolmogorov-Smirnov test	**3**
13. Time series a) Trend line b)Non-linear trend line	**3**
14. Time series a)Moving averages b)ARIMA	**3**

Evaluation Methods:

Internal Lab Exam : 40 Marks

Final Lab Exam : 60 Marks

Topics Covered Beyond The Curriculum:

Statistical concepts regarding testing of hypothesis

Differences between C and R Programming

Semester End Observations for Future Guidance:
Case studies to be explained are revised.

Identified new problems to be assigned for the next academic year students.

Learning Resources:

Text Books:

1.Hands-on Programming with R, Garrett Grolemund, O'Reilly.

2.R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, Addison-Wesley

C**S/IT252**	**Data Structures Lab**	**L**	**P**	**C**
		0	**3**	**1.5**

Course Objectives: The main objectives of this course are to:

1. To illustrate operations of linear and non-linear data structure
2. To demonstrate computational problems using suitable data structures
3. To familiarize searching and sorting techniques

Course Outcomes:
After successful completion of the course, students will be able to:

1. Implement linear and non-linear ADTs
2. Develop solutions for the given problems using appropriate data structures
3. Solve real world problems using searching and sorting algorithms

Co-Po Mapping:

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

CO-PSO Mapping

	PSO1	**POS2**	**PSO3**
CO1			
CO2			
CO3			
CO4			

List of Experiments to implement

week 1: List ADT
week 2: Applications of List
week 3: Single Circular List ADT
week 4: Doubly Linked List ADT
week 5: Stack ADT
week 6: Applications on Stack
week 7: Queue ADT
week 8: Applications of Queue
week 9: Double Ended Queue ADT
week 10: BST ADT
week 11: Priority Queue ADT
week 12: Searching and Sorting Techniques
week 13: Graph traversal techniques
week 14: Hashing Techniques

CS/IT253	Object Oriented Programming Lab	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this course are to:

1. To introduce java compiler, interpreter
2. To make the students learn an object oriented way of solving problems using java
3. To make the students write programs using multithreading concepts and exception handling
4. To make the students understand the usage of Event handling, generics, collections

Course Outcomes:

After successful completion of the course, students will be able to:

1. Write simple java programs using java fundamentals and basic OOP concepts.
2. Design programs using inheritance and polymorphism.
3. Demonstrate inter process communication using multithreading.
4. Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally).
5. Develop Event driven applications and Generic programs

List of Experiments:

The programming concepts to be implemented in the Lab are

Week 1: Fundamentals of classes and objects

Week 2: static keyword, this keyword, variable length arguments

Week 3: inner classes, constructor overloading

Week 4: Types of inheritances

Week 5: Method overloading, Method Overriding, usage of final and super

Week 6: Abstract classes, interfaces, Dynamic method dispatch.

Week 7: String class and its methods

Week 8: Packages

Week 9: Exception Handling Techniques

Week 10: Multithreading concepts

Week 11: Applets and event handling

Week 12: Awt components and delegation event model

Week 13: MVC architecture in Swing

Week 14: Generics and collections

CSSL1 (a)	Skill Oriented Course-1	L	P	C
	2D- Computer Animation	1	2	2

Course objectives:

The main objectives of this course are to:

1. To familiarize the students with various approaches, methods and techniques of Sketching , Perspective Drawings, Photoshop Image Editing and 2D Animation Technology.
2. To develop competencies and skills needed for becoming an effective Animator.
3. Mastering traditional & digital tools to produce stills and moving images.
4. Exploring different approaches in computer animation.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Make use of software to develop storyboards and 2-dimensional animation including creating, importing and sequencing media elements to create multi-media presentations.
2. Explain conceptualization, creativity, and visual aesthetics.
3. Organize various aspects of animation using a variety of 2 dimensional software.
4. Develop concepts, storyboarding and production of several 2 dimensional animations will be accomplished.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I **CO1** **5 periods**

2D Sketching : Understanding Fundamentals of Drawing and Free hand sketching, , Landscape sketching, Perspective
Drawings: 1point, 2 point and 3 pointCharacter Face Design

UNIT II **CO2** **10 periods**

Photoshop Basics Introduction UI, Selection tools, Brush tools, Pen tool, Eraser tool, Layer Pallet, Mask options, Text tool, Layer Styles, Gradient tools and Custom shapes.

UNIT III **CO3** **10 periods**

Photoshop Concepts Boucher Creation, Poster design, Matte painting, Black and White to Colour, Colour corrections and
Logo Design.

UNIT IV **CO4** **10 periods**

Animate CC Introduction UI, Layers, Tools, Image placing and Tracing, Character Design, Walk Cycle animation,
Shape Tween.

Learning Resources:

Text Book:

1. pdfcoffee.com_perspective-drawing-eguide-3-pdf
2. Adobe Photoshop CC Classroom in a Book
3. Adobe Animate CC Classroom in a Book

CSSL1 (b)	Skill Oriented Course-1	L	P	C
	Programming with C++	1	2	2

Course Objectives:

The main objectives of this course are to:

1. Introduce to the student the fundamentals of C++ language.
2. To make the students understand the principles of data abstraction, inheritance and polymorphism
3. To create awareness about generic programming and exception handling
4. To make the students familiar with IO streams, STL.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Differentiate POP and OOP and then use C++ fundamentals and various function modifiers to create and manipulate classes and objects.
2. Make use of the advantages of Compile time polymorphism and also develop reusable programs by applying inheritance.
3. Use runtime polymorphism, generic programming and exception handling techniques for developing efficient programs.
4. Demonstrate C++ streams, Name Spaces and STL.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I **12 periods**

An Overview of C++: The Origins of C++, What is Object Oriented Programming, some C++ fundamentals, Old-Style Vs Modern C++, Introducing C++ Classes, Function Overloading, Operator Overloading, Inheritance, Constructors and Destructors, The C++ Keywords, The General Form of a C++ Program

Classes and Objects: Classes, Structures and Classes, Unions and Classes are Related, Friend Functions, Friend Classes, Inline Functions, Parameterized Constructors, Static Class Members,

When Constructors and Destructors are Executed, Scope Resolution Operator, Nested Classes, Local Classes, Passing and Returning Objects, Object Assignment, arrays of objects.

UNIT II **12 periods**

Function Overloading, Copy Constructors and Default Arguments: Function Overloading, Overloading Constructor Functions, Copy Constructors, Finding the Address of an Overloaded Function, Overload Anachronism, Default Arguments, Function Overloading and Ambiguity.

Operator Overloading: Creating Member Operator Function, Overloading Using a Friend Function, Overloading new delete, Overloading Special Operators & Comma Operator

Inheritance: Base-Class Access Control, Inheritance and protected members, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes.

UNIT III **12 periods**

Virtual Functions & Polymorphism: Virtual Functions, The Virtual Attribute is inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early Vs Late Binding.

Templates: Generic Functions, Applying Generic Functions, Generic Classes, Typename and export Keywords, Power of Templates.

Exception Handling: Fundamentals, Derived-Class Exceptions, Options, Terminate() and unexpected(), uncaught_exception(), exception and bad_exception Classes, Applying Exception Handling.

UNIT IV **12 periods**

The C++ I/O System Basics: Old Vs. Modern C++ I/O, Streams, Stream Classes, Formatted I/O, Overloading << and >>, Creating Manipulators.
C++ File I/O: File Classes, Opening and Closing a File, Text Files, Unformatted Binary I/O, get(), Getline() functions, Detecting EOF ,Random Access

Namespaces, Conversion Functions and other Advanced Topics: Namespaces, Thestd Namespace, Creating Conversion Functions, const Member Functions and mutable, Volatile Member Functions, Explicit Constructors, Differences between C and C++.

Introducing Standard Template Library: An Overview of STL

Learning Resources:

Text Book:

1. The Complete Reference - C++ - Herbert Schieldt, 4/e, Tata McGraw Hill.

Reference Books:

1. Bjarne Stroustrup, "The C++ Programming Language", Special Edition, Pearson Education.
2. C++ - How to Program – Dietel&Dietel
3. Programming in C++ - Barkakati
4. Mastering C++ by Venugopal

CSSL1(c)	Skill Oriented Course-1	L	P	C
	PHP Programming	1	2	2

Course Objectives:

At the end of the course, the students will understand

1. usage of PHP for developing web applications.
2. PHP Browser Handling Power.
3. accessing web form data at the server
4. creation of database driven web applications.

Course Outcomes:

At the end of the course, the student will be able to

1. Apply basic concepts of PHP programming.
2. Design and Develop server side programs using PHP Technologies.
3. Assess the principles of object oriented development using PHP.
4. Develop Database Connectivity using MYSQL.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I **10 periods**

Essential PHP, Operators and Flow Control, String Arrays, Creating Functions

UNIT II **10 periods**

Reading Data in Web Pages and PHP Browser- PHP server variables, getting the user's browser type, Performing data validation using Regular expressions.

UNIT III **10 periods**

Object-oriented Programming- Creating Classes, Creating Objects, Setting Access to Properties and Methods, Using constructors to initialize objects, using destructors to clean up after objects, Basing one class on another with inheritance, Overriding methods, Overloading methods.

File handling -Opening files using fopen, Reading text from a file using fgets, Closing file, Reading from a file character by character with fgetc, Reading a whole file at once with file_get_contents.

UNIT IV **10 periods**

Working with Databases- Creating a MySQL database, Accessing the Database in PHP.

Sessions, Cookies- Setting a Cookie, reading a Cookie, Setting Cookies Expiration, Deleting Cookies.

Learning Resources:

Text Book:

1. PHP: The Complete Reference By Steven Holzner, TATA McGraw Hill.

Reference Books:

1. Beginning PHP and MySQL: From Novice to Professional, By by W. Jason Gilmore, Apress.
2. PHP 6 and MySQL 6 Bible, By Steve Suehring, Tim Converse, Joyce Park, Wiley Publishing, Inc.

CS/ITMC3	Design Thinking & Product Innovation	L	P	C
		2	0	-

Course Objectives:

1. Identify the design thinking principles and practices in today's industry.
2. Learn the Planning of research activities to gather and empathize from a user's viewpoint.
3. Study the Ideate techniques to help arrive at the best solution and evaluation.
4. Knowledge to Identify design thinking approaches for business challenges.

Course Outcomes:

1. Interpret the concepts of Design thinking to real-world activities.
2. Investigate a problem to determine its root cause in terms of Design Thinking perspective.
3. Apply group thinking methods and experiment with different solutions to a given problem.
4. Develop innovative thinking and creative problem solving abilities.

Co – Po Mapping:

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

CO-PSO Mapping:

	PSO1	PSO2
CO1	**3**	**3**
CO2	**3**	**3**
CO3	**3**	**3**
CO4	**3**	**3**

Course Content:

UNIT I [T1,T2] **12 Periods**

Introduction to Design Thinking – Origin of Design Thinking, Features & Principles of Design Thinking, Applications of Design Thinking, Role of Research in Design Thinking.

UNIT II[T3] **12 Periods**

Modules of Design Thinking – Inspiration – methods & tools used in Explore and Empathize phases of Design Thinking, Case study-activity.

UNIT III [T3] **12 Periods**

Modules of Design Thinking – Ideation & Implementation – methods & tools used in

Experiment, Engage and Evolve phases of Design Thinking, Case study-activity.

UNIT IV [T4] **12 Periods**

Design Thinking applied in Business & Strategic Innovation – Ten Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization, Creative Culture, Strategy & Organization – Design Thinking approaches.

Learning Resources:

Text Book(S):

1. "Design Thinking for Entrepreneurs and Small Businesses" by Beverly Rudkin Ingle, Apress. [UNIT -1]
2. "Change by design", Tim Brown, Harper Collins, 2009 [UNIT -1]
3. "Design Thinking- The Guide Book" – Facilitated by the Royal Civil Service Commission, Bhutan. [UNIT –II & III]
4. IdrisMootee, "Design Thinking for Strategic Innovation", John Wiley & Sons (2013). [UNIT -IV]

Reference Book(S):

1. "Design Thinking Business Innovation", Rio de Janeiro – 2012 1st edition, MJV press.
2. "Design Thinking- Understanding How Designers Think and Work" by Nigel Cross, Berg publishers.

Web Reference:

1. IDEO: Design Thinking for Educators toolkit https://designthinkingforeducators.com/.
2. https://dschool.stanford.edu/resources/a-virtual-crash-course-in-design-thinking
3. https://dschool-old.stanford.edu/groups/designresources/wiki/4dbb2/ (wallet Project)

Semester - IV (Second Year)

CS/IT221	Computational Statistics	L	P	C
		2	0	3

Course Objectives:

The main objectives of this course are to:

1. The knowledge to understand the concepts of linear statistical and ANOVA models and draw the conclusions.
2. The idea to develop a sound understanding of current, modern computational statistical approaches and their application to a variety of datasets.
3. To understand the key technologies in data science and business analytics such as data mining, machine learning, visualization techniques and predictive modelling.
4. The knowledge to apply principles of data science to analyze and to effectively visualize the data.

Course Outcomes:

After successful completion of the course, students will be able to:

1. CO1: Remember the basic concepts of linear statistical models
2. CO2: Interpret the results of Multivariate Regression models
3. CO3: Estimate the discriminate function to segregate and allot the item to the subgroup.
4. CO4: Data reduction and visualize the data for interpretation.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	1	2	2	2	1
CO2	3	3	3	3	3	3	1	1	2	2	2	1
CO3	3	3	3	3	3	3	1	1	2	2	2	1
CO4	2	3	3	3	3	3	1	1	2	2	2	1

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	2	3	3

Course Content:

UNIT I **14 periods**

Linear Statistical Models: Scatter diagram, linear regression and correlation, least squares methods, rank correlation, multiple correlation.

Analysis of Variance (ANOVA): Analysis of Variance (one-way classification), Analysis of Variance (two-way classification)

UNIT II **14 periods**

Multivariate Normal Distribution: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

Multiple Linear Regression Model: Standard multiple regression models with emphasis on collinearity, outliers, non-normality and auto correlation, validation of model assumptions.

UNIT III **14 periods**

Multivariate Regression: Assumptions of multivariate regression models, Parameter estimation, multivariate analysis of variance and co-variance.

Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

UNIT IV **14 periods**

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Factor Analysis: Factor analysis model, extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

Learning Resources:

Text Book:

1. Richard. A. Johnson and Dean.W. Wichern "Applied Multivariate Statistical Analysis" Pearson Prentice Hall, 6th Edition, 2007

Reference Books:

1. ALVIN C. RENCHER, "Methods of Multivariate Analysis", John Wiley & Sons Publication, 3rd Edition
2. T.W. Anderson, "An Introduction to Multivariate Statistical Analysis", Wiley, 3rd Edition, 2003.

CS/IT222 Database Management Systems **L P C**

3 0 3

Course Objectives

The main objectives of this course are to:

1. Fundamental concepts and architectures of database system
2. Features and design of conceptual and relational data models
3. Formal relational Languages and SQL to query, update, and manage a database
4. The concepts and protocols related to transaction processing, concurrency control and recovery

Course Outcomes

After successful completion of the course, students will be able to:

1. Discuss the fundamental concepts and architecture of database systems.
2. Query the database using relational algebra and SQL.
3. Explain the concepts of relational data model and design database using normalization process.
4. Develop conceptual database schema for a given specification.
5. Describe the role of transaction processing, concurrency control and recovery in a multi user database system.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1					1			2
CO2	3	2	2	2					1			2
CO3	3	2	2	2					2			2
CO4	2	2	1	1					1			2
CO5	3	3	3	2					2			3

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	2	3	3

Course Content:

UNITI **11 Periods**

Introduction to Databases and Database Management System: Database system Applications, Advantages of DBMS over File System, Data Models, Instances and schema, View of Data, Database Languages –DDL, DML, DCL, Database Users and Administrator, Database System Architecture

Introduction to the Relational Model: Structure of RDBMS, Database Schema, Keys, Relational Query Languages, Relational Operations

UNIT II **15 Periods**

Formal Relational Query Languages - The Relational Algebra and Relational Calculus

SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Transaction, Integrity Constraints, SQL Data Types and Schemas, Authorization

UNIT III **12 Periods**

Database Design and the E-R Model - Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas.

Relational Database Design - Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms, Database-Design Process.

UNIT IV **12 Periods**

Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes, Snapshot Isolation

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management

Learning Resources:

Text Book:

1. Database System Concepts by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Sixth Edition, McGraw Hill Publishers

CS/IT223	Operating Systems	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are to:

1. To introduce the structure and functions of the operating system
2. To provide the knowledge of how the operating system manages the resources
3. To expose the students to the issues related to executing multiple process in the system.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Describe the fundamental concepts of an operating system functionality, and processes.
2. Apply the concepts of multithreading and IPC mechanisms.
3. Analyze the performance of CPU scheduling algorithms, page replacement algorithms, and disk scheduling algorithms.
4. Demonstrate the methods to solve critical section problem and deadlock handling in a system.
5. Differentiate the effectiveness and the hardware support required for contiguous, non-contiguous, and virtual memory management schemes.
6. Differentiate the file systems for applying different allocation and access techniques.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3		
CO2	3	2	
CO3	2	3	3
CO4	3	2	3
CO5	3		
CO6	2		3

Course Content:

UNIT I **(CO1 &CO2)** **12 Periods**

Introduction: What Operating Systems Do, Operating-System Operations, Resource Management, Security and Protection, Virtualization, Distributed Systems, Kernel Data Structures.

Operating System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Operating-System Structure.
Processes: Process Concept, Process Scheduling, Operations on Processes, inter process Communication, IPC in shared-memory Systems, IPC in Message-passing Systems.

UNIT II (CO2,CO3&CO4) 14 Periods

Threads and Concurrency: Overview, Multicore Programming, Multithreading Models, Implicit Threading, Threading Issues.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling.

Synchronization: Background, The Critical-Section Problem, Peterson 'solution, Hardware support for Synchronization, Mutex Locks, Semaphores, Monitors. Classic Problems of Synchronization.

UNIT III (CO4 &CO5) 14 Periods

Dead Locks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Main Memory: Background, Contiguous Memory Allocation, Paging, Structure of the Page Table, Swapping.
Virtual-Memory: Background, Demand Paging, Page Replacement, allocation of frames, Thrashing - Memory Compression, Other considerations.

UNIT IV (CO6) 10 Periods

Mass-Storage Structure: Overview of Mass-Storage Structure, HDD Scheduling.

Files System Interface: File Concept, Access Methods, Directory Structure, Protection, Memory –mapped files.

File-Systems Implementation: File-System Structure, File-System operations, Directory Implementation, Allocation Methods, and Free-Space Management.

Learning Resources:

Text Book(s):

1. Operating System Concepts-Abraham Silberchatz, Peter B Galvin, Greg Gange Tenth Edition, WILEY.

Reference Books:

1. Operating Systems, Internal and Design Principles, Stallings, 8th Edition-2015, Pearson education/PHI.
2. Operating system, A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tenenbaum 4th Edition Pearson/PHI.
4. An Introduction to Operating Systems, Concepts and Practice, 4th Edition, PHI, 2013-Pramod Chandra P. Bhatt.
5. Operating Systems- A concept based approach –DM Dhamdhere -3rd Edition TMH.

CS/IT224 **Software Engineering** **L P C**

3 0 3

Course Objectives:

The main objectives of this course are to:

1. Acquire knowledge on the principles and process models for software development.
2. Explain the specific requirements for a given software project
3. Acquire knowledge on design concepts and user interface principles for Software development
4. Examine various testing techniques and metrics applicable to a Software project

Course Outcomes:

After successful completion of the course, students will be able to:

1. Describe the software engineering process model required to create a software system.
2. Discuss the software requirements and analyze a model for a software project.
3. Design and specify software components for real-world problems.
4. Evaluate various software testing techniques and metrics.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			2
CO2			2
CO3		2	3
CO4		3	3

Course Content:

UNIT I **(CO1,CO2)** **12 Periods**

Software and Software engineering: The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The software Process.

The Software Process: Process Models: A Generic Process Model, defining a Framework Activity, identifying a task set, Process Assessment and Improvement, Prescriptive Process Models: The waterfall model, Prototyping Process model, Evolutionary process model, The Unified Process.

Agile Development: What Is Agility? What Is an Agile Process? Scrum Other Agile Process Models, Scrum, Other Agile Frameworks- The XP Framework.

UNIT II **(CO3)** **13 Periods**

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Requirements gathering, developing use cases, Building the Analysis Model, Negotiating Requirements, Requirements monitoring, Validating Requirements.

Requirements Modelling: Requirements Analysis, Scenario-Based Modeling, Class-Based Modeling, Functional Modelling, Behavioural Modelling.

Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

UNIT III **(CO4)** **13 Periods**

Architectural Design: Software Architecture, Agility and Architecture, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Reviews.

Modeling Component-Level Design: What Is a Component? Designing Class-Based Components, Conducting Component Level Design.

User Experience Design: User Experience Design Elements, The Golden Rules, User Interface Analysis and Design, Interface Analysis and Design Models, The process.

UNIT IV **(CO5, CO6)** **12 Periods**

Software Testing –Component Level: A Strategic Approach to Software Testing, Planning and Record keeping, Test case design, White box testing, Black-Box-Testing.

Software-Testing Integration level: Software Testing Fundamentals, Integration testing, Validation Testing, Testing Patterns.

Software Metrics and Analytics: Software Measurement, Software Analytics, Product Metrics, Metrics for Testing, Metrics for maintenance, Process and Project Metrics, Metrics for Quality.

Learning Resources:

Textbook(s):

1. Roger Pressman and Bruce Maxim "Software Engineering- A Practitioner's Approach", 9th edition, Tata McGraw-Hill International.

Reference Books:

1. Ian Somerville, Software Engineering. 6 ed, Pearson Education.
2. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, Fundamentals of Software Engineering.2 ed, PHI.
3. RajibMall, Fundamentals of Software Engineering. 2 ed, PHI.

Web Resources:

1. http://nptel.ac.in/courses/106101061/2
2. http://nptel.ac.in/courses/106101061/5

CS/IT 225 **Web Technologies** **L P C**
3 0 3

Course Objectives:

The main objectives of this course are to:

1. Basic technologies to develop web documents.
2. Dynamic HTML Pages and Event handling mechanism.
3. XML, Web Servers, Servlet technologies.
4. Java Server Page Technologies.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Create web pages with HTML, CSS, and JavaScript.
2. Design dynamic web pages using client side scripting.
3. Create XML documents, work with Web Servers and develop Web applications with Servlets.
4. Design and develop server side programs with Java Server Pages.

CO-PO Mapping

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

1.

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I 12 Periods

Introduction to HTML5 Part - I & II. Cascading Style Sheets (CSS) Part - I & II.
JavaScript: Introduction to Scripting, Control Statements Part - I & II.

UNIT II **14 Periods**

JavaScript: Functions, Arrays, Objects. DOM Objects and Collections. JavaScript Event Handling

UNIT III **12 Periods**

XML: XML Basics, XML Namespaces, DTD, XML Schema, MathML, XSL & XSLT.
Web Servers (IIS and Apache).
Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters,

Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT IV **12 Periods**

Introduction to JSP:JSP & Servlet as Web Components, Servlets vs. JSP, JSP Lifecycle, JSP Page Lifecycle Phases, General Rules of Syntax, JSP syntactic elements, JSP element syntax, Template content. JSP elements-directives, declarations, expressions, scriptlets, actions. JSP Standard Actions: jsp: useBean, jsp: getProperty, jsp: setProperty, jsp: include, jsp: forward, jsp: plugin, jsp: param.

Learning Resources:

Text Book:

1. Harvey M. Deitel and Paul J.Deitel, "Internet & World Wide Web How to Program", 4/3, Pearson Education.(UNIT I, UNIT II and UNIT III).
2. Subrahmanyam Allamaraju and Cedric Buest, "Professional Java Server Programming: J2EE" (UNIT III and UNIT IV (Servlets and JSP)

Reference Books:

1. Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", 4/ e, "Pearson Education".
2. Tom Nerino Doli Smith "JavaScript & AJAX for the Web" Pearson Education, 2007.
3. Bill Dudney, Johathan Lehr, Bill Willies, Lery Mattingly "Mastering Java Server Faces" Willey India, 2006.
4. Web Technology - Uttam K.Roy, Oxford University Press, 2010.

Web References:

1. www.deitel.com
2. www.w3schools.com
3. www.tutorialspot.com

CS/IT261	Computational Statistics Lab	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this course are to:

1. The knowledge to understand the concepts of linear statistical and ANOVA models and draw the conclusions.
2. The idea to develop a sound understanding of current, modern computational statistical approaches and their application to a variety of datasets.
3. To understand the key technologies in data science and business analytics such as data mining, machine learning, visualization techniques and predictive modelling.
4. The knowledge to apply principles of data science to analyse and to effectively visualize the data.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Explain the basic concepts of linear statistical models
2. Interpret the results of Multivariate Regression models
3. Estimate the discriminate function to segregate and allot the item to the subgroup.
4. Implement Multi-Variate Statistical Analysis techniques using Python.
5. Apply data reduction and visualization techniques.

Lab Programs to implement

WEEK 1	Simple Linear Regression
WEEK 2	Correlation methods
WEEK 3	Multiple Regression
WEEK 4	Multivariate Regression
WEEK 5	Multivariate analysis of variance and co-variance
WEEK 6	Analysis of Variance (one-way classification),
WEEK 7	Analysis of Variance (two-way classification)
WEEK 8	Multivariate Normal Distribution
WEEK 9	Linear discriminant analysis for multivariate data
WEEK 10	Principle component analysis for multivariate data
WEEK 11	Factor Analysis for multivariate data
WEEK 12	Cluster analysis for multivariate data

Learning Resources:

Text Books:

1. Richard. A. Johnson and Dean. Wichern "Applied Multivariate Statistical Analysis" Pearson/Prentice Hall, 6th Edition, 2007
2. Daniel J. Denis "Applied Univariate, Bivariate, and Multivariate Statistics Using Python: A Beginner's Guide to Advanced Data Analysis", Daniel J. Wiley.
3. Alejandro Garcia, "Applied Multivariate Analysis with Python"

Reference Books:

1. Regression Diagnostics , Identifying Influential Data and Sources of Collinearity, D.A. Belsey, E. Kuh and R.E. Welsch
2. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner.
3. The Foundations of Factor Analysis, A.S. Mulaik.
4. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck.
5. Cluster Analysis for Applications, M.R. Anderberg.
6. Multivariate Statistical Analysis, D.F. Morrison.

CS/IT262 **Database Management Systems Lab** **L P C**

0 3 1.5

Course Objectives:

The main objectives of this course are to:

1. Syntax and usage of DDL, DML, DCL, and TCL statements, asserting database integrity constraints during database creation.
2. Semantics of SQL for implementing the user queries on a relational database.
3. Block structured PL / SQL programming concepts.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Define, manipulate and control data using Structured Query Language (SQL).
2. Identify various database integrity constraints during database creation.
3. Construct SQL statements for satisfying end user queries by utilizing functions, set operations, joins, and subqueries.
4. Develop various applications using various PL/SQL data object like Database cursors, Functions, Stored Procedures, Packages, and Triggers.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	2				2			2
CO2	2	2	2	2	2				2			2
CO3	3	3	3	3					2			2
CO4	3	3	3	3					2			2

Week 1

Practice DDL and DML statements for creating a sample database without integrity constraints.

Week 2

Practice DDL and DML statements for refining a sample database including integrity constraints.

Week 3

Query the sample database using simple select statements retrieving:

1. Small-large number of attributes
2. Distinct output values
3. By Renaming attributes
4. Computed attributes
5. By using Simple-complex conditions (AND, OR, NOT)
6. By using Partial Matching operators (LIKE, %, _, *,?)
7. Sorted records
8. By checking for Nulls

Week 4-6

Query the sample database using joins, nested queries, aggregate functions and set oriented operations

Week 7 Query the sample database using built-in single row functions

Week 8 Implement PL/SQL named and unnamed blocks

Week 9 Implement PL/SQL Implicit and Explicit Cursors

Week 10 Implement PL/SQL pre-defined and user defined exceptions

Week 11 Implement PL/SQL stored procedures, functions and packages

Week 12 Implement PL/SQL database triggers

CS/IT263 **Web Technologies Lab** **L P C**

0 3 1.5

Course Objectives:

The main objectives of this course are to:

1. Basic technologies to develop web documents.
2. Dynamic HTML Pages and Event handling mechanism.
3. XML, Web Servers, Java Servlet technologies.
4. Java Server Page Technologies

Course Outcomes:

After successful completion of the course, the students are able to

1. Create web pages with HTML, CSS, and JavaScript.
2. Design dynamic web pages using client side scripting.
3. Create XML documents using XML Technologies
4. Develop Server side web applications with Java Servlets.
5. Design server side programs with Java Server Pages.

LAB CYCLE –I

1.
   a. Create a web page having the background in green and title "My First Page".
   b. Create a web page of pink colour and display a moving message in red colour.
   c. Design a web page containing text, in form of paragraphs giving suitable heading style
2.
   a. Create a web page which displays WELCOME text using heading tags(h1 to h6)
   b. Create a web page which displays WELCOME text using <b> tag
   c. Create a web page which displays h2o and x2+y2 using <sup> tag and <sub> tag
3.
   a. Create a web page to show different attributes of Font tag.
   b. Create a web page to show different attributes: italics, bold, underline.
   c. Design a web page having background colour yellow and giving text colour red
4.
   a. Create a web page using href attribute of anchor tag & the attribute: alink, vlink etc.
   b. Create links on the words e.g. —Wi-Fi and —LAN‖ to link them to Wikipedia pages.
   c. Create a web page with appropriate content and insert an image towards the left hand side of the page. When user clicks on the image, it should open another Web page.
5.
   a. Create a web page, showing an ordered list of the names of five of your friends.
   b. Create a web page containing a nested list showing the content page of any book
   c. Create a web page, showing an unordered list of names of five of your friends
6.
   a. Create a table to show your class timetable using rowspan and colspan attributes.
   b. Use tables to provide layout to your HTML page describing your college infrastructure.
   c. Create a web page in the following table fields

Name of train	place	Destination	Train No	Time		Fare
				Arrival	Departure	

7.
   a. Develop a web page having two frames that divide the Web page into two equal rows.

b. Develop a web page having two frames that divide the Web page into two equal rows and then divide the second row into two equal columns.
c. Develop a web page having frames as described in the above web page and then fill each frame with a different background colour

8.
a. Create your bio-data form on a web page using all input types
b. Create a web page having radio buttons labeled as name of colours. Clicking on each radio button should change the colour of the Web page
c. Embed Audio and Video into your web page

9.
a. Create a webpage which displays the class time table and apply the following effects on the table:
b. For the table header apply blue as the background colour and white for the colour of the text in the table header. b. Display days in a week (Mon, Tue etc...) in bold format with the first letter in the day name in uppercase.
c. Display lunch slightly in bigger font other than the remaining text.

10.
a. Create a webpage which displays "Hello World" with font size 20 pixels, bold format, in "Times New Roman" font and green in colour using inline CSS, embedded CSS and external CSS.
b. Create a web page containing two images, where one image overlaps another image by using the z-index CSS property.
c. Demonstrate the usage of CSS Inheritance and Specificity with an example.

11.
a. Create a div element with a width and height of 500px. Create a diagonal linear gradient using the colors of the rainbow—Red, Orange, Yellow, Green, Blue, Indigo, Violet. (Linear Gradient)
b. Create a div element with a width and height of 500px. Create a radial gradient with three colors. Start the gradient in the bottom-left corner with the colors changing as they move along the gradient line to the right. (Radial Gradient)
c. Create an infinite animation of an element moving in a square pattern. (Animation)

LAB CYCLE –II
JAVA SCRIPT

1. Write a java scripts to
   a) find the given year is leap year or not
   b) compute the biggest of three numbers
   c) perform the arithmetic operations using switch statement

2. Write a java script to
   a) calculate the sum of the digits of a give number
   b) reverse of a given number
   c) print the first 10 natural numbers except 5

3. Write a java script to
   a) functions (GCD, reverse, random numbers)
   b)recursive function(factorial, Fibonacci , power)
   c) image generator

4. a) Write a java script to
   a) sort the array element using bubble sort technique
   b) search a given element in the given set of given elements using binary search technique.
   c) compute i) addition of two matrices ii) multiplication of two matrices

5. a) Write a java script to
   a) implement string operations using String object
   b) implement the mathematical operations using Math object
   c) display Greeting messages using Date object

5. demonstrate collect objects
   a) All collection
   b) Children collection
   c) Anchor collection

6. Demonstrate event model
   a) Form events(onchange, onfocus ,onblur)
   b) Mouse events (onclick, onmouesedown,onmoueseup,onmouesemove,onmoueseover)
   c) Event bubbling

LAB CYCLE –III

7. Write a valid XML document using DTD
8. Write a servlet program to validate a user
9. Write a web application using servlet and JDBC.
10. Write a JSP program on Implicit objects
11. Write a JSP program on Action tags.
12. Demonstrate cookies and session information using JSP

CSSL2 (a)	Skill Oriented Course-1I	L	P	C
	3D- Computer Animation	1	2	2

Course Objectives:

The main objectives of this course are to:

1. This course introduces students to all the major features of Maya.
2. To train the students to acquire skills and mastery in the use of Maya software.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Design, model and texture 3D objects.
2. Create expressive movement with 3D objects and rigs.
3. Create intentional lighting within a 3D scene.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT 1 **10 Periods**

Animation principles and history: Animation process, Importance of drawing in animation context, Types of animation, Animation software tools.

Introduction to Maya: Learn the basics of 3D computer graphics using Autodesk Maya. Files import and Export, Rendering.

UNIT II **12 Periods**

Basics of Polygonal Modeling: Polygon Basics, Poly Editing Tools, Putting the Tools to Use. Objects Creation, Hard Surface modeling and Organic Modeling.

UNIT III **12 Periods**

Shading and Texturing: UV unwrapping, Lighting Fundamentals, Materials and properties

UNIT IV **12 Periods**

NURBS and curves: Introduction to NURBS, NURBS primitive , NURBS carv tools, Text creations, NURBS revolve, NURBS loft.

Learning Resources:

Text Book:

1. Introducing Autodesk Maya 2012 (Autodesk Official Training Guides) by DariushDerakhshani (May 3,2011).

Reference Text Books:

1. Introducing Maya 2011 by DariushDerakhshani (May 3, 2010).
2. Learning Autodesk Maya 2010: Foundation (Autodesk Maya Techniques: Official Autodesk Training Guides) by Autodesk Maya Press (Aug 24, 2009)
3. Understanding 3D Animation Using Maya by John Edgar Park (Dec 2, 2004)

CSSL2(b)	Skill Oriented Course-1I Linux Programming	L	P	C
		1	2	2

Course Objectives:

The main objectives of this course are to:

1. Introduce the architecture of Unix and shell programming.
2. Impart knowledge on Unix internals.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Use Unix commands and shell scripts to interact with operating system.
2. Demonstrate AWK for pattern scanning and processing.
3. Demonstrate file and process management using system calls.
4. Create applications using signals and IPC mechanisms.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I **8 Periods**

Introduction to UNIX: Unix architecture, Features of Unix, Vi editor.

Unix Utilities: Directory Related utilities- pwd, mkdir, ls, cd ,rmdir. File Handling and Text Processing - cp, mv, rm, ln, unlink, lp, cat, more, pg , head, tail, sort ,nl, grep, egrep, fgrep, cut, paste, join, tee, w ,chgrp, chmod, chown, find, cmp, diff, uniq, tr.Disk utilities, Backup and other utilities- du, df, mount, unmount, umask, ulimit, tar, cpio, dump , who, mail, compress, uncompress, gzip, gunzip, crypt, sed, tty.

UNIT-II **12 Periods**

Programmable text processing: awk - awk programs, accessing individual fields, Begin and end, operators, variables, control structures, extended regular expressions, condition Ranges, field separators, Built – in functions.

Bourne Shell programming: Shell, functions of the shell , Meta characters, Input redirection, Output redirection, pipes, shell as programming language, shell variables, predefined local variables, predefined environment variables, Arithmetic, conditional expressions, control structures, positional parameters, passing command line arguments, Built – in Shell commands and shell programs.

UNIT-III **14 Periods**

File management system calls : Regular file management system calls – open( ), read( ), write( ), lseek( ), Close(),unlink( ),stat( ), getdents( ). Miscellaneous file management system calls – chown( ) and fchown( ), chmod( ) and fchmod( ), dup( ) and dup2( ), fcntl( ), ioctl( ), link( ), mknod( ), sync( ), truncate( ) and ftruncate( ).

Process Management: Creating a new process – fork( ),orphan processes, terminating a process – exit( ), zombie processes, waiting for child – wait( ), Differentiating a process – exec( ), changing directories – chdir( ), changing priorities- nice( ), Accessing user and Group ID's.

UNIT IV **14 Periods**

Signals: The defined signals, A list of signals, terminal signals, Requesting on Alarm signal – alarm( ), handling signals – signal( ), protecting critical code and chaining interrupt handlers, sending signals – kill( ), Death of children, suspending and Resuming processes, process Group's and control terminals.

Inter process communication: Pipes, Sockets, shared memory, semaphores.

Learning Resources:

Text Book:

1. "Unix for programmers and users" 3rd edition by Graham Glass, King Ables, Pearson education.

Reference Books:

1. "Advanced programming in the unix environment" w- Richard Stevens 2nd Edition Pearson education
2. "Unix programming environment", Kernighan and pike, Pearson education.
3. "Your Unix the ultimate guide" Sumitabha Das, TMH 2nd edition.
4. "Advanced Unix programming" by Marc J. Rochkind, 2nd edition Pearson Education.

List of Experiments

LABCYCLE I: (Using Commands and Shell Programming)

1. Working with different Unix commands.
2. Program on built in functions of awk programming.
3. Write Shell Programs for the following:

   a) Display all the words which are entered as command line arguments.

   b) Changes Permissions of files in PWD as rwx for users.

   c) To print the list of all sub directories in the current directory.

   d) Program which receives any year from the keyboard and determine whether the year is leap year or not. If no argument is supplied the current year should be assumed.

   e) Program which takes two file names as arguments, if their contents are same then delete the second file.
4. Write shell scripts for the following

   a) To print the given numbers in the reversed order.

   b) To print the given numbers in sorted order.

   c) To print first 25 Fibonacci numbers.

   d) To print the Prime numbers between the specified range.

   e) To print the first 50 Prime numbers.
5. Write shell scripts for the following:

   a) To delete all lines containing the word 'unix' in the files supplied as arguments.

   b) Menu driven program which has the following options. i) contents of /etc/passwd ii) list of users who have currently logged in. iii) present working directory. iv) exit.

   c) For sorting, searching and insertion, deletion of elements in the list.

LABCYCLE II : (Using System Calls)

1. Program to transfer the data from one file to another file by using un-buffered I/O.
2. Write a C program for demonstrating dup () and dup2() system calls.
3. Write a C program to demonstrate PERROR () function.
4. Program to create two processes to run a loop in which one process adds all even numbers and the other adds all the odd numbers. (use fork ()).
5. Program to create process 'i' and sends data to process 'j', prints the same after receiving it.
6. Program to demonstrate orphan process.
7. Program to demonstrate how to create a zombie process and to avoid Zombie using wait ().
8. Write a C program for Requesting an alarm signal to execute user defined alarm handler.
9. Write a C program to demonstrate Suspending and Resuming Processes.
10. Program on Inter process communication using pipes.
11. Program on Inter process communication using shared memory and semaphores.
12. Program on Client/Server Socket communication.

CSSL2 (c)	Skill Oriented Course-II	L	P	C
	Mobile Application Development	1	2	2

Course Objectives:

The main objectives of this course are to:

1. Provide knowledge on tools required for Mobile Application Development using Android.
2. Create applications on Android User Interface using Views, Pictures and Menus.
3. Build apps using Notifications and Data Persistence.
4. Make the student to use Communication mechanisms in Android.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Create an Environment to develop Android applications.
2. Design user Interfaces using Views and Menus.
3. Implement backend Android App using SQLite.
4. Develop application using Messaging and Mailing services in Android.

CO-PO Mapping

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

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I **CO1** **12Periods**

Android Programming: What Is Android? Obtaining the Required Tools, Creating Your First Android Application.

Android studio for Application development: Exploring IDE, using code completion, debugging your Application, Generating a signed APK.

Activities, Fragments, and Intents: Understanding Activities, Linking Activities Using Intents, Fragments, Displaying Notifications.

UNIT II **CO2** **12Periods**

Android User Interface: Components of a Screen, Adapting To Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically.

User Interface with Views: Using Basic Views, Using Picker Views, Using List Views To Display Long Lists, Understanding Specialized Fragments.

UNIT III **CO3** **12Periods**

Pictures and Menus with Views: Using Image Views to Display Pictures, Using Menus with Views, Using Web View.
Notifications –Creating and Displaying notifications, Displaying Toasts.
Data Persistence: Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases.

UNIT IV **CO4** **12Periods**

Content Providers: Using a Content Provider, Creating Your Own Content Providers.
Messaging: SMS Messaging, Sending E-Mail.
Learning Resources:

Text Book:

1. Beginning Android Programming with Android Studio, J.F.DiMarzio, Wiley India (Wrox), 2017.

Reference Books:

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2012.
2. Reto Meier, Professional Android 4 Application Development, Wiley India, (Wrox), 2012.
3. James C Sheusi, Android Application Development for Java Programmers, CengageLearning, 2013.

CSSL2 – (Skill Oriented Course-II)

Mobile Application Development Lab

List of Experiments:

1. Installation of Android studio.
2. Development of Hello World Application.
3. Design an application to implement activity life cycle.
4. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.
5. Demonstrate Login validation by reading User Name and Password from the User.
6. Create an application that takes the Student data (Name, Regd.Number, Email and Mobile number)from the user and display the same, when the user clicks the OK button.
7. Design Arithmetic calculator.
8. Develop an application to display images using Image Switcher.
9. Design an android application for menu.
10. Create a user registration application that stores the user details in a database table.

List of Apps:

1. Medicine Reminder
2. Language Translator
3. Simple Music Player
4. Budget Manager
5. Eye Test App
6. Ludo App
7. College News
8. India in Detail
9. Quiz Application
10. Smart Farm
11. Student Attendance and Marks Application
12. To-Do List
13. COM-RATE
14. Blood Bank
15. Food Donation Application
16. Hotel Review
17. Weather App.
18. Book Listing
19. Tax and EMI calculator App.
20. Text Encryption

CS/ITMC4	Ethics & Human Values	L	P	C
		2	0	-

Course Objectives:

The main objectives of this course are to:

1. To create awareness to specific set of morals, values and ethics the professional must know and abide by, including work ethics, integrity and commitment etc.
2. To realize the importance of moral autonomy, professional ideals and Ethical theories
3. To study safety/risk aspects, welfare of the public and about employee rights
4. Know about the global issues and code of ethics of professional bodies

Course Outcomes

After completion of the course, the students will be able to

1. Have basic understanding of how a prospective engineer should behave in his chosen field and society.
2. Realize the importance of moral autonomy, professional ideals and Ethical theories.
3. Know about the safety/ risk, welfare of the public and employee rights
4. Gain exposure to global issues and codes of some professional bodies

CO-PO Mapping

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

1.

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Course Content:

UNIT I **15 Periods**

Human Values: Morals, Values and Ethics - Integrity- Work Ethics- Service Learning - Civic Virtue Respect for Others - Living Peacefully - Caring - Sharing - Honesty - Courage - Valuing Time -Co-Operation - Commitment - Empathy - Self-Confidence – Stress Management-Character - Spirituality.

UNIT II **15 Periods**

Engineering Ethics: Senses of Engineering Ethics- Variety of Moral Issues - Types of Inquiry - Moral Dilemmas - Moral Autonomy - Kohlberg's Theory - Gillian-s Theory - Consensus and Controversy.

Professions and Professionalism: The nature and characteristics of Professions, Professionalism, the foundation and norms of Professional ethics, the need for separate code of conduct for Professionals, Professional Rights, Theories about Right Action, Uses of Ethical Theories. Case studies like The Space Shuttle Challenger, Bhopal gas tragedy, Chernobyl disaster etc.

UNIT III **15 Periods**

Engineering as Social Experimentation: Engineering as Experimentation - Engineers as Responsible Experimenters Safety.

Responsibilities and Rights: Safety and Risk - Assessment of Safety and Risk,Risk Benefit Analysis and Reducing Risk. Collegiality and Loyalty - Respect for Authority –Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Employee Rights – Intellectual Property Rights (IPR) - Discrimination.

UNIT IV **15 Periods**

Multinational Corporations - Environmental Ethics - Computer Ethics - Business ethics - Engineers As Managers - Consulting Engineers - Engineers As Expert Witnesses and Advisors - Codes Of Ethics -Sample Code Of Ethics Like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management Etc.,

Learning Resources:

Text Books:

1. Mike martin and Ronald Schinzinger, "Ethics in Engineering" McGraw-Hill, New York 1996
2. Govindarajan M, Natarajan S, Senthil Kumar V.S., "Engineering Ethics", PHI, New Delhi
3. Bayles.M. D, Professional ethics, California, Wards worth publishing company,1981
4. Koehn.D, The ground of Professional Ethics, Routledges, 1995

Reference Books:

1. Charles D,Fleddermann, "Engineering Ethics", Pearson / PHI, New Jersey 2004 (Indian Reprint)
2. Charles E Harris, Michael S.Protchard and Michael J Rabins, "Engineering Ethics - Concepts and Cases" Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the conduct of business" Pearson, New Delhi, 2003.
4. Edmund G.Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers" Oxford University Press, Oxford, 2001.

Semester- V (Third Year)

CS/IT311 AUTOMATA THEORY & FORMAL LANGUAGES

Lectures	:	2 periods/week,	Internal Marks	:	30
Tutorial:	:	1 period/week,	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	3

Course Objectives:

The main objectives of this course are to:

1. Introduce the types of Finite Automata and properties of Regular Expressions.
2. Explain Context-Free Grammars and Push Down Automata
3. Introduce the Turing Machine and explain undecidability concept.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Explain the fundamental concepts of Automata and Formal languages. L2
2. Apply the knowledge of Automata Theory, Formal languages, Grammars & Regular Expressions for solving various problems. L3
3. Design PDAs for various languages. L4
4. Design Turing machines to solve problems. L4

Course Content:

UNIT I [CO-1,2] (12 periods)

Automata: Introduction to Automata, The central concepts of automata theory - Alphabets, Strings, Languages.

Finite Automata: An Informal picture of finite automata, Deterministic finite automata (DFA) - Definition of DFA, DFA processing strings, Notations for DFA, Extended transition function, the language of DFA, Non deterministic finite automata (NFA) – Definition of NFA, Extended transition function, the language of NFA, Equivalence of DFA and NFA Finite.

Automata with ∈ transitions: Use of ∈ - transition, notation for an ∈ - NFA, Epsilon closures, extended transitions and languages, Applications.

UNIT II [CO-1,2] (12 periods)

Regular Expressions and Languages: Regular expressions, finite automata and regular expressions, Algebraic laws of regular expressions.

Properties of Regular Languages: Proving languages are not regular – Pumping lemma for regular languages, Applications of the pumping lemma, Closure Properties of Regular Languages, Equivalence and minimization of automata – Minimization of DFA

UNIT III [CO-1,2,3] (12 periods)

(Construction based treatment & proofs are excluded)

Context Free Grammars: Context Free Grammars, Parse Trees, Constructing parse trees, derivations and parse trees, ambiguous grammars.

Pushdown Automata: Definition of the Pushdown automata, the languages of PDA, Equivalences of PDA's and CFG's.

Context free languages: Normal form's for context- Free grammars, the pumping lemma for context free languages.

UNIT IV **[CO-1,2,4]** **(12 periods)**

Properties of Context free languages: closure properties for context free languages, Decision properties for CFL's.

Introduction to Turing Machines: The Turing Machine, programming techniques for Turing machines.

Undecidability: A language that is not recursively enumerable, an undecidable problem that is RE, Undecidability problems about TM, Post's Correspondence problem.

Learning Resources:

Textbook:

1. John.E.Hopcroft, R.Motwani, &Jeffery.D Ullman, "Introduction to Automata Theory,Languages and Computations", Second Edition, Pearson Education, 2003

Reference Books:

1. Daniel I.A.Cohen, 'Computer Theory',
2. KLP Mishra &N.Chandrasekharan, 'Theory of Computation', PHI.
3. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.
4. R.K.Ragade, "Automata and Theoretical Computer Science", First Edition, Pearson Education, 2004.
5. John E Hopcroft& Jeffery D Ullman' 'Introduction to Automata Theory & Languages and Computation', Narosa Publishing House.

CS/IT312 - COMPUTER NETWORKS

Lectures	:	3 periods/week,	Internal Marks	:	30
Tutorial:	:	0 period/week,	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	3

Course Objectives:

The main objectives of this course are to:

1. Introduce the fundamental concepts and layered architectures of networks.
2. Impart knowledge on functionalities, design issues, protocols and mechanisms used in different layers of network stack.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Describe the layered architectures of computer networks.
2. Explain the fundamental concepts of data communications.
3. Illustrate the data link layer protocols and the mechanisms used for accessing a channel.
4. Exemplify optimal routing algorithms and QoS mechanisms used for networks.
5. Explain reliable and unreliable protocols used for end to end connectivity.
6. Discuss the application layer protocols.

Course Content:

UNIT I **12 Periods**

Introduction: Network Hardware, Network Software, Reference Models.

Physical Layer: The theoretical basis for data communication, Guided media, digital modulation and multiplexing, switching.

UNIT II **13 Periods**

The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols.

The Medium Access Control Sub-layer: Multiple Access Protocols- ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Ethernet, Data Link Layer Switching.

UNIT III **14 Periods**

The Network Layer: Network Layer Design Issues, Routing Algorithms-Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast routing, multicast routing, Congestion control algorithms, Quality of Service-Application Requirements, Traffic Shaping, Packet Scheduling, Admission Control, Internetworking, The Network Layer in the Internet-The IP version 4.0 protocol, IP Addresses, IP Version 6.0, Internet Control Protocols.

UNIT IV **11 Periods**

The Transport Layer: The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols – addressing: Connection Establishment, Connection Release, Error Control and Flow Control, Congestion control-Desirable Bandwidth allocation, Regulating the sending rate, The Internet Transport Protocols: Introduction to UDP, Remote procedure call, Real-Time transport protocols, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

The Application Layer: DNS- The Domain Name System, Electronic mail.

TEXT BOOKS:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Fifth Edition, Pearson Education.

REFERENCES:

1. James F. Kurose, Keith W. Ross, Computer Networking, Third Edition, Pearson Education.
2. Behrouz A Forouzan, Data Communications and Networking, Fourth Edition, TMH (2007).
3. Kurose & Ross, COMPUTER NETWORKS, A Top-down approach featuring the Internet, Pearson Education, Alberto Leon, Garciak.

CS/IT313 - DESIGN & ANALYSIS OF ALGORITHMS

Lectures	:	2 periods/week	Internal Marks	:	30
Tutorial:	:	1 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	3

Course Objectives:

The main objectives of this course are to:

1. Impart knowledge on algorithm design strategies and performance analysis of algorithms.
2. Introduce pattern matching algorithms and NP-Completeness

Course Outcomes

After successful completion of the course, students will be able to:

1. Analyze the performance of algorithms based on time and space complexities.
2. Apply algorithm design strategies to solve the real world problems.
3. Use string matching algorithms to solve given problems.
4. Differentiate P and NP class problems.

Course Content:

UNIT I **10 Periods**

Introduction- What is an Algorithm? Algorithm Specification, Performance Analysis, Randomized Algorithms – Identifying the repeated element, primality testing, advantages and disadvantages.

Divide and Conquer: General Method, Merge Sort, Quick sort, Divide and Conquer Run Time Recurrence Relations.

UNIT II **15 Periods**

Greedy Programming: General Method, Knapsack problem, Job Sequencing with Dead Lines, Minimum Spanning Tree - Prim's and Kruskal's algorithms, Single Source Shortest-Paths-Dijkstra's.

Dynamic Programming: General Method, Multi Stage Graph, All Pairs Shortest Paths, Single Source Shortest Paths-general Weights, Optimal Binary Search Trees, 0/1 Knapsack, Traveling Salesman Problem.

UNIT III **13 Periods**

Back tracking: General Method, 8-queen problem, Hamiltonian Cycles, 0/1 Knapsack.

Branch and Bound: Control Abstraction for LC Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem, Traveling Salesman Problem

12 Periods

UNIT IV

String Matching – The Naïve String Matching Algorithm, The Rabin-Karp Algorithm, String Matching with Finite Automata, The KMP Algorithm.

NP-Completeness - Polynomial Time, Polynomial Time verification, NP Completeness and reducibility, NP Complete Problems.
Approximation Algorithms - The Travelling Sales Person Problem.

Learning Resources:

Text Book:

1. E. Horowitz, S. Sahni and S.Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publication. (Unit I, II, III).

2. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer Algorithm", PHI. (Unit IV).

Reference Book(s):

1. Sara Basse, A.V. Gelder, "Computer Algorithms", Addison Wesley.

CS314 PROFESSIONAL ELECTIVE - I

S.No	COURSE CODE	COURSE NAME	L-T-P	CR
1	CSEL01	Digital Image Processing	3-0-0	3
2	CSEL02	Information Retrieval	3-0-0	3
3	CSEL03	Data Engineering	3-0-0	3

CSEL01 Digital Image Processing

Course objectives:
The main objectives of this course are to:

1. To create basic understanding of fundamental concepts in digital image processing and enhancement in the spatial domain.
2. To demonstrate the approaches used in enhancement in the frequency domain and image segmentation.
3. To teach image restoration and image compression techniques.
4. To analyse morphological transformations, and image representation of real world objects

Course outcomes:

After successful completion of the course, students will be able to:

1. Define image processing systems and develop algorithms for image enhancement techniques in the spatial domain.
2. Implement enhancement techniques in the frequency domain and image segmentation
3. Develop image restoration, and image compression techniques.
4. Analyse morphological transformation algorithms, and select various descriptors for image representation.

Course Content:

UNIT I [CO1] 12 Periods

Introduction: Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals:Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels.

Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing spatial Filters, Sharpening spatial Filters.

UNIT II [CO2] 12 Periods

Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing frequency domain Filters, Sharpening frequency-domain Filters, Holomorphic Filtering, Implementation.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.

UNIT III [CO3] 12 Periods

Image Restoration: A Model of the Image Degradation/Restoration Process, Linear, Position-Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.
Image Compression: Image Compression Models, Error-free Compression, Lossy Compression, Image Compression Standards.

UNIT IV [CO4] 12 Periods
Morphological Image Processing: Dilation and Erosion, The Hit-or-Miss Transformation, Some basic Morphological Algorithms, Extension to Gray-Scale Images.
Representation and Description: Representation, Boundary Descriptors, Regional Descriptors.

Learning Resources:

Text Book:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing' Addison Wesley Pubs (Second Edition).

Reference Books:

1. " Image Processing. Analysis, and Machine Vision ", Milan Sonka, Vaclav Hlavac, Roger Boyle (Second Edition).
2. A.K.Jain, 'Fundamentals of Digital Image Processing' PHI.

CSEL02	Information Retrieval	L	T	P	C
	CS314 (CSEL02) Elective - I	3	0	0	3

Course Objectives:

The main objectives of the course are:

1. To introduce the basic concepts and techniques used for information retrieval
2. To introduce models for scoring and evaluating information Retrieval Systems
3. To impart knowledge on text classification and clustering.

Course Outcomes:

After successful completion of the course, the students will be able to:

1. CO1 – Illustrate the basic concepts and techniques used in Information Retrieval.
2. CO2 – Exemplify index construction and compression techniques.
3. CO3 – Explain scoring and computing scores in vector space model.
4. CO4 – Explain evaluation of retrieved documents and the support of feedback.
5. CO5 - Explain probabilistic information retrieval and text classification.
6. CO6 – Explain vector space classification and clustering techniques.

Course Content:

UNIT I **[CO1]** **12 Periods**

Boolean retrieval: An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

The term vocabulary and postings lists: Document delineation and character sequence decoding, Determining the vocabulary of terms, Faster postings list intersection via skip pointers, Positional postings and phrase queries.

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, Spelling correction, Phonetic correction.

UNIT II **[CO2,CO3]** **12 Periods**

Index construction: Hardware basics, blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing. **[CO2]**

Index compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression. **[CO2]**

Scoring, term weighting and the vector space model: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, Variant tf-idf functions. **[CO3]**

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction. **[CO3]**

UNIT III [CO4,CO5] 12 Periods

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance. **[CO4]**

Relevance feedback and query expansion: Relevance feedback and pseudo relevance feedback, Global methods for query reformulation. **[CO4]**

Probabilistic information retrieval: The Probability Ranking Principle, The Binary Independence Model. **[CO5]**

Text classification and Naïve Bayes: The text classification problem, Naïve Bayes text classification, The Bernoulli model, properties of Naïve Bayes, Evaluation of text classification. **[CO5]**

UNIT IV [CO6] 12 Periods

Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, k nearest neighbor.

Flat clustering: Clustering in information retrieval, Problem statement, Evaluation of clustering, K-means.

Hierarchical clustering: Hierarchical agglomerative clustering, Single – link and completelink clustering.

Learning Resources:

Text Book:

1. "An Introduction to Information Retrieval" by Christopher D. Manning, Prabhakar Raghavan & Hinrich Schütze, Cambridge University Press Cambridge, England

Reference Books:

1. Modern Information Retrieval, Baeza – Yates Ricardo and Berthier Ribeiro – Net, 2nd edition, Addison Wesley.
2. Information Retrieval : Implementing and Evaluating Search Engines, Stefan butcher, Charlie Clarke, Gordon Cormack, MIT Press, 2010.
3. Search Engines: Information Retrieval in Practice, Bruce Croft, Donald Metzler, and Trevor Strohman, Pearson Education.

CSEL03	Data Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are:

1. To introduce basics of data warehousing and data mining.
2. To impart knowledge on data mining techniques.
3. To introduce mining on complex data objects.

Course Outcomes:

After successful completion of the course, the student will be able to**:**

1. Explain the concepts of data warehousing and data mining.
2. Apply data preprocessing techniques for given data set.
3. Extract association rules from transactional databases.
4. Build a classifier for a given data set.
5. Apply various clustering and outlier detection techniques for a given data set.
6. Describe the concepts of mining on complex data objects.

Course Content:

UNIT I [CO1, CO2] 13 Periods

Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts- Data Warehouse Modeling: Data Cube and OLAP-Data Warehouse Design and Usage- Data Warehouse Implementation.

Getting to know Your Data: Data Objects and Attribute Types- Basic Statistical Descriptions of Data- Measuring Data Similarity and Dissimilarity.

Data Preprocessing: An overview of Data Preprocessing**-** Data cleaning- Data Integration- Data Reduction- Data Transformation and Data Discretization.

UNIT II [CO1, CO3] 12 Periods

Introduction - Data Mining: Why Data Mining- What is Data Mining? -What Kinds of Data can be mined? - What Kinds of Patterns can be mined? - Which Technologies are used? - Major Issues in Data Mining.

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts- Frequent Item set Mining Methods: Apriori Algorithm, Generating Association Rules, Improving the efficiency of Apriori, FP Growth Approach for Mining Frequent Item Sets, Mining Frequent Item Sets using Vertical Data Format Method.

UNIT III [CO4] 13 Periods

Classification: Basic Concepts- Decision tree induction- Bayes Classification Methods- Rule-Based Classification- Model Evaluation and Selection- Techniques to Improve Classification Accuracy.

Advanced Methods in Classification: Bayesian Belief Networks-Classification by Backpropagation-Classification by Support Vector Machines-Lazy Learners.

UNIT IV [CO5, CO6] 12 Periods

Cluster Analysis: Introduction to cluster analysis- partitioning methods- Hierarchical methods- Density-Based Methods: DBSCAN, Outliers and Outlier Analysis- Outlier Detection Methods.
Data Mining Trends: Mining Sequence Data- Mining Graphs and Networks- Mining Other Kinds of Data- Data Mining Applications.

Learning Resources

Text Book:

1. Data Mining Concepts & Techniques, Jiawei Han, MichelineKamber, and Jian Pei, 3/e, Morgan Kaufmann Publishers.

Reference Books*:*

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Addison Wesley.
2. Data Warehouse Toolkit, Ralph Kimball, John Wiley Publishers.

CS315 Open Elective /Job Oriented Course- I

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	3

CS/IT351 - DESIGN & ANALYSIS OF ALGORITHMS LAB

Practical	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	1.5

Course Objectives:

The main objectives of this course are to:

1. Provide foundations to deal with variety of computational problems
2. To demonstrate the use of algorithm design and pattern matching techniques for solving given problems.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Solve the given problems using suitable algorithm design strategies.
2. Implement algorithms using high level language.
3. Use string matching algorithms to solve string editing problems.

List of Experiments to implement:

1. Problems related to Divide and Conquer strategy
2. Problems related to Greedy Strategy
3. Graph Related Problems using Greedy Strategy
4. Problems related to Dynamic Programming
5. Graph Related Problems using Dynamic Programming
6. Problems related to Backtracking Strategy
7. Problems related to Branch and Bound
8. String Matching Problems

CS352 Data Analysis Lab

Course Objectives:

The main objectives of the course are to:

1. Introduce Python libraries used for data manipulation and visualization
2. Create awareness on data cleaning, wrangling and various operations on data
3. Impart knowledge on visualizing the data using various plots

Course Outcomes:

On successful completion of the course, students will be able to:

1. Solve the problems using Numpy features
2. Perform operations on data using Pandas
3. Visualize data using the tool Matplotlib
4. Perform operations on time series data

Course Content:

UNIT-I

NumPy Basics: Arrays and VectorizedComputation : The NumPyndarray: A Multidimensional Array Object, Universal Functions: Fast Element-wise Array Functions,Data Processing Using Arrays.

Pandas Data Structure: Introduction to pandas Data Structure, Essential Functionality,Summarizing and Computing Descriptive Statistics.

UNIT-II

Data Loading, Storage, and File Formats: Reading and Writing Data in Text Format, Binary Data Formats, Interacting with Web APIs, Interacting with Databases.

Data Cleaning and Preparation: Handling Missing Data, Data Transformation, Extension Data Types, String Manipulation, Categorical Data

UNIT-III

Data Wrangling: Join, Combine, and Reshape: Hierarchical Indexing, Combining and Merging Datasets, Reshaping and Pivoting

Plotting and Visualization: A Brief matplotlib API Primer, Plotting with pandas and seaborn, Other Python Visualization Tools

UNIT-IV

Data Aggregation and Group Operations: How to think about Group Operations, Data Aggregation, Apply: General split-apply-combine, Group Transforms and "Unwrapped" GroupBys, Pivot Tables and Cross-Tabulation.

Time Series: Date and Time Data Types and Tools, Time Series Basics, Date Ranges, Frequencies, and Shifting, Time Zone Handling, Periods and Period Arithmetic, Resampling and Frequency Conversion, Moving Window Functions

Learning Resources:

Textbook(s):

1. Wes McKinney, "Python for Data Analysis", THIRD EDITION, O`REILLY

References:

1. David Ascher and Mark Lutz, Learning Python, Publisher O'Reilly Media.
2. ReemaThareja, "Python Programming using Problem Solving approach",Oxford University press
3. Allen Downey ,JeffreyElkner ,Chris Meyers,: Learning with Python, Dreamtech Press
4. David Taieb ,"Data Analysis with Python: A Modern Approach " 1st Edition, Packt Publishing

List of Experiments:

1. NumPyndarray creation and arithmetic operations.
2. Indexing and slicing on NumPyndarray.
3. Universal Functions on data in ndarrays .
4. Array_Oriented Programming with Arrays.
5. Pandas Data structures.
6. Mechanics of interacting with the data contained in a Series or DataFrame.
7. Mathematical and statistical methods of pandas object.
8. Reading and Writing Data in Text Format
9. Handling Missing Data
10. Data Transformation operations using Pandas.
11. String Manipulation and Regular Expressions using Pandas.
12. Combining and Merging Datasets using Pandas.
13. Reshaping and Pivoting using Pandas.
14. GroupBy (split – apply – combine) Mechanics using Pandas.
15. Data Aggregation using GroupBy methods with Pandas
16. Indexing, Selection, Subsetting of Time Series data using Pandas.
17. Visualization using matplotlib
    - Bar graph
    - Pie chart
    - Box plot
    - Histogram
    - Line chart and subplots
    - Scatter plot

Content Beyond the syllabus:

Visualisation using Tableau

Learning Resources:

1. Wes McKinney, Python for Data Analysis - Data Wrangling with Pandas, NumPy, and IPython 2nd Edition. O'Reilly/SPD

2. Jake VanderPlas, Python Data Science Handbook Essential Tools for Working with Data. O'Reilly/SPD

CS353 SUMMER INTERNSHIP / MINI PROJECT

Practical	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	1.5

Semester- VI (Third Year)

CS/IT 321	Artificial Intelligence			

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	3

Course Objectives:

The main objectives of this course are to:

1. Introduce fundamental concepts of artificial intelligence.
2. Impart knowledge on problem solving using uninformed, informed, local and adversarial search strategies.
3. Create awareness on formalization of knowledge and reasoning.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Explain the fundamental concepts of artificial intelligence
2. Apply search strategies for solving real world problems
3. Utilize game playing strategies for solving problems
4. Infer knowledge using propositional and predicate logic
5. Discuss knowledge representation of the real world using Ontologies
6. Summarize the algorithms for classical planning

Course Content:

UNIT I **10 Periods**

Introduction to AI: What Is AI?, The Foundations of AI, The History of AI, The State of the Art.
Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.
Problem Solving by Search: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

UNIT II **14 Periods**

Beyond Classical Search: Local Search Algorithms and Optimization Problems, Searching with Non-Deterministic Actions.
Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning.
Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

UNIT III **12 Periods**

Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Effective Propositional Model Checking, Agents Based on Propositional Logic.
First-Order Logic: Representation Revisited, Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic.
Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT IV **14 Periods**

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Automated Planning: Definition of Classical Planning, Algorithms for Classical Planning **Planning and Acting in the Real World:** Time, Schedules and Resources, Hierarchical Planning.

Learning Resources:

Text Books:

1. Artificial Intelligence - A Modern Approach, Stuart Russell and Peter Norvig, Fourth Edition, Pearson Education

References:

1. Artificial Intelligence, E. Rich and K. Knight,3rd Edn.,(TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, 3rd Edn., Pearson Education.
3. A First Course in Artificial Intelligence, Deepak Khemani, Tata Mc-Grah Hill.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.
5. Artificial Intelligence, SarojKaushik, CENGAGE Learning

(R-20)

IT/CS322 - CRYPTOGRAPHY & NETWORK SECURITY

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

Course Objectives

The main objectives of this course are to:

1. Introduce message encryption and decryption techniques for symmetric and asymmetric cipher systems.
2. Impart knowledge on authentication and key distribution protocols.
3. Create awareness on protocols used to provide security at various layers of computer networks

Course Outcomes

After successful completion of the course, students will be able to:

1. Discuss common network security vulnerabilities/attacks
2. Explain classical symmetric encryption schemes.
3. Illustrate the concepts of public key encryption and key exchange protocols.
4. Explain MAC and Hashing techniques for message authentication.
5. Explain digital signatures, key management and distribution
6. Discuss the user authentication applications, web and E-Mail security mechanisms.

UNIT I (13 Periods)

Introduction: Computer Security Concepts, The OSI security architecture, Security Attacks, Security Services, Security Mechanisms, A model for Network Security .

Number Theory: Prime Numbers, Fermat's and Euler's theorem, testing for primality, The Chinese remainder theorem, Discrete logarithms.

Classical Encryption techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography.

UNIT II (13 Periods)

Block Ciphers & Data Encryption Standard: Traditional Block Cipher Structure, Data Encryption Standard, Strength of DES, Block Cipher Design Principles.

Advanced Encryption Standard(AES): AES structure, AES Transformation functions, AES key expansion.

Block Cipher operations:

Public key cryptography and RSA: Principles of public key crypto-systems,The RSA Algorithm.

Other Public Key Crypto Systems: Diffie Hellman Key exchange, Elgamal Cryptographic System.

UNIT III (12 Periods)

Cryptographic Hash Functions: Applications of cryptographic hash functions, Hash function based on cipher block chaining, SHA 512, SHA-3.

Message Authentication codes: Message Authentication requirements, Message Authentication functions, MAC Based on Hash functions: HMAC

Digital signatures: Digital Signatures, ELGamal Digital Signature Scheme.

Key management and Distribution: Symmetric key distribution using Symmetric and asymmetric encryption, Distribution of public keys, X.509 Certificates.

UNIT- IV (12 Periods)

User authentication: Kerberos.

Transport Level Security: Web security Considerations,
Transport Layer Security(TLS), Secure Shell(SSH)
E-Mail Security: S/MIME, Pretty Good Privacy (PGP)
IP Security: Overview, IP Security Policy, Encapsulating Security Payload.

Learning Resources:

Text Book:

1 Cryptography and Network Security Principles and Practice WilliamStallings,7thEdition, PearsonEducation.

Reference Books:

1 BehrouzA.Ferouzan,"Cryptography&NetworkSecurity",TataMcGrawHill,2007.
2 Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications,2003.
3 CharlesPfleeger,"SecurityinComputing",4thEdition,PrenticeHallofIndia,2006.
4 Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.

CS/IT323 - MACHINE LEARNING

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

Course Objectives:

The main objectives of this course are to:

1. basic concepts and applications of machine learning.
2. supervised learning and its applications
3. unsupervised learning and its applications
4. multilayer perceptrons and kernel tricks

Course Outcomes:

After successful completion of the course, the students are able to:

1. apply the machine learning concepts in real life problems
2. design solutions for supervised learning problems
3. use rule sets and reinforcement learning to solve real world problems
4. discuss the issues in dimensionality reduction and unsupervised learning algorithms

Course Content:

UNIT I **12 Periods**

Introduction: Well posed learning problems, Designing a Learning System, Perspectives and Issues in machine learning.

Concept Learning and general to specific ordering: concept learning Task , Concept learning as a search, Finding a Maximally Specific Hypothesis , Version Spaces and Candidate Elimination Algorithm, Remarks on Version space and candidate elimination.

Bayesian Learning: Bayes Theorem, Maximum Likelihood and Least Square Error Hypotheses, Bayes Optimal Classifier, Naïve-Bayes Classifier, Bayesian Belief Network.

UNIT II **12 Periods**

Decision Tree Learning : Decision Tree Representation, appropriate problems for decision tree, the basic decision tree Algorithm, Issues in decision tree learning.

Artificial Neural Networks: Introduction, Neural Network Representation, appropriate problems for neural network, Perceptrons , Multilayer Networks and the Back Propagation Algorithm.

Instance Based Learning: Introduction, KNN Learning, Locally Weighted Regression , Radial Bias Functions, Case-Based Reasoning.

UNIT III **12 Periods**

Learning Sets of Rules: Sequential Covering Algorithm , Learning Rule Sets: summary , Learning First Order Rules, Learning set of first order rules: FOIL.

Reinforcement Learning: Introduction, the Learning Task , Q Learning , Non Deterministic Rewards and Actions , Temporal Difference Learning , Generalizing from Examples , Relationship to Dynamic Programming

UNIT IV **12 Periods**

Dimensionality Reduction : Introduction, subset selection, Principal component analysis, Feature Embedding, Factor analysis, Singular Value Decomposition and Matrix factorization, Multidimensional Scaling, Linear Discriminant analysis, Canonical correlation analysis.

Clustering: Introduction, Mixture Densities, *K*-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Spectral Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

Learning Resources:

Text Books:

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. (UNIT I , UNIT II, and UNIT III)
2. Ethem Alpaydin, Introduction to Machine Learning , MIT Press, Prentice Hall of India, Third Edition 2014. (UNIT IV)

Reference Books:

1. Stephen Marsland, —Machine learning: An Algorithmic Perspective‖, CRC Press, 2009
2. Machine Learning: a Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012
3. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, MIT Press, 2012.
4. Machine Learning -The Art and Science of Algorithms that Make Sense of Data, Peter Flach, Cambridge

CS324 **PROFESSIONAL ELECTIVE –II**

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

III/IV B.Tech. (VIth Sem)				
CS324				
1.	CSEL04	Compiler Design	3-0-0	3
2.	CSEL05	Distributed Systems	3-0-0	3
3.	CSEL06	Principles of Cloud Computing	3-0-0	3
4.	*CSEL07	Industry Recommended Course(IRC)*	3-0-0	3

CSEL04 **COMPILER DESIGN**

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

Course Objectives:

The main objectives of this course are to:

1. To Discuss the phases of compiler.
2. To demonstrate parsing techniques and syntax direct translation schemes.
3. To explain run-Time storage allocations strategies and Symbol Table implementation.
4. To teach the intermediate code forms and code generation.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Demonstrate through knowledge on the phases of compiler.
2. Implement Parsers and SDT schemes.
3. Specify various intermediate code forms for compiler construction.
4. Design code generator through optimized intermediate code forms
5. Apply the various code optimization methods, and runtime allocation strategies.

Course Content:

UNIT I **12 Periods**

Introduction to Compiling: Compilers - Analysis of the source program - Phases of a compiler - Cousins of the Compiler - Grouping of Phases - Compiler construction tools.

Lexical Analysis: Role of Lexical Analyzer - Input Buffering - Specification of Tokens- Recognition of tokens- a language for specifying lexical analyzers- Finite Automata-From Regular expressions to NFA- Design of a lexical analyzer generator.

UNIT II **12 Periods**

Syntax Analysis: Role of the parser - Top-Down parsing - Recursive Descent Parsing, Predictive parsing, LL(1) Parser.

Bottom-up parsing - Shift Reduce Parsing, Operator Precedence Parser – Operator precedence parsing, Operator Precedence functions, Error recovery in operator precedence parsing, LR Parsers - SLR Parser, Canonical LR Parser, and LALR Parser- Parser Generators.

UNIT- III **12 Periods**

Syntax Directed Translation: Syntax Directed definition- construction of syntax trees, Bottom-up evaluation of S-attribute Definitions-L-attribute Definitions.

Intermediate Code Generation: Intermediate languages – SDT scheme for Assignment Statements - SDT scheme for Case Statements-SDT scheme for Boolean Expressions, SDT scheme for Flow of control constructs - SDT scheme for Procedure calls.

UNIT - IV **12 Periods**

Code Generation: Issues in the design of code generator - The target machine - Runtime Storage management - Basic Blocks and Flow Graphs - Next-use Information - A simple Code generator - DAG representation of Basic Blocks.

Code Optimization: Introduction- Principal Sources of Optimization - Optimization of basic Blocks - Introduction to Global Data Flow Analysis- Peephole Optimization.

Learning Resources:

Text Book(s):

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia, 2007.

Reference Books:

1. Alfred V.Aho, Jeffrey D. Ullman, Principles of Compiler Design, Narosa publishing, 2002.
2. Lex & Yacc - John R. Levine, Tony Mason, Doug Brown, 2nd Edition, O'Reilly
3. Engineering a Compiler - Keith Cooper & Linda Torezon, 2nd Edition Elsevier.

CSEL05 **Distributed Systems**

CSEL06 **Principles Of Cloud Computing**

Course Objectives:

The main objectives of this course are to:

1. To Explain different Cloud Deploy Models & Service Models in an enterprise cloud environment.
2. To teach Cloud Virtual Machines Migration and cloud enhancing service.
3. To create awareness Cloud Data security issues, workflow engines and SLA management for clouds.

Course Outcomes:

After successful completion of the course, the students will be able to:

1. Analyze the Integrate Enterprise cloud Environments, Cloud Deployment & Service Models.
2. Identify the use of Cloud Virtual Machines and cloud enhancing service.
3. Evaluate the Secure Distributed Data Storage and workflow engines for clouds.
4. Describe Data security and SLA Management.

Course Content:

UNIT I **12 Periods**

Introduction to cloud computing: Cloud Computing, in a Nutshell, roots of Cloud Computing, Layers and Types of Clouds, Desired Features of Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers.

Migration into a Cloud: Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud.

Enriching the 'Integration as a Service' Paradigm for the Cloud Era: An Introduction, The Onset of Knowledge Era, The Evolution of SaaS, The challenges of SaaS paradigm, New integration scenarios, The integration methodologies, Saas integration products and platforms, SaaS Integration Services, Business to Business Integration(B2Bi) Services, A Framework of Sensor-Cloud Integration.

UNIT II **12 Periods**

The Enterprise Cloud Computing Paradigm: Relevant deployment models for enterprise cloud computing, Issues for Enterprise Applications on the Cloud, Transition Challenges, Business Drivers toward a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain.

Virtual Machines Provisioning and Migration Services: Virtualization Technology overview, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context.

Enhancing Cloud Computing Environments Using a Cluster as a Service: Introduction, Related Work, RVWS Design, Cluster as a Service: The Logical Design, Proof of Concept.

UNIT III **12 Periods**

Secure Distributed Data Storage in Cloud Computing: Introduction, Cloud Storage: from LANs TO WANs, Technologies for Data Security in Cloud Computing Open Questions and Challenges.

Workflow Engine for Clouds: Introduction, Workflow Management Systems and Clouds, Architecture of Workflow Management Systems, Utilizing Clouds for Workflow Execution.

UNIT IV **12 Periods**

SLA Management in Cloud Computing: Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA Management in Cloud, Automated Policy-based Management.

Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, Homo Sapiens and Digital Information, Cloud Computing and Data Security Risk, Cloud Computing and Identity, The Cloud, Digital Identity, and Data Security, Content Level Security—Pros and Cons.

Learning Resources:

Text Book:

1. RajkumarBuyya, James Broberg, AndrZejGoscinski**,** Cloud Computing Principles and Paradigms, Wiley Publications.

Reference Books:

1. Michael Miller, Cloud Computing – Web-Based Application That Change the Way You Work
2. and Collaborate Online Pearson Publications.
3. Thomas Erl, ZaighamMahmood, & Ricardo Puttini, Cloud Computing**-** Concepts, Technology&
4. Architecture Pearson Publications.
5. Enterprise Cloud Computing - Technology, Architecture, Applications, GautamShroff,
6. Cambridge University Press, 2010.
7. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
8. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, R.
9. Kai Hwang, Geoffrey C.Fox. Jack J. Dongarra, Distributed and Cloud Computing **–** From
10. Parallel Processing to the Internet of Things, ELSEVIER Publications.

***CSEL07**	**Industry Recommended Course(IRC)***
CS325	**Open / Job Oriented Elective – II**
CS/IT361	**Artificial Intelligence lab**
CS362	**Machine Learning Lab**
CS/IT363	**Term Paper**

CSSL4 **Skill Oriented Course – IV**

Advanced skill Oriented courses

S.NO	COURSE NAME
1.	Automation Testing
2.	Object Oriented Modeling and Design
3.	Socket Programming

CSSL4 **Automation Testing**

Course Objectives:

The main objectives of this course are to:

1. Introduce basic concepts of automated software testing
2. Understand white box, black box, object oriented, web based testing
3. Know in details automation testing and selenium testing tool used for automation testing
4. Understand the importance of automation testing development.

Course Outcomes:

After the successful completion of the course, student will be able to:

1. Describe the fundamental concepts in software testing such as manual testing, automation testing
2. Design and develop a project test plan, design test cases, test data, and conduct test operations
3. Apply recent selenium automation tool for testing web application using java
4. Explain different approaches to automated testing using selenium

Course Contents :

UNIT I **10 Periods**

Introduction: Introduction to Selenium Structure Objectives What is Selenium?; Introducing Selenium, Brief History of The Selenium Project, Selenium's Tool Suite, SeleniumIDE, Selenium RC, Selenium Web driver, Selenium Grid, Test Design Considerations

Preparing System and Application Under Test: Structure Objectives Setting eclipse Create new Java project Adding Selenium jars Set browser drivers Walkthrough of BPB application Other applications

UNIT II **10 Periods**

Web Driver, Web Element, and By Structure Objectives Web Driver and its purpose Set browser drivers Methods of Web Driver The Web Element interface Generic structure of Web Element Methods of Web Elements Exception with Web Elements About By class Methods in By class Understanding locators Exception with the By class

Working with Web Elements—Form, Table, and Dropdown Structure Objectives Working with form elements working with Web Tables Working with dropdown

UNIT III **10 Periods**

Working with Web Element—Alert, Frame, IFrame, and Window Structure Objectives Working with JavaScript alerts Working with Frame and IFrame Working with HTML window
Extra Concepts— Actions, Screenshot, Web Driver Manager Introduction Structure Objectives Actions Screenshot Web Driver Manager

Unit IV **10 Periods**

What is Test NG Structure Objectives Introduction, Installation Structure Assertions in Test NG Result and reporting in Test NG Design Test NG test passing data in Test NG test
Concept of Page Object Model Structure Objectives Page object model Implementing page object model Implementing page factory Structure Objectives Managing data using CSV Managing data using Excel Reading data from Excel file Using Excel reading function

Learning Resources:

Text Book:

1. Web Browser Automation for Testing Using Selenium with Java" by Pallavi S, BPB Publications

References:

1. M G Limaye, "Software Testing Principles, Techniques and Tools", Tata McGraw Hill, ISBN: 9780070139909 0070139903
2. SrinivasanDesikan, Gopalswamy Ramesh, "Software Testing Principles and Practices", Pearson, ISBN-10: 817758121X
3. NareshChauhan, "Software Testing Principles and Practices ", OXFORD, ISBN-10: 0198061846. ISBN-13: 9780198061847
4. Stephen Kan, "Metrics and Models in Software Quality Engineering", Pearson, ISBN-10: 0133988082; ISBN-13: 978-0133988086

Web References:

1. https://www.selenium.dev/documentation/webdriver/
2. https://testng.org/doc/index.html